Implementing Reforms in Public Sector Accounting

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Editor

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MEASURING PORTUGUESE LOCAL GOVERNMENT RELATIVE EFFICIENCY: A RE-ANALYSIS*

Introduction

In last decades one has witnessed a worldwide increasing interest in the issues of public sector efficiency. Problems of controlling public expenditure have led to a growing emphasis on the public sector output and productivity (Ganley and Cubbin, 1992). Within the EU context, growing attention has been given to the quality and efficiency of public spending, given the overall financial constraints faced by governments in most countries (EC, 2004). With regard to local government, the debate over spending efficiency has been renewed with the implementation of decentralisation policies designed to refocus public decision-making from central to municipal levels of government (Afonso and Fernandes, 2003). Regardless of the level of government considered, the efficiency issue is central since it concerns making better use of the taxpayers' money by maximising the relationship between the available resources and the products or services provided.

The purpose of this paper is to evaluate Portuguese municipalities' relative efficiency, based on 2004 data of Continental Portugal, in order to rank their performance. The methodology of data envelopment analysis (DEA) is applied, combining different indicators and considering 'undertaken commitments' as inputs and accomplished activities as outputs. A cross-section comparison is performed obtaining a relative efficiency measure. The objective is not to present absolute values for each municipality ('best values'), but instead to reach an efficiency frontier that limits Portuguese municipalities' efficiency perimeter. This defines the maximum level of outputs that could have been produced by the most efficient municipalities with the resources available or the minimum level of inputs necessary to maintain the level of services offered.

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The paper makes a contribution by offering new evidence on municipalities' performance and adds to other important studies (e.g., Afonso and Fernandes, 2003 and 2005) the use of input measures that are not strictly cash-based – undertaken commitments instead of payments –, as well as a different perspective of performance and efficiency analyses having in mind an investors' perspective.

The remainder of the paper is organised as follows. Section 1 offers an overview of Portuguese local government framework, namely addressing organisation, responsibilities, funding and the accounting system. In Section 2, issues concerning efficiency in the public sector are considered, such as measurement problems, reference values, measures suggested by international organisations and difficulties in establishing input and output indicators. Some relevant empirical analyses on local government efficiency are summarised in Section 3. Section 4 presents the empirical study addressing the data and methodology and discussing the results. The paper concludes with final considerations.

1. Portuguese Local Government Framework

Unlike other Western European countries that have several intermediate tiers of government between central government and municipalities, Portugal has a three-tier administrative public sector system that includes central government, municipalities and parishes. The absence of intermediate tiers of government makes the link between central government and municipalities stronger (a positive credit factor) as it ensures tight central government controls, on the one hand, and, on the other, it allows direct negotiations between the two tiers of government (FitchRatings, 2005).

Municipalities are the local authorities assuming more importance, either with respect to political decision power or to financial expression. Parishes are small jurisdictions with few own competencies, performing tasks that are delegated from the respective municipalities (Bravo and Vasconcellos e Sá, 2000).

Portuguese municipalities' current main responsibilities are set out in Law 159/99, which sets the framework for the decentralisation process. The decentralization of competencies aims at reinforcing national cohesion and inter-regional solidarity, as well as promoting public management efficiency and effectiveness, assuring the best way of fulfilling citizens' needs and rights.

Table 1 presents the evolution of Portuguese municipalities' competencies so far established in three legal decrees (Carvalho *et al.*, 2006b). A clear enlarging tendency may be observed, which, in line with the Constitution, has been followed by adequate transfers from central government. According to the latest information, there are currently no known plans to transfer further responsibilities.

Table 1 – Municipalities' competencies evolution

Decree-Law n. 79/1977	Decree-Law n. 100/1984	Law n. 159/1999
• Managing property under the entities' jurisdiction • Public supplying • Culture and social assistance • Public sanitation	• Managing property both owned and under the entities' jurisdiction • Development and public supplying • Public and basic sanitation • Health • Teaching and education • Culture, leisure and sports • Defence, environment protection and residents' quality of life assurance • Civil protection	• Rural and urban infrastructures • Energy • Transports and communication • Education • Heritage, culture and science • Leisure and sports • Health and social support • Housing • Civil protection • Environment and basic sanitation • Consumer defence • Development promotion • Territorial an urban planning • Municipal police • External cooperation

Municipalities' political and administrative organisation is also established by law, namely in Decree-Law 169/99 (amended by law 5A/2002), as well as in the Local Autonomy European Charter (subscribed by Portugal via Parliamentary Instruction 28/90), in order to assure more effective management, adapting to specific needs of the citizens.

Traditionally, the bulk of Portuguese municipalities' revenue (excluding new borrowing) is operating revenue, averaging 79% for the last five years, which is mainly composed of taxes and fees from services provided; the remaining is capital revenue. Operating expenditure averaged 57% of total expenditure between 2000 and 2003, but declined to 50% in 2004. Consequently, capital expenditure has also been important for Portuguese municipalities (FitchRatings, 2005). Table 2 displays the main local operating revenue.

Table 2 – Municipalities main operating revenue (Local Finance Act – 1998)

Type	Description
Central government mandatory transfers	Reallocating 33% of the average of the three main taxes – VAT, corporate tax and personal income tax – collected by central government two years previously
Municipal taxes (particular revenue)	Collected by the Central Government and then returned to each municipality (property ownership tax, vehicle tax, property sales tax and a surcharge on corporate income)*
Fees and prices	Directly collected by municipalities as they provide services to be directly paid

* Parliament retains legislative power to modify local taxes, while municipalities have some limited discretion on modifying tax rates. The last major national tax reforms occurred in 2002 and were related to two main taxes – tax on property ownership and selling.

As to accounting, the current system of municipalities' accounting in Portugal consistently integrates three subsystems, using double-entry bookkeeping method – cash-based budgetary accounting, together with accrual-based financial and cost accounting[1]. In short, the system combines different perspectives to reach general objectives, as in Table 3.

Table 3 – Objectives of municipalities' accounting system

Objective	Description
Accountability	Offering information for municipalities to prepare the annual accounts as other statements to be disclosed for different users, namely The Court of Accounts and the Municipal Legislative Assembly
National Statistics	Providing information to compute the aggregated data for National Accounts, particularly concerning Local Administration
Decision-making	Offering enough financial and economic information to support decision-making both of political and management nature
Transparency	Improving transparency in managing financial resources and the whole property that municipalities manage or control

Within the whole system, expenditures and revenues are compulsorily classified according to several categories, as in Table 4.

The functional classification is particularly important in assessing municipalities' efficiency, since output measures must relate to these categories. In fact, expenditures classification per functions allows us to understand the financial effort municipalities carry out in several intervention areas following their responsibilities. From the time it considered, at macro level, the functional classification aggregates total expenditure of all sectors of public administration, it has embraced information concerning the resources applied amongst the whole of public administration activities.

In assessing efficiency, Cost Accounting is fundamental. Cost Accounting in the Public Administration is a consequence of new informational needs within the context of the *New Public Management*, namely because it provides information that, together with planning and control systems, allows the analysis of how each governmental unit contributes to economy, efficiency and effectiveness while using public resources (Torres, 2002).

As addressed above, a Cost Accounting subsystem is now a part of the Portuguese municipalities' accounting system. Nevertheless, a large majority of municipalities have not implemented the new system yet (Carvalho *et al.*, 2006b). Therefore, the efficiency of Portuguese municipalities might be assessed not in terms of resources consumed or expenses (cost – accruals perspective), but in terms of undertaken commitments

[1] For further information regarding the current main features of Portuguese municipalities' accounting system and how they represent significant improvements compared to the previous one, see Carvalho *et al.* (2006a and 2006b), Jorge *et al.* (2006) and Jorge (2003).

Table 4 – Expenditure and revenue classification

Type	Description
Economic classification	Per nature, according to the specification principle
Departmental classification	It is an additional classification only for expenditures, recommended by the Budgetary Framework Law (Law 91/2001)
Functional classification	Only for expenditures; each function corresponds to a broad category of municipal activities (Decree-Law 54A/99); this classification comprises four broad categories (general functions*, social functions**, economic functions*** and other****), detailed enough in order to consider all municipalities' responsibilities and allowing subsequent consolidated information at local, regional and national level[a]

* General administrative services; and security and public order.

** Education; health; social assistance; housing and collective services; and cultural, leisure and religious services.

*** Agriculture, farming, hunting and fishery; industry and energy; transports and communication; commerce and tourism; other economic functions.

**** Municipal debt; transfers between administrations; and other non-specified.

[a] Moreover, since functional categories are adopted from the International Monetary Fund and OECD classification, Carvalho *et al.* (2006c) support that cross-country comparisons are possible as well as consolidated information at supranational level.

(expenditures) or merely in terms of money spent (payments – cash perspective). In addition, although the reform of municipalities' financial and accounting system has intended to improve efficiency evaluation, there is still no national framework, namely a set of performance indicators to be followed by governmental entities. Currently, municipalities only present budgetary and financial ratios in their management reports and there is a great diversity amongst the measures presented, seriously compromising the overall comparisons (Carvalho *et al.*, 2005, Fernandes, 2004).

As to control and supervision, the municipalities' level of reporting to both Central Government and the Supreme Audit Office (The Court of Accounts), which was already high, increased further in 2000. Since then, they have to present, on an annual basis, a four-year investment programme and an annual provisional budget. Municipalities also need to present, on an annual basis, balance sheets, fund balances and profit and loss accounts merged into two documents: Annual Accounts and Management Report. As explained, financial statements are presented on an accruals basis while budgetary statements are cash-based. The Court of Accounts, together with several sub-agencies of the Ministry of Finance, oversees the activities of municipalities. This close monitoring of municipalities' finances might be favourable to credit rating (FitchRatings, 2005).

2. Efficiency in the Public Sector

Efficiency is defined as the relationship between used inputs and results obtained in the process of creation of value within an entity. As Bac (1994) highlights, efficiency criteria are based on business management and presume a positive balance in the relationship output/input, i.e., maintaining quality standards, which imply consumption rationality, eliminating waste.

Nevertheless, given that public sector entities, except governmental enterprises, are not profit oriented, efficiency criteria used in the private sector cannot be directly applied to the public sector, where the services provided are market-aside and difficult to valuate. Still, efficiency in the public sector is frequently defined as the relationship between goods and services provided and resources applied, emphasising output maximisation given a certain input or input minimization given a certain quantity and quality of output (Torres, 2002).

INTOSAI (1995) enlarges the definition, highlighting that efficiency is intimately related to the concept of 'productivity'[2] and it needs a reference board to be adequately evaluated, either through benchmarking or establishing best-practice standards.

As a consequence of the difficulties in setting maximums and minimums levels of inputs and outputs, Torres (2002: 60) defines efficiency as "the most adequate relationship between outputs and the necessary resources to obtain them". It means reaching the objectives established, minimising the resources used or, given the resources available, maximising the objectives. From this point of view, efficiency and effectiveness are two alternative, though interrelated, concepts, but not necessarily hierarchic.

Evaluating public sector outputs and results, although not without difficulties, is less problematic than evaluating programmes' general impacts (outcomes). In this case, it is necessary to determine to what extent the effects are attributed to the programme and not to other factors, which demands an analysis of causal relationships, identifying and controlling all external factors that might somehow affect that relationship (Ballart, 1992).

On the other hand, Simon (1994) highlights an additional problem derived from existing different measurement units for inputs and outputs, which brings difficulties for comparisons and implies that efficiency should be evaluated in relative terms. Therefore, he emphasises the need to enlarge the efficiency concept to include all factors implied in the process of creating value within an entity that are not susceptible of monetary measurement. This would allow the determination of whether a governmental entity is or is not efficient without necessarily following exclusively monetary criteria (AECA, 1997).

Afonso *et al.* (2006: 9) explain that applying the concept of efficiency to the spending activities of government, "we can say that public expenditure is efficient when, given the amount spent, it produces the largest possible benefit for the country's population."

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[2] Rosen (1993: 4) explains that public productivity, in general terms, is an efficiency measure – it tells how well resources have been used. "The more produced with a given set of resources, the higher the productivity. (…) A productive organisation,…, is one that turns out a high level of good quality product with its resources. Public productivity focuses on the efficiency of governmental (…) administrative agencies and their subunits."

The implicit relationship between benefits and costs requires both to be measured in acceptable ways. "This is easy, or easier, for machines (…) but difficult for governmental activities. It is often difficult to measure the benefits from a governmental expenditure. But, one could assume that at least the costs (i.e., the resources used) should be easy to determine. Unfortunately, this is not always so. Deficient budgetary classifications, lack of reliable data, difficulties in allocating fixed costs to a specific function, and failure to impute some value to the use of public assets used in the activity can also hamper the determination of real costs" (Afonso *et al.*, 2006: 9).

One of the most common techniques in efficiency evaluation is using management indicators. Their analysis helps to detect those programmes or services that deserve special attention, since they do not reach the standard or average levels of effectiveness, efficiency, economy and quality. Management indicators also allow comparisons between similar entities and across time within the same entity, identifying trends (Rutherford, 2000).

Fernandes (2004) summarises that management indicators within governmental entities are management instruments supporting accountability as well as decision--making oriented towards reducing public deficit and increasing value-for-money. They allow the evaluation of those activities contributing towards creating value and, therefore, understanding the relationship between resources applied, activities developed and results obtained, displaying information both to internal and external users. Accordingly, management indicators, frequently used in private companies, play a twofold role in the public administration (Fernandes, 2004): internal (supporting the establishment of public policies, controlling their implementation and evaluating final results), and external (offering information to assess entities' performance and account for public managers responsibilities).

In terms of information requirements, management indicators must facilitate information on efficiency, effectiveness and economy of public sector entities following the qualitative characteristics generally required and accepted for financial reporting information, namely reliability, relevance, comparability and opportunity (Smith, 1993; Likierman, 1994). As to methodological issues, the establishment of indicators requires taking into account the information to be facilitated by each one as well as how to get the data. Therefore, the use of several combined indicators that offer a global vision, while evaluating governmental entities' activities, is recommendable. There are, however, problems in selecting indicators to represent the most significant issues amongst entities' activities, justifying the lack of reference frameworks (Torres, 2002).

Developing and classifying management indicators in public sector entities is rather flexible, depending on what is intended to be evaluated. Consequently, there are several categories and criteria for classification (Torres, 1991). Many authors have addressed the subject, proposing alternative classifications for public management indicators. AECA (1997) and Torres (1991) offer a classification as follows in Table 5.

Table 5 – Classification of Public Sector Management Indicators

Classification Criteria	Categories
According to their nature	Economy
	Effectiveness
	Efficiency
	Equity
	Excellence
According to the object to be measured	Result
	Process
	Structure
	Strategy
According to the information offered	Budgetary
	Accounting (Financial Statements)
	Organisational
	Social
	Envelopment and Impact
According to their scope	Internal
	External

The above categories are somehow related to a dual-fold classification into input (means) and output (results or realisations) indicators, central for assessing efficiency. Input indicators are measures that allow us to know the nature and quantity of the factors used directly or indirectly by entities in order to carry out their activities. They are the basis to evaluate economy and efficiency in managing public services. Most information to compute these measures comes from cost accounting. Input measures comprise the main resources used by governmental entities, namely human, material and financial resources. Problems may arise concerning the exact resource consumption.

As to output measures, they allow the assessment of the level of services provided, therefore requiring a detailed knowledge of the entire entities' activities. Considering the complexity in finding a single indicator of output or results (given that objectives and outcomes are difficult to measure), it might be possible to combine several indicators – multidimensional series (Torres, 2002).

Relating to the above-mentioned problems of finding a set of indicators that would offer the best representation of the main activities within the entity, Fernandes (2004) refers to the scarce use of management indicators in practice, justifying the prevalence of traditional financial measures. Since financial ratios merely measure and highlight specific aspects concerning financial income (namely those that might be quantified in cash), they are not adequate decision-making support instruments in the present public sector management context. In fact, a performance analysis focused on financial issues might have dysfunctional consequences for both the entities management and the accomplishment of their main objectives.

According to Afonso and Santos (2005: 2), "the proper measurement of public sector performance, particularly in what concerns service provision is a delicate empirical issue and the related literature, principally when it comes to aggregate data, is still

limited." But the development and analysis of performance indicators is no more than a first step in the task of measuring the efficiency of public sector. The use of statistical analysis, such as regression analysis, can be seen as a significant improvement but not yet the ideal methodology (Barrow and Wagstaff, 1989). The third, and more satisfactory, phase is the evaluation using a group of methods based on the concept of frontier, hence the reason why they are called frontier methods. The idea is to identify and evaluate those organisations operating on the cost or production frontier (efficient organisations) and those operating below that frontier (inefficient organisations). The so-called data envelopment analysis (DEA) is probably the most commonly used frontier analysis technique, namely in the case of applications to measure public sector efficiency.

Afonso *et al.* (2006) analysed public sector efficiency in the new member states of the European Union compared to that in emerging markets. They compute efficiency scores and rankings by applying a range of measurement techniques, namely using composite efficiency indicators (combining information on administrative, education, health, income distribution, economic stability, and economic performance outcomes) and non-parametric analysis techniques such as free disposal hull (FDH) and DEA.

"The study finds that expenditure efficiency across new EU member-States is rather diverse especially as compared to the group of top performing emerging markets in Asia. Econometric analysis shows that higher income, civil service competence and education levels as well as the security of property rights seem to facilitate the prevention of inefficiencies in the public sector" (Afonso *et al.*, 2006: 4).

The results from DEA analysis particularly reveal "that a small set of countries define or are very close to the theoretical production possibility frontier: Singapore, Thailand, Cyprus, Korea, and Ireland. From an input perspective, the highest ranking country uses 1/3 of the input that the bottom ranking one uses to attain a certain Public Sector Performance score. The average input scores suggest that countries could use around 45 per cent less resources to attain the same outcomes if they were fully efficient. Average output scores suggest that countries are only delivering around 2/3 of the output they could deliver if they were on the efficiency frontier" (Afonso *et al.*, 2006: 42).

3. Empirical Analyses of Local Government Efficiency

Data envelopment analysis (DAE) is a performance measurement technique and is used to evaluate the relative efficiency of a group of producers or units of an organisation. These are commonly designated as decision-making units (DMUs). The emphasis on relative efficiency needs to be made, since DEA is a poor technique in estimating absolute efficiency. Simply put, DEA tells us how well a given DMU is doing compared to the others, but not compared to a theoretical maximum.

While a typical statistical analysis is based on a central tendency approach, DEA is an extreme point method. In the first case, comparisons are made to the average. In an extreme point method, comparisons are made with the best producers or units. This is based on the idea that if a given unit A is capable of producing Y(A) units of output with X(A) inputs, then the other units should also be able to do the same

if they are operating efficiently. Moreover, the units can be combined to form a composite unit with composite inputs and composite outputs. This is a virtual unit, since this composite unit does not necessarily exist. The main goal of DEA is to find the best virtual unit for each real DMU. The efficiency frontier defines the maximum combinations of outputs that can be produced for a given set of inputs. If the virtual unit is capable of making the same output with less input or making more output with less input, the real DMU is considered inefficient. On the contrary, if the virtual unit is alike the real DMU (lies in the frontier line), it is declared to be efficient. In technical terms, this virtual unit is formulated as linear program. This is why DEA is a linear programming technique.

The analysis has to make several options regarding the way concrete problems are formulated. The first is opting between an input-oriented and an output-oriented analysis. An input-oriented analysis quantifies the reduction in the inputs that is necessary to become efficient holding the outputs constant. On the contrary, an output-oriented analysis quantifies the necessary output expansion holding the inputs constant. A non-oriented analysis quantifies the improvements when both inputs and outputs can be improved simultaneously.

Another important issue is how to deal with different sizes of the DMUs. It is widely acknowledged that efficiency may increase or decrease with size, that is, returns to scale. If a constant return to scale constraint is imposed, it means that no efficiency gains can be obtained with size. Usually, a variable returns to scale formulation is admitted in concrete problems relating to efficiency in the public sector.

The number of studies performing DEA in the public sector setting is far too extensive to be reviewed here. Therefore, we concentrate on studies that consider local governments or municipalities as DMUs.

Borger and Kerstens (1996) compare three approaches to evaluate the cost efficiency of Belgian local governments: FDH, DEA, and econometric approaches. The advantage of this study is the ability to compare the different parametric and non-parametric approaches and to evaluate their sensitivity with respect to the rankings of municipalities (589 in this case). Two main conclusions were reached: first, large differences in mean efficiency scores and, second, rank correlations between the parametric and non-parametric measures were relatively low. The authors suggest prudently "to analyse efficiency questions using a broad variety of methods to check the robustness of the results" (Borger and Kerstens, 1996: 167-8).

Two more recent studies of the Finnish municipalities are also worthy of mention, both by Loikkanen and Susiluoto (2004 and 2006). The 2004 study compares DEA and econometric (Tobit) methods and its main virtue is the fact that it uses a panel (1994-2002) of 353 municipalities. As expected, they estimated efficiency scores and found considerable differences. Namely, a group of peripheral municipalities clearly tend to perform worse. On the other hand, the efficiency scores tend to remain fairly stable over time. The 2006 study basically corroborates the previous study, finding the small municipalities as the most efficient.

Another relevant study explores efficiency in local government service provision in Norway, using panel data. The total output measure "… is very comprehensive and based on a large number of indicators of production for the different service sectors. Efficiency is measured as the ratio between total output and available resources. The efficiency

measure is global in the sense that it relates to overall service provision, and not to provision of a particular service" (Borge *et al.*, 2007: 2).

Three efficiency measures all revealing substantial variation in efficiency across local governments were constructed, and the aggregate efficiency potential is around 33-35%. Firstly, a regression analysis was carried out between the aggregated output and local governments' revenue, revealing a high positive correlation. Having also observed substantial variation in aggregate output between local governments with similar levels of revenue, i.e. some local governments are able to get more services out of their revenues than others, the author pointed out that the variation in output conditioned on revenues may reflect variation in efficiency. Two additional efficiency measures were alternatively developed considering possible weaknesses in the baseline efficiency measure.

Aiming at investigating whether efficiency in public service provision is affected by political and budgetary institutions, fiscal capacity, and democratic participation, Borge *et al.* (2007) has concluded that high fiscal capacity and a high degree of party fragmentation contributes to low efficiency; furthermore, increased democratic participation tends to increase efficiency, while a centralized top-down budgetary process is associated with low efficiency. His most robust result points toward two opposing future trends in public sector efficiency. "On the one hand, the ageing of the population in many European countries is likely to increase public sector efficiency by causing fiscal stress, thereby facilitating the handling of the wave of the elderly. On the other hand, the tendency of reduced support for the largest political parties will increase party fragmentation and work in the opposite direction" (Borge *et al.,* 2007: 24-25).

Afonso and Fernandes (2003 and 2005) studied the Portuguese case. The 2005 paper extends the DEA to the entire group mainland municipalities[3]. They perform a 1 input to 1 output analysis. The input is the per capita budgetary spending while the output is a composite measure. The Local Government Output Indicator (LGOI) is a normalized measure giving equal weight to a set of performance indicators taken directly from the local government activities. In addition, they perform the analysis by region: Algarve, Alentejo, Lisbon region, Center, and North. They found that the southern regions of Alentejo and Algarve perform more efficiently than the remaining country.

4. Empirical study

In our analysis of local government efficiency, we also use DEA but we choose a different menu of inputs and outputs. This is due to the use of own collected data rather than official data that is always on a cash basis.

[3] The 2003 analysis refers to the Lisbon region only.

4.1. Computing Efficiency Scores

We collected data from the 2004 municipal annual accounts, either from the archives of The Court of Accounts (Supreme Audit Office) or, wherever necessary, from the municipalities themselves. Of the 278 mainland municipalities, only three were excluded due to unavailability of data. So our DEA includes 275 DMUs.

The input measures to perform our analysis are given by the financial resources used, that is, local expenditures. This procedure follows the standard procedure in this literature (Afonso and Fernandes 2003, 2005). As we explained in the first section, the reform of the local government accounting towards an accrual-based system makes the presentation and use of different types of financial information possible. Financial statements are presented on an accruals basis while budgetary statements are cash-based. The input measures are not strictly cash-based (payments) but undertaken commitments. Given the widely recognised problems relating to the use of cash information, this is clearly a better way to represent the use of resources. Regarding inputs, we use two model specifications. The first (M1) with only one input and the second (M2) with three inputs, those related to the municipal activity, consumption and investment outlays (see Table 6).

Table 6 – List of Municipal Inputs

Model	Variable	Indicator
M1	Xt	Total expenditure
M2	X1	Personnel expenditure
	X2	Expenditure with goods and services
	X3	Capital expenditures

It is widely acknowledged that the main challenge for these analyses of efficiency is how to measure output (Barrow and Wagstaff, 1989). While most studies use composite measures of output (Afonso and Fernandes, 2003 and 2005), we opted for a different strategy of including seven separate, and more direct, indictors of output. This avoids the measurement problems related to the construction of the composite measure itself. According to the legal framework, the municipal spending functions are the following: rural and urban equipment; energy, transport and communications; education, patrimony, culture and science; sports and leisure; healthcare and social services; housing and civil protection; environment and basic sanitation; consumer protection, social and economic development; territory organisation and external cooperation. In this sense, the municipal indicators are surrogate measures of municipal services demand. The idea is that we should expect similar performance from those municipalities with similar demand for services (Afonso and Fernandes 2005). Naturally, the selection of output indicators was also determined by the availability of published data, in this case by the National Statistics Institute. Table 7 shows the seven selected output indicators.

Table 7 – List of Municipal Outputs

Variable	Indicator
Y1	Local inhabitants under 15 or 15 years old
Y2	Local inhabitants 65 or over 65 years of age
Y3	Number of basic or elementary schools
Y4	Number of students enrolled in the elementary schools
Y5	Water consumption
Y6	Number of building permits issued in the year
Y7	Social development indicator, according to the Local Finance Law and officially published

We use an input-oriented approach since the public sector focus has been more on controlling expenditure than on the increasing of outputs. In fact, the EU context of overall financial constraints faced by governments imposes an attention oriented towards expenditure reduction, not output expansion. Regarding returns to scale, we follow the standard procedure of adopting the more flexible option of variable returns to scale.

Model 1 (Table 8 – Annex 1) presents the results of the 1 input (total expenditure) analysis while Model 2 (Table 9 – Annex 2) relates to the 3 inputs (partial expenditure) analysis. Since DEA produces relative efficiency scores, more important than the computed score is the rank order of the municipality. The rankings are also presented in the tables. The two models do not differ very much. The main difference is the number of municipalities declared to be efficient. As expected, the number of efficient municipalities is higher in the second model. It is acknowledged that the higher the number of factors included in the analysis, the higher the number of DMUs declared efficient.

Regarding substantive results, the main differences are observed with regard to size, here measured in terms of population. Since resident population is one of the factors used to determine intergovernmental grants (Local Finance Law 42/98), we grouped municipalities according to population size as follows:

- Small – ≤20,000 residents;
- Medium – 20,000-100,000 residents;
- Large – ≥ 100,000 residents.

Table 10 shows the average efficient scores when the three groups of municipalities based on size are considered. The results for both models strongly suggest that larger municipalities tend to be more efficient.

Table 10 – Average Efficiency Scores by Size

Group	Model 1	Model 2
Small Size	70.65%	74.68%
Medium Size	75.66%	81.29%
Large Size	92.14%	93.29%

4.2. Assessing the Robustness of the Scores

In what follows, we run different efficiency rankings in order to check for major changes in the number of municipalities deemed efficient, and, in this way, test the sensitivity of our original efficiency score (labeled 'Score 1'). These rankings differ as to the number of outputs specified. Table 11 displays the correlation scores of several different trial efficiency rankings. In the first seven rankings, one output (corresponding to the ranking label) is subtracted from the total number of outputs (shown in Table 7). As we can see in the first column of correlation scores, several of these different outputs cause little change in the municipal efficiency rankings. Three of these rankings are practically the same, "pop15" (r= .999), "pop 65" (r = .9763), "enrol" (r = .999).

Table 11 – Correlation Chart of Different Efficiency Score Rankings

	Score1	Pop15	Pop65	Bschool	Enrol	Watcons	Permit	Ids	Educ	Housing	Pop	Doutput
Score1	1.0000											
Pop15	0.9998	1.0000										
Pop65	0.9763	0.9758	1.0000									
Bschool	0.9537	0.9530	0.9134	1.0000								
Enroll	0.9993	0.9990	0.9744	0.9537	1.0000							
Watcons	0.9557	0.9563	0.9213	0.9004	0.9543	1.0000						
Permits	0.9271	0.9267	0.8991	0.8729	0.9263	0.8869	1.0000					
Ids	0.9201	0.9201	0.8924	0.8737	0.9203	0.8678	0.8387	1.0000				
Educ	0.9485	0.9477	0.9059	0.9979	0.9501	0.8941	0.8671	0.8677	1.0000			
Housing	0.9219	0.9223	0.8828	0.8593	0.9205	0.9722	0.9197	0.8256	0.8526	1.0000		
Pop	0.9758	0.9757	0.9998	0.9121	0.9738	0.9213	0.8982	0.8928	0.9045	0.8826	1.0000	
Doutput	0.7724	0.7713	0.7737	0.8293	0.7786	0.6775	0.6776	0.6706	0.8444	0.6226	0.7727	1.0000

Tables 12 and 13 (Annexes 3 and 4, respectively) display the municipalities considered efficient (scoring one) in seven of the remaining rankings with the lowest correlations scores (equal to or lower than .95). Table 13 displays the different municipalities considered efficient according to theoretical combinations of outputs subtracted from the total number of outputs. "Educ" refers to the two outputs related to elementary schooling (Y3 and Y4 in Table 7). "Housing" refers to the two outputs related to housing (Y5 and Y6 in Table 7). Finally, "Doutput" reflects only those outputs that are strictly attributed to municipal activity (Y3, Y6, and Y7). As we can see, this is the ranking that differs the most in comparison to our original ranking (r = .77). This is not surprising since two or three are subtracted. Nevertheless, the changes do not fundamentally alter the main conclusions regarding the most efficient municipalities.

Conclusion

While exploratory, given the nature of the data used, the results presented in this paper are a step towards ranking Portuguese municipalities according to their efficiency. The main results presented in Tables 11, 12 and 13 demonstrate that the efficiency

scores are relatively resistant to different combinations of output. This is specially important given the widely known difficulty of choosing the outputs. Therefore, we can confidently say that it is not the choice of output indicators that determines the final results.

The reasons for strong effect with respect to size observed in Table 10 may lie in the qualification of their human resources. The lack of municipal human capabilities is widely known in Portugal, namely with respect to the smaller municipalities. The priority to investment in human capital is at stake and cannot be delayed. The efficiency of municipal use of resources depends on that to great extent.

This paper also integrates the larger project of analysing the effects of the reform of the municipal accounting system. Knowing whether this new system makes municipalities more efficient is very important, given that the main objectives of the reforms were precisely a better use of public resources.

An exploratory study leaves ample space for future improvements. One is the replication of these results using other parametric and non-parametric techniques. This would improve the check of robustness of the present results. Given the well known sensitivity of the frontier techniques, this is a fundamental task.

A second future path could be the explanation of the differences of efficiency among municipalities, for example, whether or not a higher level of conformity with the new accounting system (Jorge *et al.*, 2006; Carvalho *et al.*, 2007) has a positive effect on the efficiency score. Since an endogeneity problem is certainly present here, it would have to be taken into account separately.

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Annex 1

Table 8 – Data Envelopment Analysis Results (1 input; 7 outputs)

Municipality	Efficiency Score	Rank
Abrantes	65.11%	182
Águeda	100.00%	1
Aguiar da Beira	66.22%	176
Alandroal	44.24%	265
Albergaria-a-Velha	78.41%	114
Albufeira	66.17%	177
Alcácer do Sal	92.84%	64
Alcanena	74.27%	128
Alcobaça	62.85%	191
Alcochete	72.62%	137
Alcoutim	49.42%	249
Alenquer	100.00%	1
Alfândega da Fé	52.88%	238
Alijó	78.88%	107
Aljezur	76.49%	120
Aljustrel	70.07%	158
Almada	100.00%	1
Almeida	52.27%	239
Almeirim	82.54%	94
Almodôvar	57.05%	226
Alpiarça	64.30%	187
Alter do Chão	73.19%	135
Alvaiázere	86.61%	83
Alvito	100.00%	1
Amadora	83.,83%	90
Amarante	85.80%	86
Amares	96.48%	58
Anadia	91.53%	67
Ansião	54.11%	235
Arcos de Valdevez	68.10%	166
Arganil	78.45%	113
Armamar	69.21%	160
Arouca	95.28%	59
Arraiolos	67.64%	168
Arronches	75.24%	121
Arruda dos Vinhos	58.54%	217
Aveiro	56.68%	229
Avis	71.55%	143
Azambuja	71.35%	144
Baião	90.31%	69
Barcelos	100.00%	1
Barrancos	100.00%	1
Barreiro	88.17%	75
Batalha	100.00%	1

Municipality	Efficiency Score	Rank
Beja	57.15%	225
Belmonte	68.90%	161
Benavente	72.18%	140
Bombarral	70.12%	157
Borba	70.59%	151
Boticas	66.41%	175
Braga	100.00%	1
Bragança	59.88%	203
Cabeceiras de Basto	100.00%	1
Cadaval	87.56%	80
Caldas da Rainha	100.00%	1
Caminha	67.37%	170
Campo Maior	90.28%	70
Cantanhede	79.90%	104
Carrazeda de Ansiães	89.69%	71
Carregal do Sal	100.00%	1
Cartaxo	58.03%	223
Cascais	100.00%	1
Castanheira de Pêra	38.66%	270
Castelo Branco	73.82%	132
Castelo de Paiva	59.23%	210
Castelo de Vide	68.89%	163
Castro Daire	100.00%	1
Castro Marim	66.87%	173
Castro Verde	62.60%	193
Celorico da Beira	58.37%	219
Celorico de Basto	92.67%	65
Chamusca	56.85%	227
Chaves	59.12%	212
Cinfães	100.00%	1
Coimbra	97.52%	56
Condeixa-a-Nova	70.44%	152
Constância	74.97%	125
Coruche	55.47%	232
Covilhã	46.86%	257
Crato	78.71%	109
Cuba	72.59%	138
Elvas	50.98%	241
Entroncamento	100.00%	1
Espinho	83.24%	93
Esposende	100.00%	1
Estarreja	64.83%	184
Estremoz	59.41%	206
Évora	58.35%	220

Municipality	Efficiency Score	Rank
Fafe	77.04%	119
Faro	46.66%	259
Felgueiras	70.35%	153
Ferreira do Alentejo	58.64%	216
Ferreira do Zêzere	59.41%	205
Figueira da Foz	61.29%	200
Figueira de Castelo Rodrigo	78.52%	111
Figueiró dos Vinhos	60.74%	201
Fornos de Algodres	54.12%	234
Freixo de Espada à Cinta	81.37%	98
Fronteira	58.78%	215
Fundão	31.80%	274
Gavião	85.16%	89
Góis	72.57%	139
Golegã	87.96%	77
Gondomar	100.00%	1
Gouveia	72.80%	136
Grândola	55.64%	231
Guarda	48.16%	251
Guimarães	100.00%	1
Idanha-a-Nova	70.25%	155
Ílhavo	92.52%	66
Lagoa (Algarve)	73.42%	133
Lagos	61.54%	198
Lamego	58.53%	218
Leiria	100.00%	1
Lisboa	100.00%	1
Loulé	47.20%	256
Loures	100.00%	1
Lourinhã	100.00%	1
Lousã	82.32%	95
Lousada	94.35%	60
Mação	61.77%	196
Macedo de Cavaleiros	61.92%	194
Mafra	100.00%	1
Maia	58.31%	221
Mangualde	58.08%	222
Manteigas	100.00%	1
Marco de Canaveses	37.82%	271
Marinha Grande	100.00%	1
Marvão	78.14%	116
Matosinhos	83.60%	92
Meda	65.04%	183
Melgaço	59.03%	213
Mértola	35.28%	273
Mesão Frio	64.33%	186
Mira	99.86%	51
Miranda do Corvo	75.00%	124
Miranda do Douro	47.65%	253
Mirandela	69.26%	159
Mogadouro	50.65%	245
Moimenta da Beira	68.78%	164
Moita	87.65%	79
Monção	74.08%	130
Monchique	37.50%	272
Mondim de Basto	98.27%	55
Monforte	50.89%	242
Montalegre	42.99%	266
Montemor-o-Novo	81.91%	96
Montemor-o-Velho	61.74%	197
Montijo	71.16%	145
Mora	73.22%	134
Mortágua	100.00%	1
Moura	46.15%	260
Mourão	45.17%	263
Murça	74.85%	126
Murtosa	71.66%	142
Nazaré	47.89%	252
Nelas	88.21%	74
Nisa	50.76%	243
Óbidos	41.85%	268
Odemira	59.15%	211
Odivelas	96.91%	57
Oeiras	74.52%	127
Oleiros	65.55%	179
Olhão	78.80%	108
Oliveira de Azeméis	87.42%	81
Oliveira de Frades	83.80%	91
Oliveira do Bairro	62.63%	192
Oliveira do Hospital	87.13%	82
Ourém	73.87%	131
Ourique	45.27%	262
Ovar	64.50%	185
Paços de Ferreira	100.00%	1
Palmela	71.00%	149
Pampilhosa da Serra	61.91%	195
Paredes	100.00%	1
Paredes de Coura	50.61%	246
Pedrógão Grande	77.59%	118
Penacova	99.84%	52
Penafiel	78.27%	115
Penalva do Castelo	70.24%	156
Penamacor	42.83%	267
Penedono	100.00%	1
Penela	67.46%	169
Peniche	100.00%	1

Municipality	Efficiency Score	Rank
Peso da Régua	79.61%	105
Pinhel	70.80%	150
Pombal	100.00%	1
Ponte da Barca	61.37%	199
Ponte de Lima	100.00%	1
Ponte de Sor	67.10%	172
Portalegre	39.03%	269
Portel	88.08%	76
Porto	78.58%	110
Porto de Mós	89.52%	72
Póvoa de Lanhoso	100.00%	1
Póvoa de Varzim	59.41%	207
Proença-a-Nova	67.74%	167
Redondo	88.87%	73
Reguengos de Monsaraz	50.54%	247
Resende	58.86%	214
Ribeira de Pena	59.29%	209
Rio Maior	53.57%	237
Sabrosa	71.01%	147
Sabugal	75.08%	123
Salvaterra de Magos	100.00%	1
Santa Comba Dão	67.22%	171
Santa Maria da Feira	92.97%	62
Santa Marta de Penaguião	80.46%	102
Santarém	59.38%	208
Santiago do Cacém	56.84%	228
Santo Tirso	80.78%	101
São Brás de Alportel	85.20%	87
São João da Madeira	100.00%	1
São João da Pesqueira	100.00%	1
São Pedro do Sul	52.11%	240
Sardoal	47.52%	254
Sátão	68.14%	165
Seia	47.51%	255
Seixal	100.00%	1
Sernancelhe	93.30%	61
Serpa	65.21%	181
Sertã	59.98%	202
Sesimbra	78.51%	112
Setúbal	54.09%	236
Sever do Vouga	85.98%	85
Silves	48.75%	250
Sines	25.47%	275
Sintra	100.00%	1
Sobral de Monte Agraço	81.07%	99
Soure	90.71%	68
Sousel	66.78%	174
Tábua	81.70%	97
Tabuaço	71.01%	148
Tarouca	49.88%	248
Terras de Bouro	79.60%	106
Tomar	54.84%	233
Tondela	65.37%	180
Torre de Moncorvo	46.81%	258
Torres Novas	59.72%	204
Torres Vedras	92.93%	63
Trancoso	55.64%	230
Trofa	63.19%	190
Vagos	100.00%	1
Vale de Cambra	77.90%	117
Valença	74.09%	129
Valongo	68.90%	162
Valpaços	70.34%	154
Vendas Novas	99.41%	53
Viana do Alentejo	100.00%	1
Viana do Castelo	100.00%	1
Vidigueira	66.13%	178
Vieira do Minho	100.00%	1
Vila de Rei	87.75%	78
Vila do Bispo	100.00%	1
Vila do Conde	50.76%	244
Vila Flor	85.19%	88
Vila Franca de Xira	98.88%	54
Vila Nova da Barquinha	100.00%	1
Vila Nova de Cerveira	64.19%	188
Vila Nova de Famalicão	100.00%	1
Vila Nova de Foz Côa	86.02%	84
Vila Nova de Gaia	100.00%	1
Vila Nova de Paiva	57.15%	224
Vila Nova de Poiares	44.43%	264
Vila Pouca de Aguiar	71.11%	146
Vila Real	100.00%	1
Vila Real de Santo António	45.92%	261
Vila Velha de Ródão	75.12%	122
Vila Verde	100.00%	1
Vila Viçosa	71.66%	141
Vimioso	63.26%	189
Vinhais	80.85%	100
Viseu	100.00%	1
Vizela	100.00%	1
Vouzela	80.37%	103
Average	**74.20%**	

Annex 2

Table 9 – Data Envelopment Analysis Results (3 inputs; 7 outputs)

Municipality	Efficiency Score	Rank
Abrantes	71.20%	174
Águeda	100.00%	1
Aguiar da Beira	75.10%	162
Alandroal	47.09%	265
Albergaria-a-Velha	82.98%	124
Albufeira	58.79%	231
Alcácer do Sal	89.88%	89
Alcanena	82.98%	125
Alcobaça	77.21%	155
Alcochete	83.15%	123
Alcoutim	55.63%	240
Alenquer	100.00%	1
Alfândega da Fé	59.34%	225
Alijó	91.87%	84
Aljezur	86.76%	102
Aljustrel	65.70%	199
Almada	100.00%	1
Almeida	55.63%	241
Almeirim	84.54%	109
Almodôvar	63.57%	209
Alpiarça	57.58%	233
Alter do Chão	86.02%	105
Alvaiázere	96.73%	74
Alvito	100.00%	1
Amadora	80.79%	135
Amarante	92.99%	81
Amares	100.00%	1
Anadia	100.00%	1
Ansião	60.65%	221
Arcos de Valdevez	100.00%	1
Arganil	81.86%	131
Armamar	77.49%	153
Arouca	91.23%	85
Arraiolos	69.42%	185
Arronches	79.43%	143
Arruda dos Vinhos	56.24%	239
Aveiro	79.57%	141
Avis	79.98%	139
Azambuja	75.12%	161
Baião	90.07%	88
Barcelos	100.00%	1
Barrancos	100.00%	1
Barreiro	100.00%	1
Batalha	100.00%	1
Beja	63.92%	204
Belmonte	79.16%	145

Municipality	Efficiency Score	Rank
Benavente	70.14%	180
Bombarral	68.77%	187
Borba	80.57%	137
Boticas	65.88%	198
Braga	100.00%	1
Bragança	63.61%	208
Cabeceiras de Basto	100.00%	1
Cadaval	83.15%	122
Caldas da Rainha	100.00%	1
Caminha	63.40%	210
Campo Maior	100.00%	1
Cantanhede	100.00%	1
Carrazeda de Ansiães	100.00%	1
Carregal do Sal	100.00%	1
Cartaxo	60.46%	223
Cascais	100.00%	1
Castanheira de Pêra	49.35%	260
Castelo Branco	100.00%	1
Castelo de Paiva	58.80%	229
Castelo de Vide	83.63%	115
Castro Daire	100.00%	1
Castro Marim	71.33%	172
Castro Verde	60.58%	222
Celorico da Beira	55.06%	244
Celorico de Basto	100.00%	1
Chamusca	57.57%	234
Chaves	71.12%	175
Cinfães	100.00%	1
Coimbra	82.06%	130
Condeixa-a-Nova	70.57%	178
Constância	81.13%	133
Coruche	59.00%	228
Covilhã	89.06%	94
Crato	80.80%	134
Cuba	83.65%	114
Elvas	50.70%	258
Entroncamento	100.00%	1
Espinho	88.02%	98
Esposende	100.00%	1
Estarreja	62.76%	213
Estremoz	57.50%	235
Évora	67.44%	192
Fafe	89.63%	91
Faro	54.19%	249
Felgueiras	71.29%	173
Ferreira do Alentejo	59.21%	226

Municipality	Efficiency Score	Rank
Ferreira do Zêzere	63.68%	206
Figueira da Foz	64.39%	202
Figueira de Castelo Rodrigo	86.71%	103
Figueiró dos Vinhos	60.69%	220
Fornos de Algodres	52.86%	251
Freixo de Espada à Cinta	96.37%	77
Fronteira	72.79%	168
Fundão	56.87%	236
Gavião	81.58%	132
Góis	79.95%	140
Golegã	90.91%	86
Gondomar	100.00%	1
Gouveia	83.42%	119
Grândola	62.04%	216
Guarda	75.70%	158
Guimarães	100.00%	1
Idanha-a-Nova	75.43%	160
Ílhavo	100.00%	1
Lagoa (Algarve)	80.20%	138
Lagos	63.90%	205
Lamego	63.24%	212
Leiria	100.00%	1
Lisboa	100.00%	1
Loulé	43.30%	272
Loures	100.00%	1
Lourinhã	100.00%	1
Lousã	83.61%	117
Lousada	100.00%	1
Mação	60.12%	224
Macedo de Cavaleiros	65.35%	200
Mafra	100.00%	1
Maia	59.18%	227
Mangualde	54.80%	245
Manteigas	100.00%	1
Marco de Canaveses	75.69%	159
Marinha Grande	98.09%	72
Marvão	79.21%	144
Matosinhos	88.32%	96
Meda	69.74%	183
Melgaço	78.57%	148
Mértola	38.58%	274
Mesão Frio	79.53%	142
Mira	100.00%	1
Miranda do Corvo	72.04%	171
Miranda do Douro	50.62%	259
Mirandela	70.67%	177
Mogadouro	51.99%	252
Moimenta da Beira	78.45%	149

Municipality	Efficiency Score	Rank
Moita	92.70%	82
Monção	87.39%	100
Monchique	46.24%	266
Mondim de Basto	99.97%	70
Monforte	51.49%	254
Montalegre	45.17%	269
Montemor-o-Novo	87.76%	99
Montemor-o-Velho	70.12%	181
Montijo	78.90%	147
Mora	100.00%	1
Mortágua	100.00%	1
Moura	42.31%	273
Mourão	48.63%	262
Murça	89.52%	92
Murtosa	69..52%	184
Nazaré	43.97%	271
Nelas	88.96%	95
Nisa	50.81%	257
Óbidos	45.23%	268
Odemira	58.69%	232
Odivelas	100.00%	1
Oeiras	73.53%	165
Oleiros	71.06%	176
Olhão	89.44%	93
Oliveira de Azeméis	84.23%	110
Oliveira de Frades	83.52%	118
Oliveira do Bairro	68.17%	188
Oliveira do Hospital	94.16%	80
Ourém	100.00%	1
Ourique	48.44%	263
Ovar	67.50%	191
Paços de Ferreira	100.00%	1
Palmela	84.07%	113
Pampilhosa da Serra	62.71%	214
Paredes	97.36%	73
Paredes de Coura	64.37%	203
Pedrógão Grande	82.41%	128
Penacova	100.00%	1
Penafiel	88.26%	97
Penalva do Castelo	84.20%	111
Penamacor	52.90%	250
Penedono	100.00%	1
Penela	72.04%	170
Peniche	100.00%	1
Peso da Régua	77.03%	156
Pinhel	66.74%	194
Pombal	100.00%	1
Ponte da Barca	67.66%	189

Municipality	Efficiency Score	Rank
Ponte de Lima	100.00%	1
Ponte de Sor	63.33%	211
Portalegre	44.79%	270
Portel	89.82%	90
Porto	100.00%	1
Porto de Mós	100.00%	1
Póvoa de Lanhoso	95.04%	79
Póvoa de Varzim	54.76%	246
Proença-a-Nova	66.22%	197
Redondo	83.30%	120
Reguengos de Monsaraz	58.79%	230
Resende	63.62%	207
Ribeira de Pena	56.75%	237
Rio Maior	55.50%	242
Sabrosa	84.15%	112
Sabugal	83.17%	121
Salvaterra de Magos	100.00%	1
Santa Comba Dão	66.92%	193
Santa Maria da Feira	100.00%	1
Santa Marta de Penaguião	86.45%	104
Santarém	69.08%	186
Santiago do Cacém	56.44%	238
Santo Tirso	84.88%	108
São Brás de Alportel	78.28%	150
São João da Madeira	100.00%	1
São João da Pesqueira	100.00%	1
São Pedro do Sul	51.51%	253
Sardoal	51.11%	256
Sátão	84.88%	107
Seia	54.25%	248
Seixal	100.00%	1
Sernancelhe	95.68%	78
Serpa	61.10%	219
Sertã	62.41%	215
Sesimbra	77.29%	154
Setúbal	61.89%	218
Sever do Vouga	87.29%	101
Silves	51.15%	255
Sines	24.43%	275
Sintra	100.00%	1
Sobral de Monte Agraço	76.83%	157
Soure	96.42%	76
Sousel	66.37%	195
Tábua	78.94%	146
Tabuaço	72.09%	169
Tarouca	55.29%	243
Terras de Bouro	82.29%	129
Tomar	73.34%	166
Tondela	77.79%	151
Torre de Moncorvo	54.33%	247
Torres Novas	67.58%	190
Torres Vedras	100.00%	1
Trancoso	72.94%	167
Trofa	66.28%	196
Vagos	99.19%	71
Vale de Cambra	82.55%	127
Valença	69.87%	182
Valongo	64.57%	201
Valpaços	100.00%	1
Vendas Novas	96.60%	75
Viana do Alentejo	100.00%	1
Viana do Castelo	100.00%	1
Vidigueira	77.77%	152
Vieira do Minho	100.00%	1
Vila de Rei	92.26%	83
Vila do Bispo	100.00%	1
Vila do Conde	47.39%	264
Vila Flor	85.61%	106
Vila Franca de Xira	100.00%	1
Vila Nova da Barquinha	100.00%	1
Vila Nova de Cerveira	70.54%	179
Vila Nova de Famalicão	100.00%	1
Vila Nova de Foz Côa	100.00%	1
Vila Nova de Gaia	100.00%	1
Vila Nova de Paiva	62.03%	217
Vila Nova de Poiares	45.86%	267
Vila Pouca de Aguiar	82.83%	126
Vila Real	100.00%	1
Vila Real de Santo António	49.28%	261
Vila Velha de Ródão	75.09%	163
Vila Verde	100.00%	1
Vila Viçosa	73.69%	164
Vimioso	90.08%	87
Vinhais	83.63%	116
Viseu	100.00%	1
Vizela	100.00%	1
Vouzela	80.71%	136
Average	**78.55%**	

Annex 3

Table 12 – Number of Municipalities with Efficiency Score = 1 according to Most Different Efficiency Rankings

Score1	Ids	Permits	Bschool	Watcons
Águeda	Alenquer	Alenquer	Águeda	Águeda
Alenquer	Almada	Almada	Alenquer	Almada
Almada	Alvito	Barcelos	Almada	Alvito
Alvito	Barcelos	Barrancos	Alvito	Barcelos
Barcelos	Barrancos	Batalha	Barrancos	Barrancos
Barrancos	Batalha	Braga	Batalha	Batalha
Batalha	Braga	Caldas da Rainha	Braga	Braga
Braga	Cabeceiras de Basto	Carregal do Sal	Caldas da Rainha	Cabeceiras de Basto
Cabeceiras de Basto	Caldas da Rainha	Castro Daire	Carregal do Sal	Caldas da Rainha
Caldas da Rainha	Carregal do Sal	Cinfães	Cascais	Carregal do Sal
Carregal do Sal	Cascais	Entroncamento	Entroncamento	Cascais
Cascais	Castro Daire	Esposende	Esposende	Castro Daire
Castro Daire	Cinfães	Gondomar	Gondomar	Cinfães
Cinfães	Gondomar	Guimarães	Guimarães	Esposende
Esposende	Guimarães	Leiria	Lisboa	Gondomar
Gondomar	Leiria	Lisboa	Lourinhã	Guimarães
Guimarães	Lisboa	Lourinhã	Mafra	Leiria
Leiria	Lourinhã	Manteigas	Manteigas	Lisboa
Lisboa	Mafra	Marinha Grande	Marinha Grande	Loures
Loures	Mortágua	Mortágua	Paços de Ferreira	Mafra
Lourinhã	Paços de Ferreira	Paços de Ferreira	Paredes	Manteigas
Mafra	Paredes	Paredes	Peniche	Marinha Grande
Manteigas	Penedono	Penedono	Pombal	Mortágua
Marinha Grande	Peniche	Peniche	Salvaterra de Magos	Paços de Ferreira
Mortágua	Pombal	Pombal	São João da Madeira	Paredes
Paços de Ferreira	Ponte de Lima	São João da Madeira	Seixal	Penedono
Paredes	Póvoa de Lanhoso	S. João da Pesqueira	Sintra	Pombal
Penedono	Salvaterra de Magos	Seixal	Viana do Alentejo	Ponte de Lima
Peniche	São João da Pesqueira	Sintra	Viana do Castelo	Póvoa de Lanhoso
Pombal	Sintra	Viana do Alentejo	Vila do Bispo	Salvaterra de Magos
Ponte de Lima	Viana do Alentejo	Vieira do Minho	V. Nova da Barquinha	S. João da Madeira
Póvoa de Lanhoso	Viana do Castelo	V. Nova Barquinha	V. Nova de Famalicão	S. João da Pesqueira
Salvaterra de Magos	Vieira do Minho	V. N. de Famalicão	Vila Nova de Gaia	Seixal
S. João da Madeira	Vila do Bispo	Vila Real	Vizela	Sintra
S. João da Pesqueira	Vila Nova de Famalicão	Vila Verde		Vagos
Seixal	Vila Nova de Gaia	Viseu		Viana do Castelo
Sintra	Vila Verde	Vizela		Vila do Bispo
Vagos	Viseu			Vila Nova da Barquinha
Viana do Alentejo	Vizela			Vila Nova de Famalicão
Viana do Castelo				Vila Nova de Gaia
Vieira do Minho				Vila Real
Vila do Bispo				Vila Verde
V. Nova da Barquinha				Viseu
V. Nova de Famalicão				Vizela
Vila Nova de Gaia				
Vila Real				
Vila Verde				
Viseu				
Vizela				
Entroncamento				
N= 50	N= 39	N= 37	N= 34	N=44

Annex 4

Table 13 – Comparison of the Number of Municipalities with Efficiency Score = 1 in the Efficiency Rankings Using only Theoretical Combination of Outputs

Score1	Education	Housing	Doutput
Águeda	Alenquer	Almada	Alenquer
Alenquer	Almada	Barcelos	Almada
Almada	Alvito	Barrancos	Barrancos
Alvito	Barrancos	Batalha	Batalha
Barcelos	Batalha	Braga	Braga
Barrancos	Braga	Caldas da Rainha	Carregal do Sal
Batalha	Caldas da Rainha	Carregal do Sal	Cascais
Braga	Carregal do Sal	Castro Daire	Lisboa
Cabeceiras de Basto	Cascais	Cinfães	Lourinhã
Caldas da Rainha	Entroncamento	Esposende	Manteigas
Carregal do Sal	Esposende	Gondomar	Peniche
Cascais	Gondomar	Guimarães	S. João da Madeira
Castro Daire	Lisboa	Leiria	Seixal
Cinfães	Lourinhã	Lisboa	Viana do Alentejo
Esposende	Mafra	Manteigas	Viana do Castelo
Gondomar	Manteigas	Marinha Grande	Vila do Bispo
Guimarães	Marinha Grande	Mortágua	V. Nova da Barquinha
Leiria	Paços de Ferreira	Paços de Ferreira	
Lisboa	Paredes	Paredes	
Loures	Peniche	Penedono	
Lourinhã	Pombal	Pombal	
Mafra	Salvaterra de Magos	S. João da Madeira	
Manteigas	São João da Madeira	S. João da Pesqueira	
Marinha Grande	Seixal	Seixal	
Mortágua	Sintra	Sintra	
Paços de Ferreira	Viana do Alentejo	V. Nova da Barquinha	
Paredes	Viana do Castelo	V. Nova de Famalicão	
Penedono	Vila do Bispo	Vila Real	
Peniche	V. Nova da Barquinha	Vila Verde	
Pombal	Vizela	Viseu	
Ponte de Lima		Vizela	
Póvoa de Lanhoso			
Salvaterra de Magos			
S. João da Madeira			
S. João da Pesqueira			
Seixal			
Sintra			
Vagos			
Viana do Alentejo			
Viana do Castelo			
Vieira do Minho			
Vila do Bispo			
V. Nova da Barquinha			
V. Nova de Famalicão			
Vila Nova de Gaia			
Vila Real			
Vila Verde			
Viseu			
Vizela			
Entroncamento			
N=50	N=30	N=31	N=18


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