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The determinants of efficiency in municipal governments

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Explaining differences in efficiency: an application to Spanish municipalities

This paper investigates efficiency in the municipal sector of the Region of Murcia (Spain). With that aim, data of 31 municipalities (69% of the response rate) have been collected. Services analyzed are: police, culture, sports, green areas, refuse collection and water supply. Ratios of efficiency have been related to other control variables, such as economic level, size of the municipality, decentralization, political sign and financial situation. A weak positive relation between economic level and efficiency arises. Some weak evidence also exists that public management of refuse collection is more efficient than private. In water supply, public management by means of a company controlled by the local government is clearly more efficient than private. It also seems that the higher the tax burden, the greater the efficiency in providing services.

Running title: Determinants of efficiency in municipal governments

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Explaining differences in efficiency: an application to Spanish municipalities

1. Introduction

At the present time there is a clear concern in the developed countries about the improvement of effectiveness and efficiency in public sector activities. This is a consequence, on the one hand, of the demand of more and better public services and on the other hand, of the limitations on public incomes and indebtedness. In this respect, the Monetary Union in the European Community has established that all the participating member states must achieve the budgetary stability. These provoked that the Spanish government enacted the General Law of Budgetary Stability, 18/2001, 12 December 2001. These Law obliges the public sector and different agencies (Central Government, Autonomous Communities, Local Authorities, Social Security, and owned public companies) to close their books in balance. Deficit is only contemplated in exceptional circumstances and this law gives legal expression to the balanced budget principle to carry out the budget balance and economic growth.

Public management analysis has been receiving more and more attention. On the one hand, the available amount of government resources is limited: rising taxes is politically costly, and there are legal limitations to increasing indebtedness. On the other hand, there is a growing demand for public services. Therefore, the public sector is bound to boost its efficiency in order to provide more services (output) restricted to a limited amount of resources (input).

Once the need to evaluate the public sector is stated, methodologies for this analysis have been developed. Among them, we can emphasize the Data Envelopment Analysis (DEA), as the mathematical technique internationally accepted by the literature. This methodology has been successfully applied to public services provided by municipalities of several Spanish regions (Diez-Ticio *et al.*, 2000; Bosch *et al.*, 2000;

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7 Giménez and Prior, 2003; Prieto and Zofio, 2001; Balaguer *et al.*, 2007; Giménez and
8 Prior, 2007).

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11 The implementation of techniques of management efficiency analysis is essential. In
12 this way, the Spanish Public Administration (Intervención General de la
13 Administración del Estado, IGAE, 1997) has made great efforts in the measurement of
14 objectives achievement (with the development of specialized software). Similar efforts
15 have been developed in other highly developed countries (Australia, Denmark,
16 Finland, Norway, Sweden and Switzerland)¹.

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19 In an international scope, it is worth to mention the case of the United States. In this
20 country, Governmental Accounting Standards Board (GASB) has issued documents
21 providing the methodology for the municipalities to calculate and disclose efficiency
22 indicators (Fountain and Roob, 1994; GASB, 1990, 1994). In addition, GASB has
23 promoted the establishment of standardized municipal efficiency indicators that allow
24 both the comparison between different municipalities and the analysis of the evolution
25 of the efficiency in one municipality. Likewise, in Spain, the Association of
26 Accounting and Business Management (Asociación Española de Contabilidad y
27 Administración de Empresas, AECA) issued a document entitled "Management
28 Indicators for Public Organizations", becoming a guide for Public Organizations to
29 implement management indicators in order to evaluate effectiveness, economy and
30 efficiency. In this document, DEA methodology is acknowledged as an appropriate
31 technique to make this evaluation (pp. 78-80). This document has been complemented
32 by another one entitled "A System of Management Indicators for Municipalities",
33 which describes a list of indicators to be used to evaluate municipal management.
34 Furthermore, it shows a set of rules, characteristics and methodological guidelines to
35 ensure the quality of these indicators.
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53 ¹ For an insight on these countries' projects, see Joumard *et al.* (2004) and this OECD web
54 page: http://www.oecd.org/home/0,2987,en_2649_201185_1_1_1_1_1,00.html (on 9 June
55 2007)
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7 Focusing on the Spanish local sector, Andalusian and Catalan municipalities (Navarro,
8 1998; Ortiz, 2003; Giménez and Prior, 2000) have already developed efficiency
9 analysis projects.

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12 In the Spanish health system (Pina and Torres, 1992 and García *et al.*, 1999) DEA
13 methodology is being successfully applied in the last years. In this way, the Region of
14 Murcia² has already developed several projects that have allowed it to improve
15 efficiency levels. These projects have become essential to provide useful information
16 to the political decision making.
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20 The problem of the measurement of inputs/outputs, that in the private sector is
21 relatively simple, gets complicated in the public sector, because of the difficulty to
22 establish these parameters. As a result of this, a number of works have been devoted to
23 establish and validate efficiency indicators in the public sector in general. For example,
24 Navarro (1998), Ortiz (2003) and AECA (2004) develop a battery of useful indicators
25 for several municipal services, such as: police, culture, sports, green areas, housing,
26 fire-fighting services, refuse collection, water supply and cleaning, street lighting,
27 general services and financial, economic and budgetary management. Some of these
28 services are investigated in this paper.
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32 The paper is organized as follows. Section 2 provides a detailed description of the
33 research objective and methodology. Section 3 reviews previous literature on
34 evaluation of municipal management. Section 4 describes the sample of municipalities
35 and the inputs/output used in the empirical research. Besides, it presents the variables
36 that are going to be related with efficiency indicators. Section 5 examines relationships
37 among variables. Finally, section 6 summarizes conclusions, presents limitations and
38 proposes further research.
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51 ² In terms of surface area the Region of Murcia is the ninth largest of the Spanish autonomous
52 communities and lies at the centre of the **Spanish Mediterranean coastal arch**. According
53 to the most recent census figures (1 January 2005) the Region of Murcia has a population of
54 1,335,792 inhabitants.
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2. Objective and methodology

So far, few works have focused on the evaluation of municipal efficiency. However, a great number of works have analyzed other sectors such as education or health. We think the main reasons lie, on the one hand, in the problems faced when trying to collect municipal data, and on the other hand, on the troubles arising in the measurement of public outputs. From the perspective of the municipal management we can emphasize the contributions made by Vanden Eeckaut *et al.* (1993); De Borger *et al.* (1994) and De Borger and Kerstens (1996), who analyze the Belgian experience of municipal efficiency evaluation; Worthington (2000), who evaluates by means of econometric techniques and linear programming the efficiency of local governments (LG) in Australia; Taïrou (2000), who evaluates the efficiency of the French municipalities from the point of view of its financial condition; Waldo (2001), who investigates local administration efficiency in Sweden; Hollingsworth *et al.* (2002), who assess the cost and production efficiency of local government programs for childhood immunization in urban and rural settings in Australia; Sampaio and Stosic (2005), that estimate the DEA technical efficiency for 4796 Brazilian municipalities; and Loikkanen and Susiluoto (2005), who study the cost efficiency of basic welfare service provision in 353 Finnish municipalities in 1994-2002.

In Spain, we can highlight the works of Vilardell (1998); Diez-Ticio *et al.* (2000); Bosch *et al.* (2000); Giménez and Prior (2003); Prieto and Zofio (2001); Balaguer (2004), Balaguer *et al.* (2007) and García-Valiñas and Muñiz (2007).

Our work is aimed to contribute to the Local Government (LG) literature, with regard to the efficiency assessment. Thus, we analyze the efficiency of 6 local services of Spanish LG of the Region of Murcia by means of DEA methodology: police, refuse collection, culture, sports, green areas and water supply. We sent a questionnaire³ to all of them asking for information about year 2002. The reason for choosing this year is that in the middle of 2004 some LG may have not closed 2003 budget. In a second

³ The questionnaire was sent to all LG financial managers of the Region of Murcia on 15 June 2004. The reception of questionnaires finished on 31 May 2005.

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7 phase, we checked all the information with the department heads of all services
8 included in the study for each LG. The objective was to correct the missing
9 information and information errors. The sample obtained covers a high proportion of
10 the population of LG of the Region of Murcia (69%). The LG structure of this Spanish
11 Region enhances our analysis. On the one hand, it is composed of a small number (45)
12 of relatively large LG. On the other hand, we find an appropriate variability of LG
13 characteristics, since for example it has one of the largest LG of Spain in terms of km²
14 (Lorca), together with a LG with high population density (Alcantarilla). In this way,
15 our sample presents a suitable variability in our control variables.
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21 The efficiency indicators have been related to other municipal variables, such as
22 economic level (per capita income), LG size, decentralization level, political sign and
23 fiscal effort. Thus, we investigate which variables, according to the literature, influence
24 LG efficiency. Municipal variables have been selected based essentially upon the
25 works of Vanden Eeckaut *et al.* (1993); De Borger *et al.* (1994); De Borger and
26 Kerstens (1996); Worthington (2000); Bosch *et al.* (2000); and Giménez and Prior
27 (2003).
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33 From our point of view, our results are relevant not only for politicians, public
34 managers and researchers, but also for the citizens. The latter, as taxpayers and
35 recipients of municipal services, on the one hand, demand information about LG
36 activities and on the other, request improvement of LG performance.
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40 DEA is a technique based on linear programming, used to measure the relative activity
41 of organizational units when there are multiple resources (inputs) and multiple results
42 (outputs). A great variety of applications of DEA have been developed to evaluate the
43 activity of diverse types of organizations from different sectors in several countries.
44 One of the reasons of the broad use of DEA could be the problems faced by other
45 approaches because of the complex (often unknown) nature of the relationships
46 between resources and results of these activities.
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52 DEA analysis has also been applied to provide new approaches about activities (and
53 organizations) that had previously been evaluated using other methods.
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The evaluation of the organizations' activity can be tackled through a variety of indicators. Some of them are established as a quotient:

$$\frac{\textit{output}}{\textit{input}}$$

Usually this ratio is used in order to assess the organizations' efficiency.

Productivity measures also assume ratio form when they are used to evaluate the activity of workers: sales per worker, units made by worker and hour, etc. These measures we can be referred to more exactly as partial productivity measures, in order to distinguish them from measures of total productivity of the factors. The latter try to obtain a similar ratio, but they take into account simultaneously all the resources (inputs) and all the results (outputs).

One of the advantages of DEA is that it does not require a previous specification of the weights of each input/output. Furthermore it does not require assumptions about the form of the production function, which are so common in statistical regressions and in many other circumstances. That is why relationships between variables are evaluated by means of bivariate statistical tests. Eventually, since it uses mathematical programming techniques, it is able to handle a high number of variables and relationships (restrictions).

Thus, DEA is usually used in the evaluation of the efficiency of a certain number of producers, comparing each one of them only with the best producers.

Unlike usual statistical approaches evaluating units in reference to their average, DEA is a method of extreme point, defining a border where efficient units are located. Inefficiency is established in relation to this efficiency border.

A common measurement of relative efficiency is:

$$\text{Efficiency} = \frac{\text{Weighted sum of outputs}}{\text{Weighted sum of inputs}}$$

As an initial assumption, this measurement needs a common set of weights to be applied to all the analysed units. Two problems arise when it comes to reach an agreement to obtain this set of weights: on the one hand, the difficulty to measure inputs and outputs and, on the other hand, the allocation of weights itself, which is a controversial process because of its subjectivity. Accordingly, this measurement of the efficiency with a common set of weights does not seem correct.

According to Charnes *et al.* (1978), our analysis allows each unit to establish its own set of weights, in order to reach the most favourable combination in comparison with the rest of the units. Thus, the efficiency of the unit (j_0) can be obtained by solving the following problem:

To maximize the efficiency of unit j_0 , conditional to that the efficiency of all the units is ≤ 1 .

The unknown quantities of this problem are the weights, and the solution shows on the one hand, the most favourable weights to the unit, and on the other, the efficiency measurement of each unit.

The mathematical model is as it follows:

$$\begin{aligned} \text{Max } h_0 &= \frac{\sum_r u_r y_{rj_0}}{\sum_i v_i x_{ij_0}} \\ \text{s.t. } \frac{\sum_r u_r y_{rj}}{\sum_i v_i x_{ij}} &\leq 1 \quad j = (1, 2, \dots, N) \\ u_r, v_i &\geq \varepsilon \end{aligned}$$

Where y_{rj} and x_{ij} represent outputs and inputs of unit j respectively. The variables of the problem are u_r and v_i (weights). These latter are supposed to be greater or equal

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7 than a certain small positive amount, in order to prevent some input or output from
8 being totally ignored in the efficiency assessment.
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10 The solution to this problem yields a value of h_0 between 0 and 1, which is a
11 measurement of the relative efficiency of unit j_0 . If $h_0 = 1$, then unit j_0 is efficient in
12 relation to the other units, and if $h_0 < 1$, other units are more efficient than j_0 .
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15 This flexibility in the election of the weights means at the same time a weakness and
16 strength of DEA. It is a weakness because a correct election of weights of a unit (it is
17 likely that this choice is not related to values of inputs and outputs) may allow this unit
18 to appear as efficient. However, this efficiency may have to do more with the election
19 of weights than with its inherent efficiency. Simultaneously, it is a strength since if one
20 unit is inefficient, it is so with the most favourable set of weights. Thus, the argument
21 that the inefficiency is due to incorrect weights is not acceptable.
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27 In our DEA analysis, variable returns to scale (Models BCC) and output oriented
28 models (output orientation) have been considered, that is to say, aimed at maximize the
29 results with a given level of resources⁴.
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33 **3. Revision of Literature**

34 **3.1. Economic level and tourist character**

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36 Some authors show that the greater the economic level of the LG and therefore the
37 greater the income it collects, the less pressure exists on LG politicians and managers
38 in order to reach efficiency in the provision of municipal services (Spann, 1977;
39 Silkman and Young, 1982). In a similar way, De Borger and Kerstens (1996) find that
40 greater economic level is linked to more inefficiency. However, Giménez and Prior
41 (2003) analyse the impact of municipal economic level on efficiency. They conclude
42 that differences in economic level are not significant when evaluating efficiency.
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53 ⁴ The application used to solve the mathematical problem has been DEA-Solver-LV developed
54 by Cooper *et al.* (2000) on Microsoft Excel.
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7 With regard to the tourist character of the LG, some authors (Mathieson and Passell,
8 1976; Díez-Ticio and Mancebón, 2003) explain that seasonal populations have an
9 impact on municipal services, specifically on police (which is one of the services this
10 paper evaluates). The argument is based on two points. On the one hand, the more
11 stable the population is, the narrower the relationship with police is expected, leading
12 to a greater collaboration to solve problems arising in the neighbourhood. On the other
13 hand, population variability means a lower identification of the people with their place
14 and, consequently, a smaller concern about collective problems.
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21 If we take a look at other works investigating the tourist condition of municipalities,
22 we see there is not agreement in the literature. Bosch *et al.* (2000) find that tourist level
23 of the LG has an impact on efficiency. On the contrary, Bel (2006) concludes that
24 tourist activity is not significant when it comes to assessing the efficiency of
25 municipalities of Cataluña (Spain).
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29 **3.2. Size of the Local Government**

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31 With respect to police, Díez-Ticio and Mancebón (2003) state a negative link between
32 LG size and police efficiency. They argue that an increase in the territory reduces
33 intensity of the patrol services. On the other hand, the greater the population is, the
34 greater the dedication to more responsibilities is, and accordingly the less efficiency in
35 the provision of the service appears (Carr- Hill and Stern, 1979; Darrough and
36 Heineke, 1979; Gyimah-Brempong, 1987 and 1989; and Cameron, 1989).
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42 Regarding the service of refuse collection, Stevens (1978), Dubin and Navarro (1988)
43 and Callan and Thomas (2001) also find greater efficiency in municipalities with
44 smaller population. Nevertheless, for the same service, Kitchen (1976) finds economies
45 of scale while LG size increases up to 324.000 inhabitants⁵.
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49 Considering the global efficiency of the LG, Giménez and Prior (2003), find that
50 greater population is linked to higher inefficiency in a sample of Spanish LG. De
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54 ⁵ Which is very similar to the size of greater LG of the sample, Murcia.
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7 Borger and Kerstens (1996) also find that lower population density leads to greater
8 inefficiency.
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10 11 **3.3. Public vs. private management** 12

13 Although being an old discussion, private vs. public and in-house vs. out-house
14 management comparisons have become quite fashionable in the last decades due to
15 New Public Management reforms. Although a “magic recipe” for achieving efficiency
16 in public services is far to be unambiguously stated, we think it is interesting to add
17 more evidence on this issue to the literature.
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22 So far, the majority of the DEA studies have focused on investigating whether the
23 public service is more efficiently provided by the LG or by private companies. There is
24 not agreement in the literature (Lovell and Muñiz, 2003, and Bosch *et al.*, 2000, make
25 a very complete revision of these works).
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30 Tang (1997), in a revision of previous literature, finds that private management is more
31 efficient in refuse collection, cleaning, residual water treatment and fire-fighting
32 services. Nevertheless, in water supply and railroads results are not conclusive.
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35 **3.4. Political sign** 36

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38 The political-economic literature supports the thesis that “partisan politics matters”,
39 i.e., that ideology matters in public sector management and performance (Cusack,
40 1997). However, empirical findings are not totally conclusive, specially at the
41 municipal level. For instance, Abizadeh and Gray (1993), Benito and Bastida (2004)
42 and Hagen and Vabo (2005) fail to prove a poorer performance of progressive
43 municipal parties. All these works are connected with the so-called “convergence”
44 school of thought, which argues that societies of the twentieth century have become
45 increasingly similar, facing the same kind of problems and thus using the same kind of
46 solutions. Consequently, political differences do not matter much when it comes to
47 explain variations in policy outputs (Skinner, 1976; Thomas, 1980). Likewise, other
48 authors argue that over the last two decades partisanship differences have narrowed.
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7 Because of financial and economic integration, partisan preferences have become less
8 important in implementing public policies. This could explain that there is only mixed
9 empirical evidence of the “partisan politics matters” thesis.
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12 Few works focus on the impact of political factors on LG efficiency. De Borger and
13 Kerstens (1996) conclude that socialist party participation in government coalitions of
14 Belgian LG means higher degree of efficiency than liberal party participation. De
15 Grauwe (1985) drew a similar conclusion. On the contrary, Vanden Eeckaut *et al.*
16 (1993) do not find significant influence of the political sign of the incumbents. We
17 think it is interesting to know if incumbents’ political sign influences efficiency, as the
18 “partisan politics matters” thesis assumes.
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24 **3.5. Financial constraints: fiscal burden, indebtedness, working capital**

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26 We define the fiscal burden as the proportion coming from taxes out of the total
27 municipal income. At the outset, we assume that the greater fiscal burden is, the greater
28 the demand by taxpayers for efficient provision of services will be (Spann, 1977; Davis
29 and Hayes, 1993; De Borger and Kerstens, 1996).
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34 However, it is not possible to predict the influence of indebtedness on the efficiency.
35 In a first approach, following Worthington (2000), we could argue that it will affect
36 negatively. The greater the level of municipal indebtedness, the more resources will be
37 devoted to attend debt payments. Thus, less resources will finance the provision of LG
38 services (cultural, sports, etc.).
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43 Dijkgraaf *et al.* (2003) argue that LG with financial problems are concerned about
44 services efficiency improvement, which leads to obtain costs savings. We have
45 considered the working capital as an indicator of the LG short term financial situation.
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48 **4. Sample and variables**

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50 The sample is composed by 31 municipalities of the Region of Murcia (69% of
51 response rate and a population of 91% of the total population of the Region of
52 Murcia). Our selection of outputs is based on the works of Navarro (1998), Ortiz
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7 (2003) and AECA (2004), who developed a group of indicators to assess several areas
8 of municipal management. Regarding inputs, we have used actual budget figures
9 instead of budget estimates (Giménez and Prior, 2003; Prieto and Zofio, 2001; Tairou,
10 2000; Vanden Eeckant *et al.*, 1993). This makes us face a time lag due to the months
11 LG need to elaborate final budget reports. However, we think actual figures essential,
12 since it is generally known that budget estimates overestimate incomes and
13 underestimate expenditures. Eventually, when a public service is provided by a
14 company, we use as inputs the corresponding information from their income statement
15 (issued in accordance with the Spanish Chart of Accounts).
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22 Out of the total initial input/output variables, table 1 shows inputs and outputs finally
23 used to measure efficiency of each service. The selection has been made, on the one
24 hand, for the sake of relevance, and on the other, considering its availability in the
25 municipalities surveyed (i.e., minimum number of missing values). This is the reason
26 why not all LG have been included in all the partial analyses, due to the lack of
27 available data about variables for the analysis.
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32 **(Insert Table 1)**

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34 Focusing on each service, maximum efficiency is achieved by the following LG,
35 ordered from minimum to maximum proportion of efficient LG: green areas 3/23
36 (13%), water supply 4/21 (19%), refuse collection 4/19 (21%), police 10/27 (37%),
37 culture 9/23 (39%), sports 16/23 (70%). Green areas is the service where we find the
38 lowest number of efficient LG. However, sports is a more homogeneous service, where
39 7 out of 10 LG achieves maximum level of efficiency (1).
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45 As stated above, in order to investigate which characteristics of LG are related to
46 efficiency, we have created several variables. Table 2 shows descriptive statistics of
47 these variables.
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50 **(Insert Table 2)**

Variables *econlevel* and *tourindex* were drawn from La Caixa (2004). Variables *iecon_00*, *isbie_00* and *rfdpc_00* correspond to 2000 (latest available data). Variables *population* and *sqkmext* are available in the Spanish National Institute of Statistic web page. *Polsign* comes from Ministry of the Interior web page. The web page of the General Department of Territorial Finances provides data of municipal budgets, needed to calculate *taxburdrev*. The Local Administration Department of the Region of Murcia provides data to create variables *lrdebtpc* and *wcapitalpc* (available as of 31.12.2001).

Next section investigates relationships between efficiency indicators and other LG features. As we said above, relative efficiency has been calculated in different LG services (police, culture, sports, green areas, refuse collection and water supply).

5. Determinants of the efficiency

5.1. Economic level and tourist character

With respect to LG economic level, we do not find significant relationships (table 3). Nevertheless, it is worth to mention that most of the correlations (70.83%) are positive, which gives idea that certain relationship exists between economic level and efficiency in the services. On the one hand, this lack of significance agrees with the work of Giménez and Prior (2003). On the other hand, the positive sign of most of correlations seems to go against of Spann (1977), Silkman and Young (1982) and De Borger and Kerstens (1996), who postulated that the greater the economic level is, the higher the inefficiency is.

With regard to tourist level, in four out of the six services (66.67%), correlation is positive, although there is no statistical significance. We obtain the same result than Bel (2006), and thus we cannot confirm the conclusions of Bosch *et al.* (2000), Mathieson and Passell (1976) and Díez-Ticio and Mancebón (2003) (these two latter works, regarding police service).

(Insert Table 3)

5.2. Size of the LG

LG size, measured by its population⁶, shows, in general, positive correlations with ratios of efficiency (see table 4). Only in police and refuse collection correlations are negative, although with a significance extremely reduced (0.73 and 0.97 respectively). The only significant correlation appears in water supply, revealing economies of scale.

(Insert Table 4)

With respect to LG extension (*sqkmext*), in general correlations are also positive, except in culture and green areas, but significance is low.

Population density (*density*) is positively but weakly correlated with efficiency. The only significance arises in green areas, since the greater dispersion of the population makes maintenance services more difficult. In this service, our results confirm the work of De Borger and Kerstens (1996). In conclusion, both predominance of positive correlations and low significance do not allow us to verify the conclusions obtained by Giménez and Prior (2003), who found that the greater the size of the LG, the greater the inefficiency.

5.3. Public and private management

Tables 5 to 9 depict efficiency measures of services depending on the form of management chosen by LG⁷. In general, we do not find significant differences in efficiency according to the way of management used by the LG.

Furthermore, analysis of these tables reveals the pattern of municipal services provision in the Region of Murcia. In culture, sports and green areas, direct management predominates, i.e., the own LG provides the service. In terms of sample mean, in culture and green areas, this direct management is not more efficient than the other forms of management, although this conclusion must be taken with caution due

⁶ Neperian logarithm of the number of inhabitants (*lnpopulation*).

⁷ In this section, police service was excluded, since according to Spanish laws, it must be provided directly by the LG.

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7 to the lack of significance. However, sports management by the LG seems more
8 efficient (in terms of sample mean).
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11 **(Insert Table 5)**

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13 **(Insert Table 6)**

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15 **(Insert Table 7)**

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18 With respect to refuse collection, Dijkgraaf *et al.* (2003) show that, according to
19 literature, private provision of refuse collection service is more efficient in general. In
20 our case, although with low significance, we obtain some evidence making us think
21 private management is not more efficient than public. Thus, we cannot confirm the
22 work of Dijkgraaf *et al.* (2003).
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26 On the other hand, these authors show the percentage of city councils providing this
27 service through private management in several countries: United Kingdom 30%,
28 Ireland 39% and Netherlands 40%. In the case of Region of Murcia, this percentage is
29 quite superior: 68.4% of LG decided to privatize the service.
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33 **(Insert Table 8)**

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36 In water supply, highly significant results demonstrate public management through a
37 LG-controlled company is more efficient than private management. This result is
38 contrary to Tang (1997), who showed results in this service are not conclusive.
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42 **(Insert Table 9)**

43
44 On the other hand, following Dijkgraaf *et al.* (2003), we have divided management
45 according to two classifications: in-house/out-house and public/private (see table 10).
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49 **(Insert Table 10)**

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51 Public management of refuse collection and water supply is more efficient than private
52 management, though significance is not conclusive. Dijkgraaf *et al.* (2003), in a
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7 revision of literature on refuse collection efficiency, concluded that almost all works
8 find private provision more efficient.
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11 In refuse collection, in-house management is also more efficient than out-house
12 management. The fact that both in-house and public provision of refuse collection
13 service are more efficient may be revealing the collusion effect pointed out by
14 Dijkgraaf and Gradus (2005). Only two public companies (see table 8) do not enhance
15 enough competence in the market, since they are ad-hoc companies that only provide
16 the service for the parent LG.
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19 Eventually, low significance places our results in line with previous literature, where
20 lack of consensus is the outstanding note.
21

22 23 24 25 **5.4. Political sign** 26

27 The political sign does not have an influence on efficiency, according to results
28 depicted in table 11. In particular, aside from the shortage of significance, the
29 efficiency is evenly distributed, i.e., in police, sports and refuse collection, progressive
30 parties reach greater efficiency, whereas in the remaining three services, greater
31 efficiency is achieved by conservative parties. This feature confirms the work of
32 Vanden Eeckaut *et al.* (1993).
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38 (Insert Table 11)
39

40 41 **5.5. Fiscal effort, indebtedness and financial situation** 42

43 There are some works assessing the incidence of financial variables in Spanish LG; for
44 example, Benito and Bastida (2004) find that non-financial surplus/deficit, financial
45 independence, capital expenditures, and capital revenues are the variables that best
46 explain the level of indebtedness in this type of entities; and Monasterio and Suárez-
47 Pandiello (2002) and Cabasés *et al.* (2007) study the effectiveness of institutional
48 borrowing restrictions in Spanish municipalities.
49

50 Our data show that tax burden imposed to citizens, measured by *taxburdrev*, is
51 connected to a greater efficiency in services in general, although significance
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7 (**0.002) only appears in water supply (table 12). This result confirms works of De
8 Borger and Kerstens (1996), Spann (1977) and Davis and Hayes (1993).
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11 **(Insert Table 12)**

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13 Regarding the debt position of the LG, Worthington (2000) argues that greater debt
14 service (*lrdebtpc*) results in shorter resources for services provision and thus efficiency
15 decreases. Nevertheless, our results indicate that all correlations are positive except
16 one, and although they are not significant, show a clear tendency. Maybe the
17 explanation in this case is that greater indebtedness is the result of past capital
18 investments that allow now a greater efficiency.
19

20
21 Short term financial situation of the LG, measured by its working capital (*wcapitalpc*),
22 presents ambiguous relations with services efficiency. For this reason our data cannot
23 confirm the work of Dijkgraaf *et al.* (2003), who argue that financial stress forces
24 municipal managers to improve efficiency of the services as a way to obtain cost
25 savings.
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32 **6. Conclusions, limitations and further research**

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34 This paper investigates the relative efficiency of a list of 6 services in the
35 municipalities of the Region of Murcia (Spain), by means of DEA methodology:
36 police, culture, sports, green areas, refuse collection and water supply. In a second
37 phase, efficiency indicators obtained have been related to other municipal variables of
38 control, evaluating in this way the determinants of the public efficiency.
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41 With respect to the economic level of the LG, we do not find significant relationships.
42 Nevertheless, it is worth to emphasize that most of correlations (70.83%) are positive,
43 which gives idea of some relationship between economic level and efficiency.
44 Regarding tourist level, in four out of the six services (66.67%), correlation is positive,
45 although no statistical significance is found.
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49 The size (population) of the LG reveals, in general, positive correlations with
50 efficiency ratios. Only in police and refuse collection correlations are negative,
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7 although with an extremely reduced significance. The only one significant correlation
8 takes place with water supply, revealing the existence of economies of scale in this
9 service. With respect to extension of the LG (km²), in general correlations are also
10 positive, except in culture and green areas, but significance is low.

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14 Population density is correlated positive, but weakly, with efficiency. The only
15 significance appears in green areas, since the greater population dispersion hinders the
16 maintenance of green areas
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19 In water supply, highly significant results demonstrate public management through a
20 company controlled by the LG is more efficient than private management. However,
21 according to our results, private vs. public and in-house vs. out-house management
22 comparisons, which have become very fashionable due to New Public Management
23 reforms, are not clear.
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28 Political sign does not influence efficiency. In particular, aside from the lack of
29 significance, efficiency is evenly distributed, i.e., in three services progressive parties
30 reach greater efficiency, and in the remaining three, the opposite pattern takes place.
31 This result supports the so-called “convergence” school of thought, which argues that
32 industrialised societies of the twentieth century have become increasingly similar,
33 facing the same kind of problems and thus using the same kind of solutions.
34 Consequently, political, institutional and cultural differences do not matter much when
35 it comes to explain variations in policy outputs (Skinner 1976; Thomas 1980).
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41 Fiscal effort from the tax payers is connected with a greater efficiency in the services
42 in general, although significance only appears in water supply. This is good news for
43 citizens, who have the right to demand *value for money* to the managers of their taxes.
44 On the other hand, short term financial health of the LG, measured by its working
45 capital, shows ambiguous relations with services efficiency.
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50 Regarding indebtedness, the correlations are positive, except in a service (refuse
51 collection), and although they are not significant, indicate a clear trend. Perhaps the
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7 explanation in this case is that greater indebtedness in the last years financed
8 investments that allow now a greater efficiency.
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11 Our work has the limitation of having focused on a Spanish Region and thus the
12 sample is not very large. Nevertheless, on the one hand, the response rate is very high
13 69%. On the other, inputs and outputs have been thoroughly selected and provide
14 extremely accurate data. Direct interviews were carried out with the participants to
15 check the data in detail. This meticulousness is hard to achieve if a large and disperse
16 sample of LG is considered.
17

18
19 Further research is needed to broaden the scope of services analysed. Besides,
20 repeating the survey year after year would enhance comparisons and allow
21 investigating the evolution of LG efficiency. Finally, further input and output
22 indicators should be developed and tested.
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27 28 **ACKNOWLEDGMENTS**

29
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Table 1. Description of inputs and outputs used in the survey

Service	Indicators	
Police	INPUTS	Costs of personnel Current consumptions
	OUTPUTS	Number of interventions made Number of detentions made
Culture	INPUTS	Costs of personnel Current consumptions
	OUTPUTS	Number of visits to municipal museums Number of volumes in public libraries
Sports	INPUTS	Costs of personnel Current consumptions
	OUTPUTS	Number of m ² of covered sport facilities Number of m ² supplied of discovered sport facilities Number of users registered in municipal sport activities
Green areas	INPUTS	Costs of personnel Current consumptions Current transfers
	OUTPUTS	Number of m ² of green areas Number of total hours of maintenance and conservation
Refuse collection	INPUTS	Costs of personnel Current consumptions Current transfers
	OUTPUTS	Number of tons of domestic refusal collected Number of tons of industrial or commercial refusal collected Number of industries, commercial establishments and houses in which refuse is collected daily
Water supply	INPUTS	Costs of personnel Current consumptions
	OUTPUTS	Number of m ³ of water supplied Number of new connections to potable water network conducted

Table 2. Descriptive statistics of variables

variable	Description	N	Minimum	Maximum	Sum	Mean	St. dev.
econlevel	economic level 2002	31	2.00	5.00	111.00	3.58	0.77
iecon_00	CES ⁸ study 12, table 3.3 economic index	31	2.00	5.00	103.00	3.32	0.75
isbie_00	CES study 12, table 3.3. synthetic index of well- being	31	2.00	5.00	104.00	3.35	1.05
rfdpc_00	CES study 12, table 2.2. familiar available gross income per capita (thousand euros)	31	6.99	9.07	245.15	7.91	0.57
tourindex	tourist index: 0 no tourism; 592 maximum	31	0.00	592.00	1,228.00	39.61	116.56
population	total population 31.12.2002	31	5841	377,888	1,118,283	36,073.65	71,939.32
sqkmext	extension of the LG, km ²	31	10.00	1,675.00	9,297.00	299.90	374.48
density	population density: total population 31.12.2002/km ²	31	9.01	2,187.31	9,382.77	302.67	444.24
polsign	political sign of municipal government: 0_left wing; 1_right wing	31	0.00	1.00	19.00	0.61	0.50
taxburdrev	Tax burden over revenues (taxes/total revenues 2002)	30	0.14	0.60	13.00	0.43	0.11
lrdebtpc	long run debt per capita 31.12.2001 (thousand pesetas; 1 = 166.386 pesetas)	31	11.20	105.85	1369.47	44.18	22.29
wcapitalpc	Working capital per capita 31.12.2001 (thousand pesetas)	31	-120.41	26.72	-147.34	-4.75	26.03

⁸ CES: Economic and Social Council of Region of Murcia.

Table 3. Economic and tourist level⁹

		Economic level				Tourism
		econlevel	iecon_00	isbie_00	rfdpc_00	tourindex
Police	Corr. coeff.	-0.04	0.15	0.05	0.04	0.04
	Sig.	0.80	0.35	0.75	0.76	0.76
Culture	Corr. coeff.	-0.03	0.08	-0.03	0.03	-0.02
	Sig.	0.86	0.67	0.89	0.83	0.91
Sports	Corr. coeff.	0.26	0.27	0.23	0.25	0.15
	Sig.	0.17	0.16	0.22	0.13	0.38
Green areas	Corr. coeff.	0.02	-0.08	0.15	0.00	0.01
	Sig.	0.91	0.62	0.38	0.98	0.96
Refuse collection	Corr. coeff.	-0.08	-0.01	-0.06	0.04	-0.04
	Sig.	0.68	0.94	0.74	0.81	0.83
Water supply	Corr. coeff.	0.24	0.10	0.25	0.10	0.09
	Sig.	0.18	0.58	0.15	0.54	0.56
Tau_b de Kendall. Bilateral significance: * 10%, ** 5%, *** 1%.						

⁹ We must note the limitation stemming from variables *iecon_00*, *isbie_00* and *rfdpc_00*, which refer to year 2000, being the latest available data.

Table 4. Size of the LG

		lnpopulation	sqkmext	density
Police	Corr. coeff.	-0.05	0.05	0.06
	Sig.	0.73	0.73	0.70
Culture	Corr. coeff.	0.15	-0.01	0.09
	Sig.	0.33	0.94	0.59
Sports	Corr. coeff.	0.25	0.01	0.24
	Sig.	0.13	0.95	0.15
Green areas	Corr. coeff.	0.03	-0.20	0.27
	Sig.	0.85	0.19	* 0.08
Refuse collection	Corr. coeff.	-0.01	0.25	-0.14
	Sig.	0.97	0.14	0.42
Water supply	Corr. coeff.	** 0.35	0.14	0.14
	Sig.	0.03	0.38	0.40
Tau_b of Kendall significance: * 10%, ** 5%, *** 1%.				

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Table 5. Culture: management forms

Culture		Efficiency			
Form of management	N	Minimum	Maximum	Mean	St. dev.
Direct management (own LG)	19	0.33	1.00	0.75	0.24
Autonomous public agency	2	0.63	1.00	0.82	0.26
Public company 100% controlled by LG	1	0.55	0.55	0.55	.
Significance ANOVA (* 10%, ** 5%, *** 1%): 0.661.					

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Table 6. Sports: management forms

Sports		Efficiency			
Form of management	N	Minimum	Maximum	Mean	St. dev.
Direct management (own LG)	16	0.22	1.00	0.87	0.26
Autonomous public agency	7	0.29	1.00	0.79	0.29

Significance Mann-Whitney (* 10%, ** 5%, *** 1%): 0.389.

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Table 7. Green areas: management forms

Green areas		Efficiency			
Form of management	N	Minimum	Maximum	Mean	St. dev.
Direct management (own LG)	16	0.01	1.00	0.32	0.35
Public company 51% controlled by LG	3	0.42	0.69	0.57	0.14
Private company	4	0.05	0.17	0.11	0.05
Significance ANOVA (* 10%, ** 5%, *** 1%): 0.182.					

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Table 8. Refuse collection: management forms

Refuse collection	Efficiency				
	Form of management	N	Minimum	Maximum	Mean
Direct management (own LG)	4	0.63	1.00	0.89	0.18
Public company 51% controlled by LG	2	0.57	0.99	0.78	0.30
Private company 10% controlled by LG	1	0.45	0.45	0.45	.
Private company	12	0.33	1.00	0.65	0.24
Significance ANOVA (* 10%, ** 5%, *** 1%): 0.271.					

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Table 9. Water supply: management forms

Water supply		Efficiency			
Form of management	N	Minimum	Maximum	Mean	St. dev.
Public company 51% controlled by LG	4	0.71	1.00	0.90	0.14
Private company	16	0.12	1.00	0.44	0.25
Significance Mann-Whitney (* 10%, ** 5%, *** 1%): 0.014 **					

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Table 10. In-house/out-house and public/private management

Service	Way of management (efficiency mean)			
	In house	Out house	Public	Private
Culture	0.75	0.80	0.76	.
Sports	0.87	0.79	0.84	.
Green areas	0.32	0.31	0.35	0.11
Refuse collection	* 0.89	* 0.66	* 0.85	* 0.64
Water supply	.	0.52	* 0.90	* 0.44
In-house: Direct management by the own LG. Out-house: Public entities and all types of companies. Public: LG, Public entity, public company controlled more than 50% by LG. Private: Private companies and those companies participated by City council below 51%. Significance Mann-Whitney: * 10%, ** 5%, *** 1%.				

Table 11. Political sign

	Progressive			Conservative		
	N	Mean	St. dev.	N	Mean	St. dev.
Police	11	0.72	0.31	16	0.61	0.33
Culture	10	0.74	0.28	13	0.77	0.20
Sports	9	0.89	0.25	14	0.82	0.28
Green areas	8	0.26	0.32	15	0.34	0.33
Refuse collection	5	0.79	0.25	14	0.68	0.24
Water supply	9	0.51	0.21	12	0.54	0.35

Significance Mann-Whitney: * 10%, ** 5%, *** 1%.

Table 12. Budget and financial variables

		taxburdrev	lrdebtpc	wcapitalpc
Police	Corr. coeff.	0.00	0.01	0.06
	Sig.	1.00	0.93	0.67
Culture	Corr. coeff.	-0.15	0.16	0.28
	Sig.	0.33	0.30	* 0.07
Sports	Corr. coeff.	0.16	0.11	0.12
	Sig.	0.33	0.51	0.47
Green areas	Corr. coeff.	0.04	0.14	-0.14
	Sig.	0.77	0.36	0.36
Refuse collection	Corr. coeff.	0.03	-0.08	-0.05
	Sig.	0.86	0.65	0.75
Water supply	Corr. coeff.	*** 0.50	0.20	-0.09
	Sig.	0.00	0.20	0.59
Significance Tau_b de Kendall: * 10%, ** 5%, *** 1%.				