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Decentralization and Local Governments' Performance: How Does Fiscal Autonomy Affect Spending Efficiency?*

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Abstract. All over the world, recent legislative reforms share the goal of increasing fiscal autonomy of lower tiers of governments. The aim of this policy is to reduce Vertical Fiscal Imbalance (VFI) and enhance the efficiency in the provision of public services, via increased accountability of local politicians. The purpose of this study is to assess whether inefficiency of local governments is really affected by the degree of VFI, relying on a sample of Italian municipalities to study the determinants of spending performances. Consistently with modern fiscal federalism theories, our results show that more fiscally autonomous municipalities exhibit less inefficient behaviours, thus supporting the waves of reforms towards the devolution of taxing power to lower government tiers.

Keywords: Municipalities; Decentralization; Fiscal autonomy; Electoral accountability; Spending inefficiency.

JEL classification: D78; H71; H72; R51.

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1. Introduction

In Italy, as in other countries around the world, recent legislative reforms share the goal of increasing fiscal autonomy of lower tiers of governments, from regions to municipalities.[1] Enhancing tax decentralization implies a better alignment between spending and funding responsibilities and, as remarked by several economists, a *potential* improvement of the efficiency (as well as of the effectiveness) of public services provided to citizens. The mechanism to explain these improvements in public spending efficiency and voter welfare – suggested by the modern theoretical literature on fiscal federalism – highlights the importance of increasing electoral accountability of incumbent local politicians, by forcing them to collect autonomously a substantial part of tax revenues used to finance their expenditures (e.g., Oates, 2005; Weingast, 2009).

This normative prescription is at the heart of the so-called *Second Generation Theory* of fiscal federalism (SGT), as opposed to the *First Generation Theory* of fiscal federalism (FGT). More precisely, FGT looks at government agencies as entities managed by welfare maximizing politicians and analyses the desirability of decentralisation in the light of a sort of trade-off between, on the one hand, the efficiency of a decentralised provision of local public goods in the presence of differentiated preferences and, on the other hand, the inefficiencies from not internalising possible scale economies and spillovers across jurisdictions (e.g., Oates, 1972, 1999). However, the types of inefficiencies on which FGT concentrates are not those that typically makes newspapers' headlines, from mismanagement of public resources to real cases of corruption. To understand the dissipation of public monies one needs to recognise: first, that politicians do not typically act to maximise social welfare, but their own interest; second, that their effort in pursuing public goals cannot be directly

[1] For Italy, see the framework law 42/2009 on fiscal federalism, now partially implemented trough the legislative decrees 23/2011 (relative to municipalities) and 68/2011 (relative to regions). An overview of the evolution of taxing power of sub-central governments in 30 OECD countries over the years 1995-2005 is provided in Blöchliger and Rabesona (2009), while Stegarescu (2005) investigates the long-run trend in the degree of tax revenue decentralization for 23 OECD countries in the time period between 1965 and 2001.

observed by voters; third, that political institutions affects the heterogeneity of politicians. These are the arguments at the core of SGT, which focuses on a different trade-off with respect to FGT. In particular, the "centralisation versus decentralisation" argument is based on the comparison between the benefits from a greater coordination of policies under centralisation (which favours the internalisation of scale economies and spillovers) and the higher degree of electoral accountability of local politicians obtainable through fiscal decentralisation (e.g., Besley, 2006). Hence, from a normative point of view, decentralisation should be pursued not only when there are differences in tastes for local services, but also as an effective tool to achieve a better control of voters on politicians' performance. To this end, Oates (2005) suggests to implement a reliable and effective system of local taxation, such as the Property Tax, because of the incentives this type of tax provides to local governments toward the provision of public goods that maximises citizens' property values, and – in turn – their revenues (e.g., Tiebout, 1956; Glaeser, 1996). As Weingast (2009) puts it, «subnational governments that raise a substantial portion of their own revenue – i.e., *with a low degree of Vertical Fiscal Imbalance* – tend to be more accountable toward the citizens, to provide market-enhancing public goods, and to be less corrupt».

Is tax decentralization really effective in ensuring better performances of local governments, in particular in terms of spending efficiency? Empirical studies on incentive effects stemming from local taxation – starting with the seminal paper by Oates (1985) – are mostly focused on how decentralization affect government *size*, implicitly assuming that a large spending is inefficient (e.g., Jin and Zou, 2002; Rodden, 2003; Fiva, 2006; Borge and Rattsø, 2008; Eyraud and Lusinyan, 2011). A scant number of works has attempted to directly asses *efficient* spending by estimating production and cost frontiers (Coelli *et al.*, 2005), that allows the separation of productive inefficiencies from structural expenditure and, then, to investigate the determinants of local governments' *estimated inefficiency*, exploring the role of different types of variables (socio-

economic and political characteristics, spatial location, etc.). However, even in this literature, the determinants of spending inefficiency considered in the empirical analyses can be related to factors that SGT deems to be important in order to generate the right incentives to a higher accountability in very few cases only. In particular, it is worth noticing the ambiguous effects estimated for local taxes: while an inverse relationship between higher local tax rates and the inefficiency of municipalities emerges in De Borger *et al.* (1994), De Borger and Kerstens (1996), and Vanden Eeckaut *et al.* (1993), the recent study by Balaguer-Coll *et al.* (2007) points to a positive impact of greater per capita tax revenues on inefficient spending. SGT suggests the importance of Vertical Fiscal Imbalance (VFI), not of local taxes *per se*; but none of the studies on the efficiency of local governments has ever analyzed the role of VFI.

The goal of this paper is to analyse the role of VFI as a determinant of spending efficiency. To do so, we rely on a cross-section of Italian municipalities, filling another gap in the strand of literature on spending efficiency of local governments, that has never considered Italy so far. To assess local spending efficiency, we exploit both *parametric* and *nonparametric* frontier estimation techniques (SFA and DEA, respectively). Following the existing empirical literature (e.g., De Borger and Kerstens, 1996; Prieto and Zofio, 2001; Balaguer-Coll *et al.*, 2007; Giménez and Prior, 2007), we selected output indicators that are proxies for the level of services provided by local governments with respect to their most fundamental functions, identified in terms of both the incidence on municipal budget and the relevance for the citizens: general administration, waste management, education, elderly care, road maintenance and local mobility. Inputs of local governments' activities are represented by the corresponding costs as accounted in municipal budget, by disaggregating current expenditure according to these specific items. This represents an additional improvement compared to previous literature, that has so far relied on a crude measure of current spending considered as a whole. After defining the efficient spending frontier, the impact of fiscal autonomy is assessed

considering the ratio of municipal own taxes on total current revenues, which represents a measure of VFI and – more importantly – the best proxy for the electoral accountability of local politicians. We also augment our empirical model by considering the potential incentives to higher efficiency stemming from fiscal restraints imposed by the central government to the largest municipalities (the so-called *Domestic Stability Pact*). Finally, we test the robustness of our findings considering also the role played by other potential drivers of local governments' performance, which embrace a variety of spatial, political and organizational variables. Our main result is that VFI does matter in reducing spending inefficiency.

The remainder of the paper is structured as follows. In Section 2, after discussing some institutional characteristics of Italian municipalities, we present our data, we define the variables and the empirical strategy. The results showing the impact of fiscal autonomy and of other variables affecting spending inefficiency are presented in Section 3. Section 4 provides concluding remarks.

2. Assessing spending inefficiency of Italian municipalities

2.1. Institutional features of Italian municipalities

The Italian Public Administration is characterised by different layers of governments below the central level: regions, metropolitan areas, provinces, and municipalities. The Republican Constitution – implemented in 1948 and amended in 2001 – assigns different tasks to these different local governments. In particular, excluding metropolitan areas (which are basically a selection of the biggest cities in different regions), municipalities are in charge of a wide array of services: from administrative services provided directly to citizens (including, for instance, the registry office) to local police, from local mobility to waste management and social services (like childcare or care for the elderly). Funding for municipalities also include a number of different sources of revenue, from own taxes and fees and charges for specific services to grants

received from regional and central governments. According to aggregate data at the national level, about 2/3 of municipal expenditure is funded with autonomous revenues, while the remaining 1/3 is received as a transfer from upper-level governments.[2]

As for tax revenues, the most important source of fiscal autonomy is represented by the local property tax, the so-called *Imposta Comunale sugli Immobili* (*ICI*), which brings about almost 1/4 of total municipal revenues. It applies on both domestic and business properties, according to a set of rules defined at the national level. Local governments can however freely set both the tax rate, in a range between 0.4% and 0.7%, and – up to a certain degree – total or partial exemptions for specific types of property. Other two important local taxes are represented by a surcharge on the Personal Income Tax (*Addizionale Comunale IRPEF*) and the specific tax for waste collection and management (*TARSU*). As for the first, which represents more than 10% of total revenues at the national level, municipalities can only modify – within a limited extent – the tax rate. As for the second – which is slowly changing from a tax to a tariff for the service provided – it is computed relying on a vague proxy of waste production (i.e., the size of the dwelling), and municipalities can freely decide both rates and exemptions; it represents almost 10% of total revenues for municipalities at the national level. The distribution of taxable basis is of course very different across municipalities, especially for the local property tax and the surcharge on the Personal Income Tax.

Differences among municipalities arise also in terms of administrative and political rules, according to the size of the town as measured by total population. For instance, the size of the municipal council varies between 12 members (for municipalities below 3000 inhabitants) to 50-60 members (for municipalities above 500,000 inhabitants). The remuneration of the mayor and of council members increases with population size too. The monthly gross wage of the

[2] It is worth highlighting that the situation is very much differentiated across the country. Indeed, Northern municipalities are funded with about ¾ of autonomous revenues, while for Southern municipalities the corresponding figure is only around ¼ .

mayor ranges between 1291 to 7798 euro; gross wage for council members is computed as a percentage of the mayor one: it is 15% for small municipalities, and increases up to 75% for the largest ones. Electoral rules are also different, with a threshold fixed at 15,000 inhabitants: below this limit there is a single round of voting, while above the threshold voting is according to the runoff plurality rule. Term limits for the mayor are however the same and no more than two consecutives mandates of five years each are at present allowed. A threshold operates also for the possibility to create neighbourhood councils within the city: these are sub-levels of local governments with independent budgets and are allowed for municipalities with more than 30,000 inhabitants. Finally, as local governments' budgets are consolidated in the Italian budget of the Public Administrations and contribute to define the national deficit – which is relevant for the fiscal rules defined in the European *Stability and Growth Pact* [3] – Italy has introduced a so-called *Domestic Stability Pact* (DSP) since 1999. The fiscal rules for municipalities and other sub-national governments have often been varied by the central government, that imposed restraints alternatively on expenditure growth or on deficit size. The scope of the law spans over all levels of decentralized administrative structure, i.e., regions, provinces and municipalities. However, starting from 2001, the municipalities with less than 5000 inhabitants were excluded from the DSP[4].

Besides tax structure, political rules and fiscal restraints, a last important dimension along which the municipalities appear to be different concerns the managerial model adopted for providing a local service of particular relevance, namely the waste collection and disposal.[5] The observed alternatives range

[3] The *Stability and Growth Pact*, first introduced in 1997 and successively revised in 2005, is an agreement among EMU member states aimed at mantaining and enforcing fiscal discipline in the EMU. For more details, see Brunila *et al.* (2001).

[4] For a discussion of strengths and weaknesses of Italian DSP fiscal rules, refer to Giuriato and Gastaldi (2009). A critical analysis of the main European experiences is provided in Ambrosanio and Bordignon (2009).

[5] In principle, the differences among municipalities as for the management form would involve also education and social services, like those provided by nursing homes and child care centers. However, differently from waste management, spending for education and social services

from the direct production within the municipality (i.e., the so-called *in-house* provision), to the assignment of the function to a specific firm (publicly- or privately-owned), up to the creation of a cooperative aggregating two or more municipalities in the management of the service[6].

2.2. Data and variables

The sample we use in our empirical analysis is composed by 262 municipalities, all belonging to the province of Turin. The province of Turin represents an interesting case study within the Italian landscape, because it is the province with the highest number of local governments (315), thus ensuring a great variability in the data. This variability is confirmed not only by looking at population size (included are Moncenisio, with 48 inhabitants, as well as Moncalieri, with 55,000 inhabitants, besides Turin – the chief regional town of Piedmont – with over 900,000 residents), but also in terms of territory morphology (more than 10% of municipalities are located over 1000 metres of altitude), the management of public services and political and socio-economic characteristics.

However, to some extent, this huge heterogeneity across units may introduce potential biases in our study, especially for the presence of some municipalities that produce the analysed services within particular geographical contexts and are subject to a different voting mechanism for the election of the mayor and the municipal council. Therefore, we have decided to exclude from the sample – besides Turin, one of the Metropolitan Areas envisaged by the Constitution – all the towns over 15,000 inhabitants, as they are hard to compare with other smaller municipalities along two relevant dimensions: in terms of spending, for these largest municipalities the share absorbed by the four sectors considered in our analysis represents much less than 80% of total current expenditure (see the

included in the municipal budget only represent direct transfers to the citizens to subsidize the access to these services, while operating costs are ruled out.

[6] As for the environmental services, it is worth highlighting the importance of the national law *D.Lgs. 05/02/1997* (the so-called *Decreto Ronchi*), which assigns different competencies to central state, regions, provinces and municipalities in this field. In particular, it establishes the power of municipalities to define the management form for waste collection and disposal.

discussion below), given the higher incidence of the remaining functions (e.g., local police, cultural and sport services, economic development); moreover, they are subject to a runoff voting mechanism, that is likely to significantly influence political outcomes and subsequent policy choices (e.g., Osborne and Slivinsky, 1996; Bordignon and Tabellini, 2009). We also excluded municipalities located over 900 meters of altitude, as they show remarkably higher expenditure levels compared to other municipalities of the province (on average, 1800 euro against 560 euro per capita): this can be due to the fact that provision of services is strongly affected by both the particular morphology of the territory and the heavy tourist inflows, which clearly impact on peak demand for services such as waste management and local mobility [7].

The data have been provided by different public institutions and refer to the year 2005 (the last period for which all the relevant information is available). Expenditures and revenues come from the budgets of Italian municipalities published by the Ministry of Domestic Affairs (the so-called *Certificati Consuntivi*). Other important data – related to output indicators and explicative variables for spending inefficiency – have been obtained from statistical services of *Regione Piemonte* and *Provincia di Torino*.

2.2.1. Input and output indicators

The definition of input and output variables is strongly influenced by the Italian institutional framework discussed above. More precisely, we select the spending items and related output measures by looking at the most important competencies, in terms of both the incidence on the municipal budget and the relevance of the provided services for the citizens.

[TABLE 1 HERE]

In Italy, municipal current expenditure is classified in 12 macro-functions. More than 90% of current expenditure in our sample is represented by five of these

[7] Dividing the municipalities according to their altitude, one can observe that just starting from 900 meters they show levels of average current spending beyond 1000 euro per capita.

functions (see table 1): "General administration" (39%); "Environmental management" (22%); "Educational services" (13%); "Social services" (including child care and elderly care, 9%); "Road maintenance and local mobility" (8%). Clearly, the share of each function on local current spending varies according to municipal size: for instance, moving from the smallest municipalities (0-500 inhabitants) to the biggest ones (between 10,000 and 15,000 inhabitants), the weight of "General administration" decreases from 54% to 31%, while the shares of "Educational services" and "Social services" increase from 6% and 5% to 13% and 12%, respectively. We use current expenditure of municipalities for each of these items as an aggregate input indicator, given by the sum of the corresponding budget values.

For the categories "General administration", "Educational services" and "Road maintenance and local mobility", we consider the whole expenditure as registered in the municipal budget. In order to strengthen the connection between spending and the selected output indicators, for the categories "Social services" and "Environmental management", we just retain a fraction of the whole expenditure devoted to these functions: spending for "Environmental management" only includes the sub-item "Waste collection and disposal", which represents a relevant share of the total expenditure related to this task (60-70%); similarly, related to total spending for "Social services", we consider only the component specifically devoted to public welfare and elderly care. Our final input indicator (EXP) represents, on average, 86% of total current expenditure, with very little variations across demographical classes of municipalities. Notice that this selection procedure represents a significant improvement compared to previous literature on local governments' efficiency, which has so far relied on a crude measure of total current expenditure considered as a whole.

As remarked by Fox (2001), output measurement of government departments is rather difficult and often represents a source of controversy. Often, mainly due to data limitations, one has to select proxies for the provision of services (like

demand indicators) instead of direct output measures. Moreover, also the quality of public services represents a source of concern, since it can vary across municipalities and lead to different expenditure levels for the same output quantities. Here we closely follow the available literature (in particular, De Borger and Kerstens, 1996, and Balaguer-Coll *et al.,* 2007), and define the four output indicators that are more directly linked with our selected spending categories: (1) the total served population as a proxy for "General administration" services; (2) the total amount of garbage collected for "Waste collection and disposal"; (3) the total number of people in needs of care (i.e., those under 14 years old – enrolled in nursery, primary and secondary schools – and those over 75 years old) for "Educational services" and "Social services"; (4) the total length of municipal roads for "Road maintenance and local mobility".

Although the publicly available information does not go much beyond these data and our output measures strictly mirror the indicators used in previous analyses of local governments' efficiency in Europe, we are nevertheless aware that most of these variables are very loose proxies of real outputs produced by municipalities. Indeed, with the exception of the amount of garbage collected (*WASTE*), which can be viewed as a direct output of the expenditure in waste management, the indicators listed above reflect more *citizens' needs* rather than the quantities of services actually provided. This suggests caution in interpreting results from the estimation of spending inefficiency (not only for this paper), that has to be correctly read as a relative measure of excess spending for given citizens' needs. In particular, as De Borger and Kerstens (1996) and Balaguer-Coll *et al.* (2007) point out, the size of the population (*POP*) is usually assumed to proxy for the needs of various administrative services supplied by municipalities (management of registers and release of certificates for births, marriages and deaths, etc.). The number of people under 14 years old and over 75 years old represents a consistent fraction of the needy and the indicator (*DEPEND*) is reasonably correlated with the demand of educational

and elderly care services. Finally, the total length of municipal roads (*ROAD*) is aimed at proxying for the needs associated to the ordinary management of the existing road infrastructures (surface maintenance, public street lighting, local public transport arrangements, etc.).

We also recognise that output quality is a crucial issue when trying to assess local governments' performance. For the same level of output, municipalities may differ in the quality of the services provided – e.g., certificates may be obtained online, issued in one day, or several weeks; waste collection may be weekly or bi-weekly, etc. – and ignoring this aspect could imply that a greater spending due to higher quality is mistakenly identified as higher inefficiency. However, as for outputs, measuring the quality of public services is a longstanding problem in local public finance, not only because of the lack of relevant data, but also for the definition of quality. So far, only Balaguer-Coll *et al.* (2007) considers a direct indicator built from a survey on citizens' perceptions of the quality of services provided. However, despite representing a clear improvement, these subjective measures could bias results as well, because perceptions are affected for instance by different frameworks or by previous experiences. Although similar data are currently unavailable for Italian municipalities, one may recur also in this case to a proxy of the demand for quality. From this point of view, it is well known that richer communities demand higher service quality (e.g., Bergstrom and Goodman, 1973; Reiter and Weichenrieder, 1997). We then exploit information on average municipal income and include the variable (*INCOME*) as a control for the (demand of) quality of the public output in our spending frontier model. Notice that taking into account differences in local communities' income – besides controlling for different kinds of services and efficient levels of public expenditures, for given citizens' needs – also allows us to consider other potentially relevant issues for efficiency, such as the heterogeneity in tax bases and different incentives to monitor municipal expenditures (De Borger *et al.*, 1994; De Borger and Kerstens,

1996), which in turn should ensure a more precise assessment of the impact of fiscal autonomy and other determinants of spending efficiency [8].

Table 2 shows the summary statistics for input and output indicators used in the empirical analysis. In addition to the aggregate value of spending input (*EXP*), also spending for each category separately are reported; these disaggregated values (EXP_{GA}, EXP_{WM}, EXP_{EE}, EXP_{RM}) will be used in a preliminary step of the empirical analysis in which we explore the influence of different types of variables (output proxies and inefficiency determinants) on the expenditure for each function. Then, in a second stage, a global approach is a adopted in order to evaluate jointly the spending performance of all sectors.

[TABLE 2 HERE]

It is worth noticing that our sample does not show any variability in input prices at which the municipalities buy their inputs. Indeed, there is no wage flexibility, as salary scales and allowances of municipal personnel are completely fixed. Moreover, since we are considering only the province of Turin, all municipalities have access to the same capital market, and obtain most of their funds from the same specialized financial institutions at the same interest rate. Thus, the hypothesis of identical input prices across municipalities is quite plausible.[9] Consequently, throughout the analysis we focus on the measurement of *overall* cost or spending inefficiency (with the meaning explained above), as it is more closely related to the nature of our data than pure *technical* inefficiency (which would require the knowledge of input price information in order to disentangle the *allocative* component of excess cost).

2.2.2. Fiscal autonomy and other determinants of spending inefficiency

The study focuses on the effects of tax decentralization and other explicative factors for estimated spending inefficiency, by relying on both SFA and DEA methodologies discussed in Section 2.3. Besides a measure of fiscal autonomy –

[8] We thank the editor and an anonymous referee for having raised all these critical aspects and suggested the inclusion of muncipal income in the model specification.

[9] About this issue, see also the discussion in De Borger and Kerstens (1996).

the key issue of our analysis – the other aspects considered among the potential determinants of local governments' performance embrace a variety of fiscal, spatial, political and organizational variables. Summary statistics are presented in table 3.

[TABLE 3 HERE]

a) FISCAL INDICATORS

Similarly to other countries, Italian municipalities rely on three main different sources of revenues: local taxes, fees and charges for specific services, and grants from upper-level governments. As a measure of fiscal autonomy, we adopt the tax decentralization indicator proposed for the first time by Akai and Sakata (2002), defined as the share of own taxes (*ICI* + *Addizionale Comunale IRPEF* + *TARSU*) [10] on local government's total revenues.[11] As remarked by the authors, this indicator (*FISCAUT*) reflects how much public spending of lower-tier governments is maintained on the basis of tax revenues collected at the local level. It is thus a measure of VFI particularly suitable for testing the theoretical prediction that an effective electoral accountability of local politicians – here interpreted as a lower excess spending for given citizens' needs – can be obtained by increasing their responsibilities in terms of funding. It is worth highlighting that the inclusion of the average municipal income among the variables defining the efficient frontier allows a better identification of the effects associated to the use of own fiscal tools, since we are able to control (at least to some extent) for the different tax bases available to different local communities[12].

[10] See the discussion in Section 2.1.

[11] This measure of tax autonomy has been succesively adopted, among the others, in the studies on fiscal decentralization in OECD countries by Stegarescu (2005) and Baskaran (2010).

[12] Indeed, the *ICI* and *TARSU* tax bases (the property value and the dwelling size, respectively) are strongly correlated with citizens' income level, while in the case of *Addizionale Comunale IRPEF* the tax base just coincides with citizens' income. Nevertheless, we are also aware that the use of *FISCAUT* indicator may imply an endogeneity problem, as the degree of fiscal autonomy is affected by local tax rates and the way these are set is likely to depend in part on the ability of municipalities to manage their expenditures efficiently. However, the problem is hard to be solved with the available information, which does not allow defining other proxies of fiscal autonomy strictly exogenous with respect to spending performance. Thus, we decided to rely

To fully understand the role played by the accountability of local politicians, we introduce other fiscal indicators in the analysis. First, we decompose per capita current revenues into their three main sources – own taxes, fees and charges, and grants – and, for each category, we identify the municipalities with a per capita level exceeding the median, for which the dummies *HTAX*, *HEXTRA* and *HGRANT* are equal to 1. Then, we interact the three dummies with the variable *FISCAUT*, hence controlling for the presence of a possible opportunistic behaviour due to an excessively large availability of resources in the richest communities (distinguishing by type of revenue, as in Balaguer-Coll *et al.,* 2007), which could loosen the improvements of electoral accountability potentially obtainable by the reduction in VFI. The tightness of budget constraint and its impact on the accountability of local politicians is further investigated trough the dummy variable *PACT*, that distinguishes local governments subject to the DSP (see Section 2.1) from the municipalities (with less than 5,000 inhabitants) that – starting from 2001 – have been excluded from the application of this fiscal discipline rule.[13]

b) SPATIAL INDICATORS

The importance of the spatial dimension in determining the spending performance of decentralized governments has been highlighted by the strand of fiscal federalism literature which relies on the spillover approach for explaining the presence of possible interactions among expenditure decisions of neighbouring jurisdictions (e.g., Revelli, 2003; Baicker, 2005; Ermini and Santolini, 2010). According to these studies, the benefits or possible detrimental effects of public expenditure (concerning social services, local mobility and road maintenance, environmental management, etc.) spread across the administrative boundaries of one jurisdiction and the spending decisions of each community will possibly depend, besides its own characteristics, also on policies chosen elsewhere. The specific nature of the spillover – which can

on this measure, while recommending caution in interpreting the estimated impact of tax decentralization on spending efficiency in terms of a pure causal relationship.

[13] See Kornai *et al.* (2003) for an extensive discussion of the "soft budget constraint" concept.

results in a positive or a negative impact on expenditure levels – depends on the relationship of complementarity or substitutability among local public services provided by the neighbouring jurisdictions. Considering our context (all communities belonging to the province of Turin), it is reasonable to assume that those closer to Turin may be affected from both positive and negative spillovers of public good provision there, and can free-ride on certain services (e.g., educational and elderly services, waste disposal) and spend more for others (e.g., road maintenance). To take into account the potential role played by these effects, we follow some previous studies on cost efficiency of local governments (e.g., Lokkainen and Susiluoto, 2004; Afonso and Fernandes, 2005) and include a variable for the distance of each municipality from Turin (*KMTO*). Furthermore, we use population density in the municipal area (*DENS*) to control for the presence of both density economies and congestion effects in the provision of public goods within each community.

c) POLITICAL INDICATORS

Some political features of municipal governments are considered as potentially relevant determinants of spending efficiency. In particular, we define the variable *YGOV*, which assumes values from 0 to 4 and represents the number of post-election years for the mayor and the governing coalition, in order to test the presence of opportunistic behaviours by local politicians attributable to the "electoral budget cycle". The theoretical argument here is that incumbent politicians – in an effort to signal their competence to the voters, so as to increase their chances to be re-elected – tend to enlarge (inefficiently) spending when they are closer to new elections (e.g., Rogoff and Sibert, 1988), i.e., when more post-election years are passed. We also interact *YGOV* with the fiscal indicators *PACT* and *FISCAUT*, so as to check for the presence of possibly relevant interplays between the impact of electoral mandate deadline on spending efficiency and the variables reflecting the accountability and fiscal constraints of local politicians.

A control is also included for the political orientation of governing coalition, using two dummy variables that assume value 1 if coalition parties belong to a centre-left list (*LEFT)* or to a so-called "civic list", with no clear ideological orientation (*CIVIC*). We finally consider two variables controlling for the age (*MAYORAGE*) and the gender (*MAYORSEX*) of the mayor, looking at recent political economy literature that stresses the role of more experienced and female representatives in determining policy preferences and spending outcomes (e.g., Edlund and Pande, 2002; Chattopadhyay and Duflo, 2004; Dal Bó and Rossi, 2008; Funk and Gathmann, 2008).

d) WASTE MANAGEMENT INDICATORS

We also assess the impact of different management models of waste collection and disposal that are observed in our sample. Indeed, this particular service may be provided by the municipalities adopting several organizational forms. The weight that waste management has recently gained in Italy for judging the behaviour of local politicians can be easily understood in the light of yardstick competition between municipalities (e.g., Salmon, 1987; Revelli, 2006), and highlights the importance of reaching efficiency in spending for local administrations.[14] Waste collection can be managed: directly by the local government; directly by a consortium of local governments with the possibility for a municipality to be either consortium head or a simple participant; through a specialized external firm, which can be either publicly or privately owned; through a public-owned cooperative firm involving two or more municipalities. We summarize these six different organizational choices into three variables. A first dummy (*PUBLIC*) distinguishes the public ownership from the private one; a second dummy (*PUBLIC×FIRM*) indicates that the service is provided by an external firm, conditionally on this firm having public ownership; finally, a

[14] Examples of the importance of waste management for the comparative evaluation of local administrators include the recent garbage crisis and the subsequent scandals in Naples and Palermo. See, e.g., "Naples burns as residents protest at garbage crisis", *The Guardian*, May 27th, 2007.

third dummy (*PUBLIC×FIRM×COOP*) represents a cooperative organization, conditionally on being a publicly owned firm.

2.3. The empirical strategy

In order to make our empirical analysis more transparent and easier to interpret, we first run simple OLS regressions for each sector separately, by investigating whether the variations in spending for general administration (EXP_{GA}), waste management (EXP_{WM}), education and elderly care (EXP_{EE}), and road maintenance and local mobility (EXP_{RM}) are actually related to their output proxies (*POP*, *WASTE*, *DEPEND* and *ROAD*, respectively) and are affected by fiscal autonomy and the other explicative factors of inefficiency discussed above. Notice that, in this explorative analysis, we include in the model for each spending function only the corresponding output proxy and the variable *INCOME* as an indirect control for output quality, a set of dummies controlling for potential scale effects (i.e., two variables measuring the impact on spending of extreme size classes: *POP-1000* = 1 for the municipalities with less than 1000 inhabitants and *POP-10,000* = 1 for those with more than 10,000 inhabitants[15]; and a variable capturing the impact of altitude on spending: *ALT-600* = 1 for the municipalities located over 600 meters)[16], and the determinants of inefficiency. As for the latter, the three dummies summarizing the different organizational choices for waste management are included only in the cost models referring to this function and to the general administration – as also this category of spending is likely to be affected by the adopted schemes, especially in the case of public solutions (due to the presence of some common overhead costs) –

[15] Following the classification adopted by the Ministry of Domestic Affairs, the municipalities have been divided into seven size classes: under 500 inhabitants (13% of observations), between 500 and 1000 (22%), between 1000 and 2000 (25%), between 2000 and 3000 (9%), between 3000 and 5000 (15%), between 5000 and 10,000 (11%), and finally over 10,000 (4%).

[16] These thresholds were selected by looking at the distribution of per capita current spending of municipalities according to their population size and altitude. The municipalities under 1000 and over 10,000 inhabitants represent the extreme sides of a ∪-shaped trend that shows per capita spending along different dimensional classes. Moreover, the municipalities located at an altitude over 600 meters typically exhibit per capita spending levels significantly higher than the average of the sample. Interestingly, the 600 meters limit is also considered by the Italian Law 991/1952 to define mountain municipalities.

while they are not considered in the analysis of spending relative to the other two categories (EXP_{EE} and EXP_{RM}). After the sector-by-sector regressions, we proceed with a more global approach and run a OLS regression on the aggregated current expenditures (EXP) on the whole set of regressors (output proxies and structural control variables, as well as inefficiency determinants), so as to account for potential interactions among the expenditure decisions related to the different functions.

As a final important step, we will try to disentangle the *inefficient* component of municipal spending (with the meaning clarified in Section 2.2.1) from its structural part (which is driven by citizens' needs), and test whether such inefficiency is affected by the degree of tax autonomy and the other fiscal, spatial, political and organizational variables. To this end, we will exploit the standard techniques adopted in the empirical literature to assess the efficiency of production units (firms, as well as governments), which are usually classified in parametric and nonparametric methods. In particular, we estimate here both *parametric stochastic* frontiers (SFA model) and *nonparametric deterministic* frontiers (DEA model), since each technique presents advantages and disadvantages, but the literature has not been able so far to establish when a methodology is strictly superior to the other (e.g., Coelli *et al.*, 2005). Generally, when considering parametric techniques, the functional form of the *best-practice* frontier has to be defined a priori, while in the case of nonparametric techniques no functional form needs to be pre-determined and only the basic microeconomic properties of a production set are imposed as constraints to a linear programming problem. On the other hand, the SFA technique accounts for both inefficiencies and random variables outside the control of the decision maker that might impact on the production performances, while standard deterministic frontiers like DEA are able to account only for inefficiency, ruling out the role of stochastic disturbances. Given these pros and cons, it is important to check the robustness of our results, by using both approaches to

investigate municipal spending inefficiency and the specific role played by tax autonomy.

More precisely, within the SFA approach, we focus here on the *cost function* representation of a given production technology for municipal services. For any i-th observation, the cost function $C(q_i, w_i; \beta)$ defines a lower bound for spending C_i necessary to provide output levels q_i at given input prices w_i. The vector β is the set of technological (or structural) parameters to be estimated. Stochastic parametric frontiers are based on the specification of a composed error term (ε_i) that allows to disentangle spending inefficiency from stochastic disturbances: a *symmetric* component (v_i) captures the usual random noise, while a *one-sided* (positive) error term (u_i) is introduced to measure cost inefficiency. When a Cobb-Douglas technology with no variability in input prices w_i is assumed (see De Borger and Kerstens, 1996, and the discussion at the end of Section 2.2.1), the resulting SFA spending (or cost) model – expressed in a logarithmic form – is:

$$\ln C_i = \beta_0 + \sum_m \beta_m \ln q_{mi} + \sum_k \delta_k \ln d_{ki} + \varepsilon_i \qquad (1)$$
$$\text{with } \varepsilon_i = v_i + u_i$$

where C represents municipal current spending in the selected functions (*EXP*), q_m are the corresponding "output" indicators (*POP*, *WASTE*, *DEPEND*, *ROAD*), and d_k are other structural variables controlling for the quality of public output (*INCOME*) and the presence of potential scale effects due to population size (*POP-1000* and *POP-10,000*) and geographical altitude (*ALT-600*). To estimate the SFA model (1), we rely on the maximum likelihood technique proposed by Battese and Coelli (1995, SFA-BC95 from now on), and assume the one-sided inefficiency term to be distributed as a truncated-normal: $u_i \sim N^+(\eta' Z, \sigma_u^2)$. This specification allows the mean of spending inefficiency to be affected – through the vector of coefficients η to be estimated – by a set of observable exogenous factors Z, which includes tax autonomy and the other determinants discussed above. Finally, the symmetric random noise component v_i is assumed to be distributed as a standard $N(0, \sigma_v^2)$.

As for the investigation of spending inefficiency within the DEA framework, we rely instead on a standard two-stage procedure (Coelli *et al.*, 2005). Following De Borger and Kerstens (1996), in a first stage we compute an inefficiency score for each municipality, by fitting a *Variable Returns to Scale* DEA model – the so-called DEA-VRS frontier, which allows us to take into account the presence of both scale economies and scale diseconomies in the production technology[17] – with the aggregate value of spending (*EXP*) used as input indicator and the proxies for the quantity (*POP*, *WASTE*, *DEPEND*, *ROAD*) and the quality (*INCOME*) of the services provided used as output indicators. Then, in the second stage, we take DEA-VRS inefficiency scores and regress them on the same set *Z* of inefficiency determinants specified in the SFA-BC95 model. The second-stage analysis relies on a Tobit regression model, a censored model that allows us to make proper inference on the factors driving the estimated inefficiency, considering that, in the DEA framework, fully efficient municipalities show a value of 0 and no values below 0 can be observed.[18]

3. Results

3.1. Preliminary OLS estimates

In table 4a we report the findings of the explorative investigation on spending determinants carried out for each function separately, while table 4b shows the OLS estimates for the aggregate current expenditure. The results refer both to a BASIC MODEL specification, where only tax autonomy and other fiscal indicators are considered, and an EXTENDED MODEL specification, which includes also the

[17] The generalization of DEA technique to the case of *Variable Returns to Scale* – which is the most adopted approach in the literature since the early '90s – is due to the contribution of Banker *et al.* (1984). The orginal approach by Charnes *et al.* (1978) implicitly assumes *Constant Returns to Scale* (DEA-CRS model) in the production technology.

[18] Recent developments in DEA (Simar and Wilson, 2007) permit to estimate the efficiency levels conditionally to the influence of exogenous variables *Z*, without assuming different distributions for the scores in the two stages of the analysis (which represents the main shortcoming of the standard Tobit procedure). However, the implementation of this methodology is not essential in our context, as we check the robustness of our results by relying on both SFA and DEA to assess productive efficiency.

spatial, political and organizational variables among the possible drivers of spending performance.

[TABLE 4a HERE]

Looking at the sector-by-sector estimates, one can first notice that each spending item is positively and significantly driven by the corresponding output proxy, with the highest correlation observed for education and elderly care (the impact of *DEPEND* on EXP_{EE} is slightly greater than 1) and the lowest correlation in the case of road maintenance and local mobility (β_{ROAD} ranges between 0.29 and 0.34). This clearly provides an empirical support to our choice of output variables in terms of proxies for citizens' needs. Second, the impact of output quality on expenditure turns out to be important, as *INCOME* plays a major role in almost all the estimated models, with a positive and significant effect that appears particularly large for EXP_{RM}. A possible explanation for this evidence is that the increase in income makes citizens more demanding toward "road maintenance", asking for instance their Mayors to promptly repair broken pavements or roads, and to improve urban living areas. Also population size and altitude are important in affecting spending. The positive and significant coefficients for the dummies *POP-1000*, *POP-10,000* and *ALT-600* in most specifications (again, remarkably for EXP_{RM} in the EXTENDED MODEL) points to the presence of some adverse scale effect for the smallest and the biggest municipalities (notice, in particular, the presence in all sectors of a statistically significant cost increase for local governments with more than 10,000 inhabitants), as well as for the mountain (and touristic) resorts.

Turning now the attention to the impact of tax autonomy and the other fiscal constraints, *FISCAUT* appears to play an important role in the provision of general administration services (EXP_{GA}) and care services (EXP_{EE}), two categories for which the estimated coefficients show a negative and statistically significant sign: this finding supports the theoretical argument that a higher accountability of local politicians can be reached by rising their responsibilities in terms of funding; indeed, the higher is the share of current revenues derived

from own taxes, the lower is the spending level of local government, even if we are not yet able in this preliminary stage to attribute the decrease observed in expenditure to a reduction of excess costs compared to citizens' needs (for which a frontier analysis is required, see next section).[19] For the same spending categories, given the positive sign of the coefficients associated to the interaction of *FISCAUT* with *HTAX* and *HEXTRA*, our results also show that fiscal incentives due to revenue autonomy are partially offset by spending increases when local taxes per capita, as well as fees and charges in the case of EXP_{GA}, are higher than the median. This evidence supports the existence of an opportunistic behaviour by politicians (discussed also in Balaguer-Coll *et al.*, 2007) when a local government can rely on a large amount of own revenues. The external imposition of a tighter budget constraint – such as the limit on spending growth established by the DSP for the municipalities with more than 5000 inhabitants – seems to be effective in motivating incumbent politicians to better control their expenditures, at least in some functions like waste management and road maintenance and local mobility, for which the estimated coefficient of *PACT* is negative and statistically significant.

When considering the EXTENDED MODEL, results on the impact of fiscal variables are very similar to those discussed above, showing their robustness to alternative specifications of spending functions. But this model offers other interesting insights considering the effects associated to the spatial, political and organizational factors. There is evidence of positive spillovers from being closer to Turin, since we observe a decrease in spending (statistically significant only for waste management and education and elderly care) when the distance from Turin (*KMTO*) reduces. As for the impact due to a higher population density (*DENS*), potential congestion effects seem to prevail over density economies in the sectors of education and elderly care and road maintenance and local mobility, while the inverse is observed for general administration services.

[19] Indeed, our evidence is consistent with the results of the empirical studies that consider how tax decentralization affect local governments' size, without separating inefficient spending from its structural component (see Section 1).

Looking at the political features of the municipalities, the variable measuring the number of post-election years for the mayor and the governing coalition (*YGOV*) exerts a significant influence on spending decisions only when it is interacted with the fiscal indicators *PACT* and *FISCAUT*: this reveals that the opportunistic behaviour of incumbent politicians highlighted by the empirical literature on the "electoral budget cycle" (e.g., Galli and Rossi, 2002; Veiga and Veiga, 2007) is conditioned by the presence of fiscal constraints imposed on the local government. More precisely, the positive coefficient of *YGOV×PACT* (statistically significant for EXP_{GA}, EXP_{WM} and EXP_{EE}) confirms the recent findings by Mink and De Haan (2005) and Bartolini and Santolini (2009) of a strong "electoral budget cycle" effect for the municipalities subject to a fiscal discipline rule: the introduction of the DSP provides incentive for opportunistic spending by incumbents that are closer to the end of their mandate; this could be due to a forward-looking behaviour, which leads to intensify compliance to DSP in the early years of mandate, so as to exploit higher margins for increasing the expenditure when close to new elections. We also consider the interaction *YGOV×PACT×FISCAUT*, to study the interplay between the fiscal constraints and the degree of tax autonomy in influencing the "electoral budget cycle". Interestingly, one can notice that a higher revenue autonomy has the effect of dampening the "electoral budget cycle" impact on spending observed for the municipalities under the DSP, hence increasing the importance of the argument of a stronger accountability of local governments obtainable through tax decentralization. The control for the political orientation of the government points to negative and significant effects on spending for centre-left coalitions (*LEFT*) and for older mayors (*AGEMAYOR*), although these variables seem to influence only the expenditure in road maintenance and local mobility.

The last set of regressors included in the EXTENDED MODEL aims at controlling for the impact of different organizational choices for waste management on the expenditures in the sector and, possibly, in general administration. The results highlight a significant effect only for the dummy *PUBLIC×FIRM×COOP*: both

the public/private ownership of the firm, and the externalization of the service do not seem to matter in itself; it is instead relevant that, besides being publicly owned and run through a firm, garbage collection and disposal is managed cooperatively. The organizational scheme of the public-owned cooperative firm would then represent a more efficient solution, in terms of reduced spending both for waste management and general administration. These cost savings are likely to result from the advantage of sharing large fixed costs (typical of the consortium option) combined with the benefit of increasing expenditure control (typical of the external firm option).

[TABLE 4b HERE]

The estimates for aggregate current expenditure in the four selected functions (table 4b) generally confirm the main findings discussed above of separate models for each spending category. Considering the multi-output production function underlying this global specification of the cost model, one can notice that population size is the most important proxy of citizens' needs for explaining variability in current spending (β_{POP} is about 0.66), while *WASTE*, *DEPEND* and *ROAD* play a secondary role. Moreover, constant returns to scale seem to dominate the aggregate provision of municipal services, as the sum of estimated elasticities with respect to the four output indicators is very close to one (it ranges between 0.92 and 0.93). Notice, however, that this result crucially depends on the fact that 61% of the municipalities in our sample do not belong to extreme size classes (under 1000 and over 10,000 inhabitants) and are located under 600 meters of altitude. Indeed, as already observed before, *EXP* significantly increases for the group of the smallest (*POP-1000*) and the biggest (*POP-10,000*) municipalities, as well as for those over 600 meters (*ALT-600*), thus suggesting the likely presence of scale economies/diseconomies in the production of municipal services, that will be discussed in more details in the next section, when comparing results from SFA and DEA frontier estimations. Aggregate current spending also shows a positive elasticity with respect to the average level of municipal income (β_{INCOME} ranges between 0.36 and 0.40), thus

confirming the importance of controlling for the demand of higher quality services in richer communities. Looking at the impact of fiscal indicators, the coefficient of tax autonomy (*FISCAUT*) has the expected negative sign – again partially offset by a relatively small increase in spending for the municipalities with a per capita level of own revenues (both taxes and fees and charges) higher than the sample median – and supports the argument of a higher accountability of local governments induced by the increase of their funding responsibility. When the model is extended so as to include the spatial, political and organizational variables, the introduction of DSP (*PACT*) exerts a statistically significant effect in containing spending[20]. Finally, also the link of the "electoral budget cycle" with fiscal constraints and the higher efficiency of managing waste collection trough a public-owned cooperative firm are confirmed. This analysis does not allow, however, to understand whether the degree of fiscal autonomy impact on structural expenditure – which is related to citizens' needs – or on the inefficient spending. To do so, we move a step further and consider frontier models.

[TABLE 5 HERE]

3.2. Analysis of spending inefficiency

Table 5 reports summary statistics for the inefficiency scores obtained with the SFA (considering both the BASIC and the EXTENDED specification of the model $\eta'Z$ for the mean of u_i in equation (1) and the DEA-VRS models. The average inefficiency is between 0.24 (EXTENDED MODEL) and 0.26 (BASIC MODEL) for SFA and about 0.20 for DEA-VRS[21], which means that municipalities, on average,

[20] Notice that this result is robust to a different specification of the aggregate spending function, in which returns to scale are allowed to fully vary across the municipalities. In particular, we substituted the dummies for extreme size classes (*POP-1000* and *POP-10,000*) with a quadratic term for the population. According to this specification, the estimated coefficient for *PACT* is net of possible confounding effects due to population size.

[21] It is worth remarking that the estimation of efficient frontier within DEA framework is based on the identification of a group of fully efficient municipalities (for which the inefficiency score is equal to zero, i.e., 33 cases in our analysis) that are used as benchmarks for assessing the performance of the other units of the sample. Therefore, by construction, the average efficiency (inefficiency) computed using DEA is typically higher (lower) compared to values resulting from SFA estimation (see, e.g., Coelli *et al.*, 2005).

could satisfy citizens' needs with respect to the analysed services with a 20-26% reduction in current level of spending. The distributions of inefficiency levels appear concentrated around the mean both in SFA and DEA models, as they exhibit a median value very close to their mean and 75% of observations show a spending inefficiency lower than 0.33-0.35 using SFA and 0.28 using DEA. Not surprisingly, the standard deviation is generally small and relatively higher for SFA estimates, due to the presence of more extreme scores (maximum values are around 0.93-0.94 against 0.52 in the DEA model).

[FIGURE 1 HERE]

More importantly, the correlation between SFA and DEA inefficiencies is very high (ranging between 0.7 and 0.8), considering both DEA-VRS and DEA-CRS models (see footnote 17). As discussed above, the inclusion of population size and altitude dummies in the cost frontier (1) helps controlling for the impact of variable returns to scale on efficiency estimates, like in a DEA-VRS framework, even if these effects do not vanish completely. Indeed, also for SFA parameter estimates the sum of elasticities with respect to the four output proxies is very close to one (0.94 in the BASIC MODEL and 0.93 in the EXTENDED MODEL, see table 6a), highlighting a multi-output production technology mainly characterized by constant returns to scale, which is the basic assumption of a DEA-CRS model. Such a result is probably driven by the prevalence in our sample of medium-sized municipalities, for which returns to scale appear to be actually constant looking at the difference in inefficiency levels between DEA-CRS and DEA-VRS (figure 1). Variable returns to scale seem instead to characterise municipalities under 1000 and over 10,000 inhabitants (notice that the coefficients of *POP-1000* and *POP-10,000* in SFA estimates are both positive and statistically significant). More precisely, the former mainly exhibit increasing returns to scale, perhaps because of the stronger influence of fixed costs on current spending (especially with regard to waste management and general administration services), while the latter mostly show decreasing returns to scale, since they probably produce a wider range of more complex services (this is particularly true for social

welfare spending). As for the definition of the proper scale for providing the essential services analysed in this study, municipalities with a number of served inhabitants from 3,000 to 5,000 apparently correspond to the optimal size. This size emerges by looking at both the differences between DEA-CRS and DEA-VRS scores and SFA inefficiencies in figure 1. It is also worth noticing that, in the DEA-VRS model, spending inefficiency (net of scale inefficiency) tends to decrease with municipal size. In the light of the positive correlation between municipal size and the degree of tax autonomy observed in our sample (0.62), a possible interpretation of this evidence relies on the argument that local politicians are probably subject to a more severe control from their citizens when the latter can ask for differentiated and more effective services that are financed to a relevant extent through taxes collected at local level. To explore this issue more in depth, we turn now our attention to the investigation of the factors that could help explain estimated inefficiency.

Tables 6a and 6b show the estimates of the SFA-BC95 frontier model (1) and DEA-VRS Tobit regression, respectively, relying on the same vector Z of inefficiency determinants (BASIC and EXTENDED specifications) used in the preliminary OLS analysis.

[TABLES 6a AND 6b HERE]

First, SFA parameter estimates of frontier variables (output proxies and other control factors) are very similar to those discussed above for the average spending function (table 4b), both in terms of magnitude and statistical significance, thus confirming that these are important drivers of the structural component of aggregate current expenditure in the selected functions. Most importantly, the model highlights the prevalence of spending inefficiency u_i with respect to random noise v_i in determining the global error term ε_i: the parameter γ – the share of residual variance due to deviations from the best practice frontier, $\sigma_u^2/(\sigma_u^2 + \sigma_v^2)$ – is very close to 0.60 in both specifications. This evidence supports the hypothesis that the municipalities of our sample are not cost minimizing and a traditional *average* spending function with the term u_i

equal to zero does not adequately represent the observed performances. Looking now at the parameter estimates of inefficiency determinants, SFA-BC95 and Tobit models perform both well in terms of general statistical fit (as indicated by LR and F tests) and provide similar results as for the sign and the significance of most coefficients, showing that our findings are robust to alternative methodological approaches for analysing spending inefficiency.

As for the key issue of our study, the sign of the coefficient of *FISCAUT* is negative and highly statistically significant in all models. Hence, the negative impact on expenditure stemming from a greater tax autonomy of municipalities targets *inefficient* spending, i.e., the waste of resources with respect to the amount required to satisfy citizens' needs. This finding supports the theoretical prediction of SGT that a higher accountability of local politicians can be obtained by reducing VFI (e.g., Weingast, 2009), specifying some previous results in the literature that highlighted the positive effects of higher local tax rates on municipal efficiency (Vanden Eeckaut *et al.*, 1993; De Borger *et al.*, 1994; De Borger and Kerstens, 1996). At the same time, both SFA-BC95 and Tobit estimates confirm that a large availability of own resources – as reflected in per capita levels higher than the sample median – counteract the incentive effect of fiscal decentralization: the interactions of *FISCAUT* with *HTAX* and *HEXTRA* show positive and significant coefficients, even if the first-order effect is much larger (see Balaguer-Coll *et al.,* 2007). Finally, also the DSP seems to work well as a mechanism of fiscal discipline, leading to cuts in excess spending, although the reducing impact exerted on inefficiency is statistically significant only in the Tobit model, probably because the variable *PACT* partly captures a size effect in SFA models[22].

As for the role played by the other variables included in the EXTENDED MODEL, the two spatial indicators are never significant (like in the OLS estimates of table 4b); indeed, at the aggregate spending level, it is likely that positive and

[22] Remind that the variability of returns to scale over the sample is not fully controlled in our SFA model specification, where only the impact of extreme size classes on spending is taken into account through the dummies *POP-1000* and *POP-10,000*, while nonparametric DEA framework allows returns to scale to vary freely across all productive units.

negative spillovers associated with a higher proximity to the capital (*KMTO*) are compensated, and the same holds for congestion effects and cost savings resulting from increased population density (*DENS*). Looking at the political variables, it emerges now a positive and significant coefficient also for the first-order effect of the shorter time period before new elections (*YGOV*), in both SFA and Tobit estimates. However, the impact of the "electoral budget cycle" conditional to the presence of the DSP and its interaction with tax autonomy continue to play the major role, as remarked by the magnitude of the parameters associated to the interactions of *YGOV* with *PACT* and *FISCAUT*. The relevant aspect of our results compared to the existing evidence on the "electoral budget cycle" in local governments (e.g., Veiga and Veiga, 2007; Bartolini and Santolini, 2009) is that they clarify that the observed increase in municipal spending when close to new elections can be interpreted as a greater waste with respect to an efficient expenditure level.[23] As for the political orientation, the coefficient of the dummy for centre-left coalitions (*LEFT*) is significant and negative, as well as the one associated to the presence of a civic list (*CIVIC*), even if only in SFA estimates. The impact of *LEFT* on spending inefficiency can be added to the existing political economy literature, which often found a propensity of left-wing governments towards a larger expenditure (e.g., Blais *et al.*, 1993; De Haan and Sturm, 1994): observing a larger spending carried out by left-wing coalitions does not imply a higher inefficiency, indeed the latter even seems to decrease. Finally, the presence of

[23] A control for the robustness of these findings is also provided introducing the dummy *2GOV*, which distinguishes the municipalities with a mayor facing a second term limit from those with a mayor that can be re-elected. The theoretical literature suggests that the impossibility to be re-elected influences the opportunistic behaviour of the incumbents, especially in proximity of the new elections (e.g., Besley and Case, 1995, 2003; Smart and Sturm, 2006). However, testing the effect of this variable – considered alone or interacted with the years of mandate – we did not observe any significant impact on the inefficiencies. A plausible explanation for this evidence could be found analyzing more in depth the municipalities included in our sample: the dummy *2GOV* is equal to one for 26.5% of these municipalities; among these, in the following elections (between 2006 and 2009), a person belonging to the previous governing coalition was elected as a mayor in the 58% of the cases; in another 22% of cases, a person belonging to the previous governing coalition has been presented as one of the main candidates to become mayor. These statistics stress the role of a party affiliation and party discipline in identifying candidates and their behaviors once elected. Therefore, incumbents' interests, merging in the party's ones, do not vanish simply with their impossibility of re-election.

older mayors significantly reduces inefficiency (*AGEMAYOR*), at least in Tobit estimates. Again, this result adds to the recent literature on the effects of term length on politicians' behaviour, which points out a positive role of higher age representatives in determining a good legislative performance of governments (e.g., Dal Bò and Rossi, 2008). As for the effects of the organizational choice for waste management, both SFA and Tobit results remark that a higher efficiency in spending can be reached if garbage collection and disposal is provided by a publicly-owned cooperative firm.

4. Conclusions

This paper studies the role played by tax decentralization (measured as the degree of VFI, i.e., the fiscal autonomy in covering the costs associated to the provision of essential public services) in influencing spending efficiency of local governments. The study relies on a sample of 262 Italian municipalities belonging to the province of Turin and exploits both standard regression analysis and efficiency frontier techniques (SFA and DEA) to study local governments' spending performances and their main determinants, considering four main spending categories: general administration, waste management, education and elderly care, road maintenance and local mobility

Consistently with modern fiscal federalism theories, our results show that more autonomous municipalities – i.e., local governments with a low VFI – exhibit a lower spending for satisfying citizens' needs, thus supporting the argument that an effective electoral accountability of local politicians can be obtained by increasing their responsibilities in terms of funding. We also find some evidence on the possibility for the central government to control spending efficiency through fiscal rules (here the *Domestic Stability Pact*). The analysis has then been extended to account for the role played by other potential factors, including spatial, political, and organizational variables. Among these, a major impact on spending performances seems to be exerted by the opportunistic behaviour of incumbent politicians, as highlighted by theoretical literature on

the "electoral budget cycle". We provide new empirical support to the (inefficient) increase of spending observed for the mayors closer to new elections, and we also find that this effect is strongly conditioned by the presence of fiscal restraints imposed on local governments (i.e., the DSP) and by the degree of accountability deriving from their fiscal autonomy.

From a policy perspective, the evidence emerged in this study supports the recent waves of reforms towards the devolution of taxing power to lower government tiers – from regions to municipalities – observed in Italy as well as in other countries around the world, with the purpose of reducing VFI and increasing the accountability of local politicians and, through this mechanism, improving both the efficiency and the effectiveness of public services provided to the citizens.

References

Afonso, A., and Fernandes, S. (2005), Local Government Spending Efficiency: DEA Evidence for the Lisbon Region, Regional Studies 40(1), 39-53.

Akai, N., and Sakata, M. (2002), Fiscal Decentralization Contributes to Economic Growth: Evidence from State-Level Cross-Section Data for the United States, Journal of Urban Economics 52, 93-108.

Ambrosanio, F., and Bordignon, M. (2009), Internal Stability Pacts: The European Experience, European Economic Governance Monitor, EEGM Paper 4, European Economic Governance Monitor.

Baicker, K. (2005), The Spill-Over Effects of State Spending, Journal of Public Economics 89, 529–544.

Balaguer-Coll, M.T., Tortosa-Ausina, E., and Prior, D. (2007), On the Determinants of Local Government Performance: A Two Stage Nonparametric Approach, European Economic Review 51(2), 425-451.

Banker, R.D., Charnes, A., and Cooper, W.W. (1984), Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis, Management Science 30(9), 1078-1092.

Bartolini, D., and Santolini, R. (2009), Fiscal Rules and the Opportunistic Behavior of the Incumbent Politician: Evidence from Italian Municipalities, CESifo Working Paper 2605, CESifo Group, Munich.

Baskaran, T. (2010), On the Link between Fiscal Decentralization and Public Debt in OECD Countries, Public Choice 145, 351–378.

Battese, G.E., and Coelli, T.J. (1995), A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data, Empirical Economics 20, 325-232.

Bergstrom, T.C., and Goodman, R.P. (1973), Private Demands for Public Goods, American Economic Review 63(3), 280-296.

Besley, T. (2006), Principled Agents?, Oxford University Press.

Besley, T., and Case, A. (1995), Does Electoral Accountability Affect Economic Policy Choices? Evidence from Gubernatorial Term Limits, Quarterly Journal of Economics 110, 769-798.

Besley, T., and Case, A. (2003), Political Competition and Policy Choices: Evidence from the United States, Journal of Economic Literature 41(1), 7-73.

Blais, A., Blake, D., and Dion, S. (1993), Do Parties Make a Difference? Parties and the Size of Governments in Liberal Democracies, American Journal of Political Science 37, 40-62.

Blöchliger, H., and Rabesona, J. (2009), The Fiscal Autonomy of Sub-Central Governments: An Update, OECD Working Paper 9, OECD Network on Fiscal Relations Across Levels of Government, Paris.

Bordignon, M., and Tabellini, G. (2009), Moderating Political Extremism: Single Round vs Runoff Elections under Plurality Rule, CESifo Working Paper 2600, CESifo Group, Munich.

Borge, L.E., and Rattsø, J. (2008), Property Taxation as Incentive for Cost Control: Empirical Evidence for Utility Services in Norway, European Economic Review 52(6), 1035-1054 .

Brunila, A., Buti, M., and Franco D. (2001), The Stability and Growth Pact, Palgrave Macmillan.

Charnes, A., Cooper, W., and Rhodes, E. (1978), Measuring the Efficiency of Decision Making Units, European Journal of Operational Research 2(6), 429-444.

Chattopadhyay, R., and Duflo, E. (2004), Women as Policy Makers: Evidence from a Randomized Policy Experiment in India, Econometrica 72(5), 1409-1443.

Coelli, T.J., Prasada Rao, D.S., O'Donnell, C.J., and Battese, G.E. (2005), An Introduction to Efficiency and Productivity Analysis, 2nd edition, Springer, New York.

Dal Bó, E., and Rossi, M. (2008), Term Length and Political Performance, NBER Working Paper 14511, Cambridge, MA.

De Borger, B., and Kerstens, K. (1996), Cost Efficiency of Belgian Local Governments: A Comparative Analysis of FDH, DEA, and Econometric Approaches", Regional Science and Urban Economics 26, 145-170.

De Borger, B., Kerstens, K., Moesen, W., and Vanneste, J. (1994), Explaining Differences in Productive Efficiency: An Application to Belgian Municipalities, Public Choice 80, 339-358.

De Haan, J., and Sturm, J.E. (1994), Political and Institutional Determinants of Fiscal Policy in the European Community, Public Choice 80, 157–172.

Edlund, L., and Pande, R. (2002), Why Have Women Become Left-Wing? The Political Gender and the Decline in Marriage, Quarterly Journal of Economics 117(3), 917-961.

Ermini, B., and Santolini, R. (2010), Local Expenditure Interaction in Italian Municipalities: Do Local Council Partnerships Make a Difference?, Local Government Studies 36(5), 655-677.

Eyraud, L., and Lusinyan, L. (2011), Decentralizing Spending More than Revenue: Does It Hurt Fiscal Performance?, IMF Working Paper 11/226, International Monetary Fund, Fiscal Affairs Department.

Fiva, J. (2006), New Evidence on the Effect of Fiscal Decentralization on the Size and Composition of Government Spending, FinanzArchiv/Public Finance Analysis 62(2), 250-280.

Fox, K.J. (2001), Efficiency in the Public Sector. Studies in Productivity and Efficiency, vol. 1, Kluwer Academic Publishers, Boston.

Funk, P., and Gathmann, C. (2008), Gender Gaps in Policy Making: Evidence from Direct Democracy in Switzerland, Universitat Pompeu Fabra, mimeo.

Galli, E., and Rossi, S. (2002), Political Budget Cycles: The Case of the Western German Länder", Public Choice 110, 283–303.

Giménez, V., and Prior, D. (2007), Long- and Short-Term Cost Efficiency Frontier Evaluation: Evidence from Spanish Local Governments, Fiscal Studies 28(1), 121-139.

Giuriato, L., and Gastaldi, F. (2009), The Domestic Stability Pact in Italy: A Rule for Discipline?, MPRA Paper 15183, Munich Personal RePEc Archive.

Glaeser, E. (1996), The Incentive Effects of Property Taxes on Local Governments, Public Choice 89, 93–111.

Inman, R.P. (2003), Transfers and Bailouts: Enforcing Local Fiscal Discipline with Lessons from U.S. Federalism, in: Rodden, J.A., and Eskeland, G.S. (Eds.), Fiscal Decentralization and the Challenge of Hard Budget Constraints, MIT Press, Cambridge, MA, 35–83.

Jin, J., and Zou, H. (2002), How Does Fiscal Decentralization Affect Aggregate, National, and Subnational Government Size?, Journal of Urban Economics 52, 270-293.

Kornai, J., Maskin, E., and Roland, G. (2003), Understanding the Soft Budget Constraint, Journal of Economic Literature 41(4), 1095-1136.

Lokkainen, H., and Susiluoto, I. (2004), Cost Efficiency of Finnish Municipalities 1994-2002. An Application of DEA and Tobit Methods, paper presented at the 44th Congress of the European Regional Science Association, Porto, Portugal.

Lott, J.R., and Kenny, L.W. (1999), Did Women's Suffrage Influences the Size and Scope of Government?, Journal of Political Economy 107, 1163-1198.

Mink, M., and De Haan, J. (2005), Has the Stability and Growth Pact Impeded Political Budget Cycles in the European Union?, CESifo Working Paper 1535, CESifo Group, Munich.

Oates, W.E. (1972), Fiscal Federalism, Harcourt Brace Jovanovich, New York, NY.

Oates, W. E. (1985), Searching for Leviathan: An Empirical Study, American Economic Review 75, 748-757.

Oates, W.E. (1999), An Essay on Fiscal Federalism, Journal of Economic Literature 37, 1120-1149.

Oates, W.E. (2005), Toward a Second-Generation Theory of Fiscal Federalism, International Tax and Public Finance 12, 349-373.

Osborne, M.J., and Slivinsky, A. (1996), A Model of Political Competition with Citizen-Candidates, Quarterly Journal of Economics 111, 65-96.

Prieto, A.M., and Zofio, J.L. (2001), Evaluating Effectiveness in Public Provision of Infrastructure and Equipment: The Case of Spanish Municipalities, Journal of Productivity Analysis 15, 41-58.

Reiter, M., and Weichenrieder, A. (1997), Are Public Goods Public? A Critical Survey of the Demand Estimates for Local Public Services, FinanzArchiv/Public Finance Analysis 54, 374-408.

Revelli, F. (2003), Reaction or Interaction? Spatial Process Identification in Multi-Tiered Government Structures, Journal of Urban Economics 53, 29–53.

Revelli, F. (2006), Spatial Interaction among Governments, in: Ahmad, E., and Brosio, G. (Eds.), Handbook in Fiscal Federalism, Edward Elgar, Cheltenham, UK.

Rodden, J. (2003), Reviving Leviathan: Fiscal Federalism and the Growth of Government, International Organization 57, 695-729.

Salmon, P. (1987), Decentralization as an Incentive Scheme, Oxford Review of Economic Policy 3, 24-43.

Simar, L., and Wilson, P.W. (2007), Estimation and Inference in Two Stage Semi-Parametric Models of Productive Efficiency, Journal of Econometrics 136, 31-64.

Smart, M., and Sturm, D. (2006), Term Limits and Electoral Accountability, CEP Discussion Paper 770, LSE.

Stegarescu, D. (2005), Public Sector Decentralization: Measurement Concepts and Recent International Trends, Fiscal Studies 26 (3), 301-333.

Tiebout, C. (1956), A Pure Theory of Local Expenditures, Journal of Political Economy 64(5), 416-424.

Vanden Eeckhaut, P., Tulkens, H., and Jamar., M.A. (1993), Cost Efficiency in Belgian Municipalities, in: Fried, H.O., Lovell, C.A.K., and Schmidt, S.S. (Eds.), The Measurement of Productive Efficiency. Techniques and Applications, Oxford University Press.

Veiga, L.G., and Veiga, F.J. (2007), Political Business Cycles at the Municipal Level, Public Choice 131, 45–64.

Weingast, B.R. (2009), Second Generation Fiscal Federalism: The Implication of Fiscal Incentives, Journal of Urban Economics 65, 279-293.

Table 1. ***Macro-functions of municipal current expenditure in the province of Turin***

CATEGORY OF PROVIDED SERVICES	AVERAGE SHARE
General administration	38.6%
Territorial and environmental management	21.9%
Educational services	12.5%
Social services	9.4%
Road maintenance and local mobility	7.5%
Local police	4.7%
Cultural services	2.4%
Economic development	1.2%
Sports and entertainment	1.0%
Tourism	0.4%
Support to productive activities	0.3%
Justice	0.1%

Table 2. ***Summary statistics for input and output indicators of SFA and DEA spending models***

VARIABLE DESCRIPTION	NAME	Mean	Std. Dev.	Min	Max
INPUTS					
Current expenditure (10^3 Euro)	*EXP*	1297	1284	95	6743
a) general administration	EXP_{GA}	604	509	88	2672
b) waste management	EXP_{WM}	278	348	11	2189
c) education and elderly care	EXP_{EE}	296	356	5	1927
d) road maintenance and local mobility	EXP_{RM}	119	106	7	595
OUTPUTS					
Population (nr. of served inhabitants)	*POP*	2657	2826	102	13,835
Total amount of waste collected (quintals)	*WASTE*	12,117	13,914	486	76,107
Total number of pupils and old people (pupils enrolled in nursery, primary and secondary school + over 75 inhabitants)	*DEPEND*	466	488	16	2449
Total length of municipal roads (km)	*ROAD*	33	28	3	240
CONTROL VARIABLES					
Municipal income per capita (10^3 Euro)	*INCOME*	18.39	1.48	13.90	26.40
Dummy for *less than 1000 inhabitants*	*POP-1000*	0.35	0.48	0	1
Dummy for *more than 10,000 inhabitants*	*POP-10,000*	0.04	0.19	0	1
Dummy for *altitude over 600 meters*	*OVER-600*	0.17	0.37	0	1

Table 3. ***Summary statistics for the determinants of spending inefficiency***

VARIABLE DESCRIPTION	NAME	Mean	Median	Std. Dev.	Min	Max	%
FISCAL INDICATORS							
Fiscal autonomy (% of revenues from local taxes on total current revenues)	*FISCAUT*	32	31	10	13	69	-
Local tax revenues per capita		154	150	34	77	448	
High taxes (municipalities with local tax revenues per capita over the median)	*HTAX*	-	-	-	0	1	50%
Fees and charges per capita		146	116	109	31	904	
High extra-taxes (municipalities with fees and charges per capita over the median)	*HEXTRA*	-	-	-	0	1	50%
Grants per capita		219	203	100	14	696	
High grants (municipalities with grants per capita over the median)	*HGRANT*	-	-	-	0	1	50%
Domestic Stability Pact (municipalities subject to the DSP fiscal rule)	*PACT*	-	-	-	0	1	15%
SPATIAL INDICATORS							
Distance of the municipality from Turin	*KMTO*	37.09	36.50	13.78	8	72	-
Population density (inhabitants per squared km)	*DENS*	2.04	1.35	2.11	0.06	15.80	-
POLITICAL INDICATORS							
Electoral mandate (number of post-election years for the governing coalition in 2005)	*YGOV*	1.40	1	1.03	0	4	-
Governing coalition with a civic list	*CIVIC*	-	-	-	0	1	56%
Centre-left-wing governing coalition	*LEFT*	-	-	-	0	1	23%
Mayor's gender (municipalities with a male mayor)	*MAYORSEX*	-	-	-	0	1	83%
Mayor's age (age of the mayor in 2005)	*MAYORAGE*	53	54	11	25	79	-
WASTE MANAGEMENT INDICATORS							
Public management	*PUBLIC*	-	-	-	0	1	77%
Public management by a firm	*PUBLIC×FIRM*	-	-	-	0	1	33%
Public management by a cooperative firm	*PUBLIC×FIRM×COOP*	-	-	-	0	1	27%

Table 4a. *Preliminary analysis of spending determinants: OLS estimates for each sector separately* [a]

Regressor	Dep. var. = EXP_{GA}		Dep. var. = EXP_{WM}		Dep. var. = EXP_{EE}		Dep. var. = EXP_{RM}	
	BASIC MODEL	EXTENDED MODEL	BASIC MODEL	EXTENDED MODEL	BASIC MODEL	EXTENDED MODEL	BASIC MODEL	EXTENDED MODEL
POP	0.820 (0.025) ***	0.837 (0.027) ***	-	-	-	-	-	-
WASTE	-	-	0.621 (0.089) ***	0.606 (0.088) ***	-	-	-	-
DEPEND	-	-	-	-	1.024 (0.041) ***	1.006 (0.043) ***	-	-
ROAD	-	-	-	-	-	-	0.294 (0.052) ***	0.336 (0.053) ***
INCOME	0.232 (0.146)	0.373 (0.179) **	0.852 (0.423) **	0.657 (0.476)	0.512 (0.302) *	0.278 (0.306)	1.576 (0.451) ***	1.073 (0.505) **
POP-1000	0.112 (0.045) **	0.119 (0.046) ***	-0.084 (0.114)	-0.071 (0.124)	-0.104 (0.072)	-0.100 (0.072)	0.741 (0.105) ***	0.674 (0.106) ***
POP-10,000	0.032 (0.044)	0.091 (0.047) **	0.292 (0.110) ***	0.308 (0.099) ***	0.191 (0.089) **	0.141 (0.071) **	0.559 (0.108) ***	0.402 (0.115) ***
ALT-600	0.113 (0.036) ***	0.067 (0.044)	0.223 (0.092) **	0.148 (0.108)	-0.066 (0.068)	0.031 (0.085)	0.146 (0.104)	0.398 (0.125) ***
FISCAUT	-0.368 (0.073) ***	-0.352 (0.082) ***	-0.154 (0.163)	-0.086 (0.172)	-0.237 (0.116) **	-0.205 (0.097) **	0.020 (0.200)	0.017 (0.207)
FISCAUT×HTAX	0.044 (0.005) ***	0.042 (0.005) ***	0.006 (0.014)	0.004 (0.015)	0.018 (0.010) *	0.017 (0.010) *	0.021 (0.016)	0.021 (0.016)
FISCAUT×HEXTRA	0.019 (0.005) ***	0.015 (0.005) ***	0.001 (0.015)	0.009 (0.016)	0.005 (0.008)	0.009 (0.008)	-0.030 (0.016) *	-0.027 (0.015) *
FISCAUT×HGRANT	0.006 (0.007)	0.006 (0.007)	-0.043 (0.037)	-0.039 (0.028)	-0.030 (0.012) **	-0.026 (0.012) **	-0.042 (0.021) **	-0.035 (0.022)
PACT	0.039 (0.040)	0.063 (0.054)	-0.405 (0.101) ***	-0.344 (0.132) ***	-0.014 (0.072)	-0.068 (0.090)	-0.429 (0.094) ***	-0.310 (0.119) ***
KMTO	-	0.047 (0.033)	-	0.201 (0.094) **	-	0.094 (0.054) *	-	0.067 (0.095)
DENS	-	-0.035 (0.020) *	-	0.002 (0.041)	-	0.059 (0.036) *	-	0.200 (0.060) ***
YGOV	-	0.010 (0.013)	-	-0.008 (0.026)	-	0.014 (0.024)	-	0.020 (0.040)
YGOV×PACT	-	0.920 (0.439) **	-	1.814 (0.909) **	-	1.441 (0.701) **	-	0.605 (1.086)
YGOV×PACT× FISCAUT	-	-0.205 (0.096) **	-	-0.396 (0.197) **	-	-0.312 (0.152) **	-	-0.124 (0.235)
CIVIC	-	-0.001 (0.030)	-	-0.009 (0.073)	-	0.032 (0.048)	-	-0.048 (0.074)
LEFT	-	0.020 (0.032)	-	-0.028 (0.086)	-	0.027 (0.052)	-	-0.225 (0.091) **
SEXMAYOR	-	-0.027 (0.026)	-	0.071 (0.060)	-	0.034 (0.058)	-	0.022 (0.083)
AGEMAYOR	-	0.031 (0.054)	-	-0.244 (0.163)	-	-0.134 (0.100)	-	-0.415 (0.161) ***
PUBLIC	-	-0.002 (0.025)	-	-0.163 (0.103)	-	-	-	-
PUBLIC×FIRM	-	0.073 (0.051)	-	0.259 (0.256)	-	-	-	-
PUBLIC×FIRM×COOP	-	-0.122 (0.052) **	-	-0.221 (0.055) ***	-	-	-	-
Nr. observations	262		262		262		262	
R^2	0.95	0.96	0.77	0.78	0.94	0.94	0.70	0.72
F test [p-value]	711.76 [0.000]	349.87 [0.000]	159.84 [0.000]	128.73 [0.000]	411.45 [0.000]	269.06 [0.000]	96.42 [0.000]	52.19 [0.000]

[a] All variables have been transformed in natural logarithm; robust standard errors are reported in round brackets; significance level: *** 1%, ** 5%, *10%.

Table 4b. ***Preliminary analysis of spending determinants: OLS estimates for the aggregated current expenditure*** [a]

Regressor	**Dep. var. = *EXP*** [b]	
	BASIC MODEL	EXTENDED MODEL
POP	0.669 (0.056) ***	0.655 (0.058) ***
WASTE	0.167 (0.039) ***	0.173 (0.039) ***
DEPEND	0.063 (0.032) **	0.068 (0.033) **
ROAD	0.024 (0.010) **	0.026 (0.010) **
INCOME	0.356 (0.101) ***	0.402 (0.115) ***
POP-1000	0.066 (0.026) **	0.065 (0.026) **
POP-10,000	0.078 (0.038) **	0.115 (0.029) ***
ALT-600	0.053 (0.022) **	0.046 (0.026) *
FISCAUT	-0.450 (0.042) ***	-0.429 (0.044) ***
FISCAUT×HTAX	0.041 (0.003) ***	0.039 (0.003) ***
FISCAUT×HEXTRA	0.012 (0.003) ***	0.011 (0.003) ***
FISCAUT×HGRANT	-0.006 (0.004)	-0.005 (0.004)
PACT	-0.025 (0.023)	-0.057 (0.031) *
KMTO	-	0.004 (0.019)
DENS	-	-0.010 (0.012)
YGOV	-	0.010 (0.008)
YGOV×PACT	-	1.039 (0.281) ***
YGOV×PACT× FISCAUT	-	-0.232 (0.061) ***
CIVIC	-	-0.013 (0.017)
LEFT	-	-0.017 (0.019)
SEXMAYOR	-	-0.003 (0.015)
AGEMAYOR	-	-0.026 (0.034)
PUBLIC	-	-0.010 (0.015)
PUBLIC×FIRM	-	0.023 (0.030)
PUBLIC×FIRM×COOP	-	-0.049 (0.020) **
Nr. Observations	262	
R^2	0.99	0.99
F test [p-value]	1845.57 [0.000]	1134.63 [0.000]

[a] All variables have been transformed in natural logarithm; robust standard errors are reported in round brackets; significance level: *** 1%, ** 5%, *10%.

[b] $EXP = (\boldsymbol{EXP_{GA}} + \boldsymbol{EXP_{WM}} + \boldsymbol{EXP_{EE}} + \boldsymbol{EXP_{RM}})$.

Table 5. *Analysis of spending inefficiency: summary statistics for SFA and DEA scores*

	SFA BASIC MODEL	SFA EXTENDED MODEL	DEA-VRS
Mean	0.26	0.24	0.20
Standard deviation	0.17	0.17	0.12
Min	0.02	0.01	0.00
25th percentile	0.12	0.10	0.12
Median	0.25	0.22	0.20
75th percentile	0.35	0.33	0.28
Max	0.93	0.94	0.52
Fully efficient municipalities	-	-	33

Figure 1. *Distribution of SFA and DEA average inefficiency by municipal size classes*

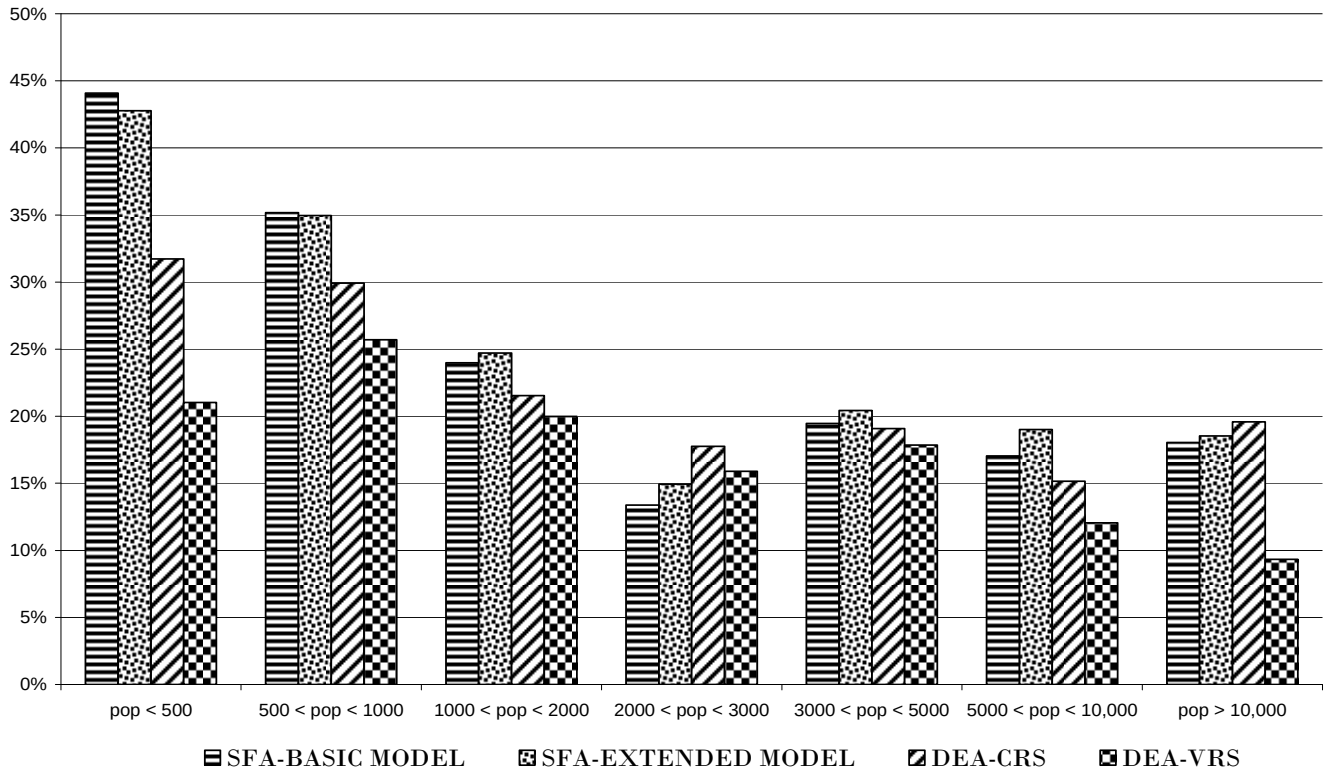

Table 6a. ***Analysis of spending inefficiency: SFA-BC95 parameter estimates*** [a]

Regressor	**Dep. var. = *EXP*** [b]	
	BASIC MODEL	EXTENDED MODEL
Frontier variables		
POP	0.697 (0.044) ***	0.697 (0.046) ***
WASTE	0.156 (0.027) ***	0.155 (0.026) ***
DEPEND	0.060 (0.029) **	0.059 (0.029) **
ROAD	0.023 (0.010) **	0.022 (0.010) **
INCOME	0.324 (0.098) ***	0.387 (0.102) ***
POP-1000	0.070 (0.023) ***	0.068 (0.022) ***
POP-10,000	0.077 (0.036) **	0.110 (0.034) ***
ALT-600	0.045 (0.020) **	0.036 (0.021) *
Wald test $_{(8)}$ [p-value]	8156.81 [0.000]	9338.74 [0.000]
Inefficiency determinants		
FISCAUT	-0.528 (0.054) ***	-0.529 (0.052) ***
FISCAUT×HTAX	0.052 (0.007) ***	0.053 (0.006) ***
FISCAUT×HEXTRA	0.015 (0.004) ***	0.014 (0.004) ***
FISCAUT×HGRANT	-0.002 (0.005)	-0.002 (0.005)
PACT	0.007 (0.032)	-0.047 (0.047)
KMTO	-	0.003 (0.024)
DENS	-	-0.014 (0.013)
YGOV	-	0.012 (0.007) *
YGOV×PACT	-	1.325 (0.527) ***
YGOV×PACT× FISCAUT	-	-0.296 (0.116) ***
CIVIC	-	-0.044 (0.020) **
LEFT	-	-0.050 (0.023) **
SEXMAYOR	-	-0.014 (0.019)
AGEMAYOR	-	-0.014 (0.035)
PUBLIC	-	-0.017 (0.018)
PUBLIC×FIRM	-	0.031 (0.033)
PUBLIC×FIRM×COOP	-	-0.066 (0.034) **
$\sigma^2 = (\sigma_u^2 + \sigma_v^2)$	0.010 (0.001) ***	0.009 (0.001) ***
$\gamma = [\sigma_u^2/(\sigma_u^2 + \sigma_v^2)]$	0.587 (0.190) ***	0.597 (0.174) ***
LR test $_{(r)}$ [p-value]	181.42 $_{(7)}$ [0.000]	205.93 $_{(19)}$ [0.000]

[a] Number of observations: 262; all variables have been transformed in natural logarithm; standard errors are reported in round brackets; significance level: *** 1%, ** 5%, *10%.

[b] $EXP = (\boldsymbol{EXP_{GA}} + \boldsymbol{EXP_{WM}} + \boldsymbol{EXP_{EE}} + \boldsymbol{EXP_{RM}})$.

Table 6b. ***Analysis of spending inefficiency: Tobit parameter estimates*** [a]

Regressor	**Dep. var. = *DEA-VRS scores*** [b]	
	BASIC MODEL	EXTENDED MODEL
FISCAUT	-0.272 (0.035) ***	-0.259 (0.038) ***
FISCAUT×HTAX	0.025 (0.003) ***	0.025 (0.004) ***
FISCAUT×HEXTRA	0.009 (0.003) ***	0.007 (0.003) **
FISCAUT×HGRANT	-0.006 (0.004)	-0.004 (0.004)
PACT	-0.062 (0.020) ***	-0.043 (0.021) **
KMTO	-	0.029 (0.024)
DENS	-	0.012 (0.011)
YGOV	-	0.007 (0.004) **
YGOV×PACT	-	1.599 (0.294) ***
YGOV×PACT× FISCAUT	-	-0.352 (0.065) ***
CIVIC	-	-0.021 (0.017)
LEFT	-	-0.027 (0.021)
SEXMAYOR	-	0.006 (0.017)
AGEMAYOR	-	-0.057 (0.028) **
PUBLIC	-	0.013 (0.016)
PUBLIC×FIRM	-	-0.022 (0.036)
PUBLIC×FIRM×COOP	-	-0.018 (0.008) **
F test [p-value]	28.73 [0.000]	12.92 [0.000]

[a] Number of observations: 262; all variables have been transformed in natural logarithm; robust standard errors are reported in round brackets; significance level: *** 1%, ** 5%, *10%.

[b] Inefficiency scores are computed using *EXP* as input variable and *POP*, *WASTE*, *DEPEND*, *ROAD*, and *INCOME* as output variables in a DEA-VRS frontier model.