ABSTRACT: Economic efficiency—understood in terms of jurisdictions providing a maximum amount of output for a given level of inputs—is one potential means to evaluate public policies. Various approaches, however, co-exist to measure the (technical) efficiency of organizations. Given that these rely on different underlying assumptions, it is important to assess whether, and to what extent, the approach taken affects the outcome of efficiency studies. This paper employs a data set of local governments in Flanders in 2000 to compare the three common approaches to measure (in)efficiency (i.e., free disposal hull, data envelopment analysis, and econometric techniques). Our results indicate that the methodological choices of instrumentation have a substantial effect on analytic performance measurement. Hence, assessing the robustness of the results across various approaches to efficiency measurement is crucial to avoid incorrect inferences.

KEYWORDS: data envelopment analysis, Flemish municipalities, free disposal hull, government (in)efficiency, stochastic frontiers

In many countries, a further decentralization of tasks from higher-level governments to the municipal level is contemplated. While smaller jurisdictions with more homogeneous populations may be better suited to match the provision of public goods with the preferences of their constituents (cf. Mill, 1861; Musgrave, 1959; Oates, 1972, 1999; Tullock, 1969), an exceedingly small scale of operation may be economically unviable. That is, lower-level (and therefore smaller) jurisdictions may lack a sufficient fiscal base, be unable to exploit economies of scale, or lack adequate managerial competencies and experience among their staff. The increased international attention for further decentralization—both in fiscal terms...
as in the allocation of tasks—thus raises the question whether local jurisdictions can (or do) adequately execute the tasks bestowed on them.

One way to evaluate public policies is by analyzing whether (local) governments use their resources in an economically efficient manner. Economic efficiency—understood in terms of jurisdictions providing a maximum amount of output for a given level of inputs (i.e., minimizing waste or friction; e.g., Koopmans, 1951; Lovell, 1993)—is obviously only one among many public concerns (besides effectiveness, equity, responsiveness, adequateness, appropriateness, and so on; Dunn, 2004, pp. 223–231). Our focus on it should not be taken to mean that it is more important than the remaining concerns or that policy decisions are not taken within a given political and institutional environment (which affects policy outcomes). Nevertheless, administrative decisions about strategy and tactics and the evaluation of public policy often include measures of efficiency (besides the other previously mentioned criteria; Dunn, 2004, p. 358), and it is therefore crucial to understand the tools employed to measure it. Moreover, economic efficiency refers to a central (potential) benefit of decentralization. In fact, when local governments are lacking in economic efficiency, the economic benefits from a further decentralization of tasks are likely to be limited. There is little to gain by shifting tasks to inefficient levels of government.

Numerous studies have previously taken up the issue of local government efficiency (see De Borger & Kerstens, 2000, for a review). Most of these studies, however, concentrate on efficiency in particular areas of public good provision (e.g., waste collection, police services, road maintenance, and so on; see, e.g., De Borger & Kerstens, 2000; Kalseth & Rattsø, 1998). Although such analyses are of interest in their own right, they do not allow an assessment of the overall performance of governments. Nonetheless, general performance assessments are crucial to most adequately review the potential (economic) benefits of government decentralization. Moreover, most previous work focuses on one methodological approach to efficiency measurement (i.e. free disposal hull [FDH], data envelopment analysis [DEA], or a stochastic approach). Still, when the results of efficiency analyses are affected by the approach taken, a multiple-design approach might be crucial to avoid erroneous inferences (see, e.g., Balcombe, Fraser, & Kim, 2006; Bauer, Berger, Ferrier, & Humphrey, 1998; Cummins & Zi, 1998; De Borger & Kerstens, 1996; Matthijs & Swinnen, 2001; von Hirschhausen, Cullmann, & Kappeler, 2006).

This analysis addresses both these caveats. We assess overall local government performance in the Flemish municipalities in 2000. Moreover, and arguably more important, we provide a comparison of three different approaches to efficiency measurement (i.e., FDH, DEA, and stochastic). As such, we assess whether the conclusions drawn from efficiency analyses are robust to the technology employed. Our main findings indicate that (a) there is some definite scope for improvements in the technical efficiency of Flemish local governments (a common finding under
all three methodological approaches) and (b) the level and variation in inefficiency is affected by the approach taken. The latter finding should induce due caution in the interpretation of results from studies relying on one single approach (and indicates that such studies should be used very carefully in administrative decisions about strategy and tactics).

**Approaches to Measure (Government) Efficiency**

Economic efficiency, as mentioned, can be defined as jurisdictions providing a maximum amount of output for a given level of inputs (or requiring a minimum level of inputs for a given output). Most fundamentally, this implies that when Jurisdiction X can transform A units of input into B units of output, other jurisdictions should be able to achieve the same outcome (if they operate equally efficiently). From this perspective, efficiency measurement appears straightforward at first sight. One first determines which combinations of inputs and outputs designate optimal or efficient behavior. Then, in a second step, each jurisdiction is compared with the best-performing jurisdictions to determine the level of (in)efficiency. Applying these two steps in a real-world setting is, however, replete with difficulties. One set of problems concerns the choice of inputs and outputs (Lovell, 1993). Obviously, this choice is not value neutral and depends on what is deemed important by both the subject(s) of and those responsible for the efficiency study. This is of central concern because the results of efficiency analyses depend very much on these input/output choices, implying they should be adequately defended. A second set of problems is more methodological. How do we determine which input–output combinations are optimal or efficient (known as the *best-practice frontier*)? Is any deviation from the best-practice frontier inefficiency (and if so, how much?) or to be interpreted as, say, measurement error?

While the value-laden input/output decisions are hard to resolve a priori (and will not be explicitly tackled herein), a number of different approaches have been proposed in the literature to address the methodological problems brought forward (for an excellent introduction, see Lovell, 1993). DEA is one of the earliest approaches to efficiency measurement, a nonparametric method proposed by Farrell (1957). Under DEA, jurisdictions are designated as efficient when they outperform not only all other jurisdictions in the sample, but also all possible linear combinations of all other jurisdictions (even when the resulting input/output combinations do not occur in reality and are in some sense virtual jurisdictions). Hence, each jurisdiction is compared to all possible real and virtual opponents and deemed efficient only when it obtains a better overall performance (i.e., a higher aggregate index value) than all these opponents. A jurisdiction that is outperformed for at least one conceivable weighting scheme is DEA-dominated or inefficient (Cherchye & Vermeulen, 2006; Melyn & Moesen, 1991). The idea
behind this approach is that dominated jurisdictions should, given the observed performance of all other jurisdictions in the sample, be able to perform better in at least one dimension (either reduce inputs or boost outputs). This is not the case for nondominated observations, which are thus deemed efficient.3

The efficient jurisdictions then form the central elements of the best practice frontier (the exact shape of which depends on specific assumptions made; see following discussion). To determine the relative (in)efficiency of nonefficient jurisdictions, their input/output combinations are projected onto this frontier. One thereby weighs the input/output combinations of the jurisdictions that directly dominate the inefficient jurisdiction in such a way as to minimize the estimated inefficiency of the inefficient observation (thus applying, in a sense, benefit-of-the-doubt weights; see Melyn & Moesen, 1991). More technically, DEA works through solving a linear programming problem of the following form:

\[
\text{Min} \quad \lambda_k \in [0, \infty)
\]

subject to:

\[
\lambda_k C_k - \sum_{j=1}^{n} z_j C_j \geq 0
\]

\[
\sum_{j=1}^{n} z_j y_{jr} \geq y_{kr} \quad \text{with } r = 1, \ldots, s
\]

\[
\lambda_k, z_j \geq 0 \quad \text{for } j = 1, \ldots, n,
\]

where \( C_k \) and \( C_j \) represent total input by Organizations k and j, respectively, \( y_{kr} \) and \( y_{jr} \) denote the output level for Organizations k and j with respect to output r, s equals the number of outputs taken into account, and n is the number of organizations under study. Finally, \( z_j \) are weights given to the organizations with which Organization k is compared in the determination of its (in)efficiency. In equilibrium, the value of the objective function, \( \lambda_k \), represents how efficient Organization k employs its inputs (\( C_k \)) in the production of its outputs (\( r = 1, \ldots, s \)). Note that the formulation in equation (1) imposes constant returns to scale, leading the best practice frontier to be a straight line from the origin touching the input-output combination of the most efficient organization(s) (hence, we label the result DEA-crs; see Figure 1). However, constant returns to scale imply that jurisdictions can linearly scale input and outputs without affecting the level of efficiency. Such an assumption may be valid over limited ranges of production but is unlikely to be justifiable in general. Assuming constant returns to scale may thus be overly restrictive. Hence, some scholars have allowed for variable returns to scale by adding one additional constraint (i.e., \( \sum_{j=1}^{n} z_j = 0 \)) to equation (1). This is labeled as DEA-vrs below (see Figure 1).4

Another important characteristic of the linear programming problem in equation (1) is that the best-practice frontier is assumed to be strictly convex. Still, there are “no valid theoretical arguments for assuming a priori that pro-
duction possibilities are truly convex” (Cherchye, Kuosmanen, & Post, 2000, pp. 263–264), and some empirical studies suggest violations of the convexity hypothesis (e.g., Hasenkamp, 1976). Hence, this assumption was relaxed in later work by De Prins, Simar, and Tulkens (1984) and Tulkens (1993).

By imposing two additional restrictions on equation (1) (i.e., \( \lambda_j \geq 0 \) and \( z_j \in \{0, 1\} \)), their FDH method yields a frontier with a staircase shape in the input–output space (see Figure 1). The basic idea in terms of determining efficient and inefficient observations is, however, the same as under DEA (see previous discussion).

Important, both nonparametric approaches (DEA and FDH) share the common feature that all deviations from the frontier are designated as inefficiency. This has two important implications. First, because the different restrictions posed on the problem in equation (1) influence the shape of the efficiency frontier (and thereby how closely it envelops the data), they also directly affect the efficiency estimates retained from the analysis. Although this mitigates the value of the retained (in)equality estimates, it has a lower bearing on the relative performance of the assessed jurisdictions (which is the most important information from these types of analyses). Second, and more problematic, it entails that deviations from the best-practice frontier that are due to measurement errors or other stochastic influences are also identified as inefficiency (which is inappropriate).

Stochastic parametric approaches to efficiency measurement, developed by Aigner, Lovell, and Schmidt (1977) and Meeusen and van den Broeck (1977), can
avoid the latter problem by allowing the researcher to distinguish between measurement error and inefficiency. With the risk of oversimplifying this methodological approach, one might describe the basic idea as the estimation of a production (or cost) function upon which “inefficiency is identified with [the] disturbances in [this] regression model” (Greene, 1993, p. 68). The disturbance term (i.e., the realized deviations from the estimated frontier isoquant) is, however, (nontrivially) separated into random white noise and inefficiency. More technically, an appropriate formulation of a standard, general production function would be—in translogarithmic form following Christensen, Jorgenson, and Lawrence (1973) and dropping municipality subscripts for convenience—

$$\ln C = \alpha + \sum_{r=1}^{s} \beta_r \ln y_r + \frac{1}{2} \sum_{r=1}^{s} \sum_{q=1}^{s} \lambda_{rq} \ln y_r \ln y_q + v + u = \varepsilon,$$  \hspace{1cm} (2)

where, as before, $C$ designates the input indicator, $y$ indicates the various output indicators, $s$ points to the number of outputs in the model, and $\beta_r$ and $\lambda_{rq}$ are parameters to be estimated. Crucially, the error term $\varepsilon$ is composed of two parts (assumed to be independent) and thereby allows distinguishing between measurement error and inefficiency. More specifically, it consists of a symmetric component ($u$, assumed to be white noise) and a one-sided nonnegative component representing inefficiency ($v$ generally assumed half-normally distributed although similar findings result from assuming a truncated normal distribution; cf. De Borger & Kerstens, 1996; Méon & Weill, 2005). Whereas estimation of equation (2) generates estimates of the composed error term $\varepsilon$, the conditional distribution of $v_i$ given $(u_i + v_i)$ contains all available information about $v_i$ for any organization $i$ (Bauer, 1983; Jondrow et al., 1982). Either the mean or the mode of this conditional distribution can then be used as a point estimate of $v_i$; that is, $E(v_i | u_i + v_i)$ or $M(v_i | u_i + v_i)$, respectively. In the following discussion, we use the mean of this conditional distribution (denoted SF-Mean) to designate cost inefficiencies. Hence, SF-Mean indicates to what extent inputs can be reduced without reducing current output levels (although, for ease of comparison with the nonparametric approaches, we invert this index to obtain efficiency rather than inefficiency ratings).

**Local Governments in Belgium: Institutional Context**

As in most west European countries, Belgian municipalities have traditionally had important responsibilities with respect to education, housing, health care, social welfare, recreation, infrastructure, and the environment (including refuse collection; John, 2001, p. 36). While local governments have significant authority in executing these particular tasks, their description and aims are laid down in federal and regional legislation (e.g., the Municipal Law or Gemeentewet). Hence, although Article 162 of the Belgian Constitution explicitly states that municipali-
ties can take any initiative to the benefit of their inhabitants and in the communal interest, they are by no means free to do as they please. In fact, the same article of the constitution also asserts that municipalities are subject to intervention from higher-level governments to prevent violations of the law or harm to (broader) public interest. This places Belgium firmly in a Napoleonic tradition where the central (and, in the case of Belgium, regional) government wields significant power (John, 2001, pp. 34–39; Moesen, 2005).

More recently, increased discussions have taken place in Belgium on a further decentralization of tasks from higher level governments to the municipal level (Moesen, 2005). This discussion first appeared in 1988–89 when a significant amount of resources and responsibilities—in total amounting to about one-third of state spending—was redistributed from the federal to the regional level (Gérard, 2001). The idea that about 25 percent of these resources and responsibilities could immediately be further decentralized toward the local level was at that point, however, disregarded (Moesen, 2005). Nevertheless, this localization discussion revived at the onset of the new millennium, when the Flemish regional government launched a core assignments debate (kerntakendebat) aimed at a thorough discussion concerning the redistribution of tasks and resources across the regional, provincial, and municipal governments. Thus far, however, the process remains very much top–down (i.e., the regional government decides which tasks divestiture toward the municipalities can be discussed) rather than bottom–up (i.e., the municipalities demanding more autonomy; Moesen, 2005).

This institutional setting is important because it has been frequently argued that decisions made by those at the top involve choices among values or goals, whereas decisions lower in the organization or delivery system are largely devoid of such value content (see March & Simon, 1958; Simon, 1957). Hence, in systems that have traditionally been driven by the central government (such as Belgium), the work of local governments has much larger factual (or means-focused) than value (or ends-focused) content. Local government work in Belgium thus can be best described as do-or-die and has traditionally been somewhat devoid of value choices. This is very different from, for example, the United States, where municipalities have much more political weight and independence (and the value component of local policy decisions is much larger). This generates a situation that is particularly conducive to efficiency measurements (as the value content or neutrality of the inputs and outputs then becomes less of an issue).

Empirical Analysis

In this section, we apply the procedures discussed in the previous section (FDH, DEA-crs, DEA-vrs, and SF-Mean) to data from 304 of the 308 Flemish municipal governments in 2000 (data availability precluding the inclusion of the remaining
four municipalities). As input variable \( (C) \), we use total current expenditures in each municipality. The level of local public goods provision is gauged through five output variables (see De Borger & Kerstens, 1996; De Borger et al., 1994; Vanden Eeckaut, Tulkens, & Jamar, 1993): (a) the number of subsistence grants beneficiaries, (b) the number of students in local primary schools, (c) the surface of public recreational facilities (in hectare), (d) the total length of municipal roads (in km), and (e) the share of municipal waste picked up through door-to-door collections. These measures relate to important responsibilities of Flemish local governments with respect to social, educational, recreational, infrastructure, and environmental services. More specifically, the number of subsistence grants beneficiaries and primary school students proxy the extent of social welfare and educational service provision. The surface of public recreational facilities indicates the provision of recreational, leisure services. The length of municipal roads proxies the provision of local infrastructure goods, and the share of waste collected indicates public environmental and ecological services. Clearly, none of these variables is a direct output measure, and they should best be seen as crude proxies for the level of public goods provision (De Borger et al., 1994; De Borger & Kerstens, 1996). Therefore, as in previous work on local government efficiency, “the outputs used are rather loosely related to the services delivered by municipal governments” (De Borger & Kerstens, 1996, pp. 153–154). This, regrettably, reflects the general problem with defining and measuring public sector outputs (cf. De Borger & Kerstens, 1996; Levitt & Joyce, 1987). The results are summarized in Table 1.

As can be seen in Table 1, there appears to be scope for improvements in the performance of municipal governments (in terms of their economically efficient

### Table 1. Technical Efficiency in Flemish Municipalities \((N = 304)\)

<table>
<thead>
<tr>
<th></th>
<th>DEA-crs (1)</th>
<th>DEA-vrs (2)</th>
<th>Scale = ((1)/(2))</th>
<th>FDH</th>
<th>SF-Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average (all)</td>
<td>49.57</td>
<td>64.32</td>
<td>79.82</td>
<td>95.04</td>
<td>85.76</td>
</tr>
<tr>
<td>Average (inefficient)</td>
<td>47.74</td>
<td>58.19</td>
<td>78.14</td>
<td>77.81</td>
<td>85.76</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>14.06</td>
<td>20.06</td>
<td>15.61</td>
<td>11.58</td>
<td>5.24</td>
</tr>
<tr>
<td>Minimum</td>
<td>17.98</td>
<td>24.51</td>
<td>34.80</td>
<td>28.81</td>
<td>57.18</td>
</tr>
<tr>
<td>Maximum</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>95.52</td>
</tr>
<tr>
<td>No. inefficient</td>
<td>297</td>
<td>265</td>
<td>295</td>
<td>82</td>
<td>304</td>
</tr>
<tr>
<td>No. efficient</td>
<td>7</td>
<td>39</td>
<td>9</td>
<td>222</td>
<td>0</td>
</tr>
<tr>
<td>of which efficient by default(^a)</td>
<td>0</td>
<td>6</td>
<td>—</td>
<td>154</td>
<td>—</td>
</tr>
</tbody>
</table>

\(^a\)Municipalities are efficient by default when they are not dominated by another municipality, but also do not dominate any other municipality.

Note: DEA = data envelopment analysis. FDH = free disposal hull.
use of inputs in the production of public goods). This is by and large in line with all previous studies on local government performance, both those regarding overall performance (as here) and those concentrating on one particular service (see De Borger & Kerstens, 2000). Still, given the data problem mentioned previously, interpreting the levels of (in)efficiency mentioned in Table 1 should be done with proper care, and we therefore not dwell on these findings here.

Regarding our central research question, it can be easily seen that the efficiency ratings from the three nonparametric approaches (FDH, DEA-crS, and DEA-vrs) clearly depend on the assumptions made with respect to the shape of the best practice frontier (or, in other words, on the restrictions placed on the linear programming problem in equation 1). For example, measuring efficiency without scale efficiency effects (i.e., imposing variable rather than constant returns to scale in the DEA approach) leads to significantly higher estimated efficiency ratings. In fact, the difference between the average value under DEA-vrs and DEA-crS is statistically significant ($t = 4.39, p < 0.01$). Also, when we drop the convexity assumption (i.e., move from DEA to FDH), the estimated efficiency scores become even higher (as expected because the best practice frontier then wraps itself closer around the data). Difference-in-means $t$-tests indicate that these differences between FDH and DEA-crS and DEA-vrs are statistically significant beyond the 1 percent level ($t = 15.63$ and $t = 9.51$, respectively). However, 154 of the 222 municipalities designated as efficient under FDH are efficient by default (i.e., these municipalities are not dominated by another municipality but also fail to dominate any other). Hence, their efficiency status lacks substantive meaning (e.g., De Borger et al., 1992), and one might state that they figure as “soldiers in no-man’s land.” Moving from the nonparametric approaches to the parametric one, such soldiers in no-man’s land disappear. Just as among the nonparametric approaches, however, the estimated inefficiency is likewise found to differ significantly between the nonparametric approaches and the parametric one. Indeed, the average inefficiency level under SF-Mean is substantially smaller than under the DEA approach ($t = 14.34$ and $t = 7.42$ when comparing SF-Mean to DEA-crS and DEA-vrs, respectively) but larger than under FDH ($t = 3.94$). Similar results have been found by, among others, De Borger and Kerstens (1996) and Balcombe, Fraser, & Kim (2006).

Before we conclude that the various approaches lead to different results, it is important to remember that arguably the most important information to be taken from these types of studies is the relative performance of municipalities. In fact, it is well known that the absolute efficiency levels derived from the analysis are specific to the sample used and assumptions made (cf. supra). Hence, it may be more important to compare the various approaches in terms of the ordering of municipalities from more to less efficient. To the extent that such a relative performance assessment leads to the same results across approaches, we are able
to clearly distinguish which municipalities consistently do better than others. To assess this relative ordering across municipalities, we calculate the interrelation between the results from all four measures presented. The resulting correlation matrix is presented in Table 2.

Table 2 clearly shows that the outcomes using the various approaches are, in general, relatively strongly positively correlated. This indicates that—although there are differences in the exact level of efficiency depending on the approach used (see Table 1)—the efficiency ratings from various approaches tend to support similar conclusions as to the municipalities’ relative performance (cf. Balcombe et al., 2006; Cummins & Zi, 1998; De Borger & Kerstens, 1996; von Hirschhausen et al., 2006). This is reassuring given that all measures discussed in this analysis are essentially relative rather than absolute performance measures (calculating inefficiency relative to the data-specific best practice frontier rather than to some a priori exogenous determination of efficiency). Nonetheless, the largest value in Table 2 is 0.70. Hence, significant variation remains even in the relative performance of municipalities across the various efficiency approaches. This should lead future researchers to check carefully whether the results employing their preferred efficiency measure(s) are robust against using alternative approaches.

### Conclusion and Discussion

Shifting the provision of public goods to regional or local levels of government may be—at least theoretically—intrinsically desirable for certain types of public services (cf. Mill, 1861; Musgrave 1959; Oates 1972, 1999; Tullock, 1969). It, however, engenders the question whether local governments are capable of adequately and accurately executing the tasks bestowed on them. One of the means to evaluate this question is by looking at the economic efficiency of local governments. Indeed, one can question the benefits of a further decentralization of tasks to local governments when local governments are incapable of adequately executing their current tasks (unless, obviously, higher-level governments are found to be even less efficient than local ones). Nevertheless, for an evaluation of local governments’ economic efficiency to be of practical value, we need to understand the tools through which such an assessment is made in practice. This is not a trivial question, as the assessment of economic (or technical) efficiency is not straightforward, and various approaches
to measure it have been brought forward in the literature. These, however, build on different underlying assumptions to calculate efficiency. To the extent that these approaches lead to similar results, we can rest assured that the results are robust to differences in these underlying assumptions. If not, we need to be careful in interpreting the results from studies using one particular approach.

In this paper, we address this (methodological) question by employing a number of parametric and nonparametric approaches to estimate the level of local government technical (in)efficiency in Flanders in 2000. The results allow for two main conclusions. First, all approaches indicate at least some scope for improvement in the efficiency of Flemish municipalities. One may therefore question their ability and willingness to perform efficiently the tasks allocated to them and, in the same breath, the oft-cited rational to decentralize further public goods provision toward local levels of government. Second, and more crucial to our central research question, comparing the outcomes of the various approaches to efficiency measurement indicates that the point estimates for (in)efficiency can vary widely depending on the specific approach used. Nonetheless, the results are generally relatively strongly correlated such that they tend to support similar conclusions as to the municipalities’ relative performance. Because all approaches included in this study essentially are relative rather than absolute performance measures, this is reassuring.

Finally, however, a word of caution is in order. The results of efficiency measurements such as those presented in this work crucially depend on the availability of adequate, timely, and accurate data. Data availability (or, rather, lack thereof) made it impossible to include measures for all—or even most—local government outputs, to account for possible quality and input price variations and to extend the analysis over multiple years. Hence, our results should not be taken as an ultimate end. Rather, the data limitations confronting the present analysis should be regarded as a point of debate in the discussion on (local) government performance measurement (cf. Moore, Nolan, & Segal, 2005). Without adequate information about the level and quality of public goods provisions, an assessment of whether the value for money of public good provision is satisfactory is problematic. Such assessments at different levels of government, however, are crucial as a means to assess part of the potential benefits of (further) fiscal decentralization.

Notes


2. All proposed methods achieve relative rather than absolute efficiency measures in the sense that they do not build on some absolute definition of efficiency but, rather, determine the
best practice based on the decision-making units at hand (the only option in real-world applications; see also Hauner, 2005; Staat, 2006).

3. To give a simple numerical example, assume three jurisdictions (A, B, and C). Although these, for simplicity, use a given amount of inputs, they differ in the quantity of two outputs X and Y they produce (A, B, and C produce 50, 25, and 7 units of X and 2, 10, and 35 units of Y, respectively). Hence, although A is most efficient in producing output X (given the input constraint), C plays this role for output Y. Moreover, as one cannot construct a linear combination of the remaining two jurisdictions that outperforms (or dominates) A or C, both are termed efficient. Jurisdiction B is dominated by at least one other jurisdiction in both output dimensions, and one can construct a linear combination of A and C that outperforms B (e.g., 50 percent A and 50 percent C would produce 26 X and 21 Y). Hence, B is inefficient.

4. This additional constraint generates an efficiency measure without scale efficiency effects such that the comparison of DEA-crs and DEA-vrs gives an indication of the presence of scale effects (e.g., von Hirschhausen, Cullmann, & Kappeler, 2006; Worthington, 2000; Wu, Devadoss, & Lu, 2003).

5. We are grateful to two anonymous referees for pointing this out to us.

6. One might argue that taking total expenditures is inappropriate if not all dimensions of public goods provision are taken up into the efficiency calculation. Therefore, we re-estimate the efficiency ratings using only spending on those issues for which we observe government outputs (see following discussion). The correlation between both sets of efficiency ratings is very high (r = 0.72) and they lead to the same qualitative conclusions. We are grateful to Holger Sieg for pointing this out to us (results available on request).

7. Unfortunately, information on variation in output quality and input prices was not available. Panel data could admittedly help in resolving some of the problems related to these measurement issues. However, time series data were not available for several of our output variables such that this could not be addressed in this analysis.

8. Also, the level of (in)efficiency observed using these methods is affected by the choice of inputs and outputs. Whereas this choice in this analysis has been determined by data availability and previous scientific analyses, this choice should in real-world applications be carefully defended. The reason is that the resulting efficiency estimates and judgments might otherwise benefit those whose values and interests have been most influential in the choice of input and output variables.

9. Note that this also indicates that a significant part of the observed inefficiency (i.e., roughly 20 percent) derives from production at an inefficient scale (although it does not indicate whether the scale of production is too small or too large on average). A similar effect is observed for data on New South Wales by Worthington and Dollery (2002), for Spanish municipalities by Balaguér-Coll, Prior-Jimenez, and Vela-Bargues (2002), and for U.S. cities by Moore, Nolan, & Sagal (2005). Still, disregarding scale effects, excessive use of resources still occurred (as can be seen in column 2 of Table 1).

10. The inefficiency of the inefficient municipalities is, however, larger under Fdh than SF-Mean.

11. Obviously, the correlations between Fdh and the other approaches are lower due to the large number of observations that are efficient by default under the Fdh-method.

12. On a more positive note, one might argue that at least part of the fiscal problems faced by local governments in Flanders these days can be confronted by making more efficient use of available resources. Given the inherent unpopularity of tax increases (Niskanen, 1979; Vermeir & Heyndels, 2006), this might be seen by local politicians as a viable—and electorally more rewarding (or, at least, less intricate)—alternative.

References


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