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Local Government Efficiency in German Municipalities

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Abstract

This article evaluates German local governments' cost efficiency using a sample of 1021 municipalities in the state of Baden-Württemberg for the year 2001. We thereby concentrate on overall or 'global' efficiency scores – rather than estimate efficiency for one particular service – and explicitly account for exogenous or non-discretionary influences. The latter not only corrects for influences possibly beyond the control of local policy-makers, but also allows some indication with respect to the determinants of such 'global' efficiency. Our results indicate that there is a substantial divergence in efficiency across municipalities despite a homogeneous institutional setting. As especially smaller municipalities appears less efficient, these results support a case for policy programs aimed at boundary reviews or more extensive inter-communal cooperation among small municipalities.

Keywords: Local government performance; Stochastic frontier analysis; German municipalities.

JEL-codes: H40

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Lokale Staatliche Effizienz in deutschen Kommunen

Dieser Beitrag evaluiert die lokale staatliche Kosteneffizienz auf der Basis der Datengrundlage von 1021 Kommunen im Bundesland Baden-Württemberg im Jahr 2001. Dabei konzentrieren wir uns auf die Ermittlung von „globalen“ Effizienzindikatoren anstelle der Effizienzanalyse bestimmter öffentlicher Dienstleistungen und berücksichtigen explizit exogene Umfeldbedingungen. Letzteres berücksichtigt den Einfluss von Faktoren, die sich der Kontrolle der lokalen politischen Akteure entziehen und macht Einblicke in die Determinanten der „globalen“ Effizienz möglich. Unsere Ergebnisse deuten darauf hin, dass es trotz eines homogenen institutionellen Umfelds eine erhebliche Divergenz der Effizienz zwischen den Kommunen gibt. Weil besonders kleinere Kommunen als weniger effizient erscheinen, unterstützen diese Ergebnisse politische Bemühungen zur Überprüfung des räumlichen Zuschnitts von Gemeinden oder einen Ausbau der interkommunalen Kooperation unter den kleinen Kommunen.

Keywords: Lokale staatliche Leistung, Stochastic frontier analysis, deutsche Kommunen.

1. Introduction

A substantial literature on vote and popularity functions illustrates that voters tend to be fiscal conservatives, and generally dislike paying taxes. Indeed, there is a significant political cost of taxation in the sense that it reduces politicians' popularity or re-election odds (e.g., Niskanen, 1975; Peltzman, 1992; Vermeir and Heyndels, 2006; Geys and Vermeir, 2008a, b; Geys, 2010). Yet, the public goods provided as a result of tax revenues are commonly appreciated. Both elements taken together – i.e., reluctance to pay taxes, but appreciation of public good provision – suggest that voters are likely to care strongly about a cost-efficient provision of public goods. This is nothing new. Nevertheless, despite this wide-ranging interest in efficient governments, studies measuring the efficiency of the public sector have thus far mainly focused on efficiency in particular areas of public good provision such as waste collection, police services, child care, road maintenance, public libraries and so on (for reviews, see De Borger and Kerstens, 2000, and Worthington and Dollery, 2000; recent contributions include Bönisch, 2011; De Witte and Geys, 2011; Monten and Thater, 2011). One obvious reason for this is that 'composite' or 'global' efficiency measurements are more difficult to implement (e.g., because appropriate indicators for the quantity and quality of public outputs are hard to define at such general level). Even so, they are of considerable importance as single-policy analyses may provide a biased indication of governments' overall efficiency (i.e., a government efficiently providing, say, education services need not be equally efficient in a range of other tasks).

In this article, we evaluate German local government efficiency from a general perspective for all municipalities in one state (i.e., Baden-Württemberg) in one year (i.e., 2001) using a stochastic parametric frontier approach. While we are not the first to analyze overall local government efficiency (for an excellent review of early contributions, see De Borger and Kerstens, 2000; more recent articles include Sampaio De Sousa and Stosic, 2005; Hindriks and Gerard, 2005; Geys, 2006; Balaguer-Coll et al., 2007; Borge et al., 2008; Geys and Moesen, 2009a, b), our central innovation lies in providing one of the first global efficiency assessments for German local governments. While Kalb et al. (2012) provide another recent contribution in this direction, their contribution is very descriptive and focuses exclusively on an international comparative perspective. In comparison, our aim here is more prescriptive in the sense that our efficiency estimation is employed as a tool (rather than constitutes the outcome aimed at) to make inferences about public policies towards local public finances and municipal restructuring (by linking them to recent work on the effect of demographic change on local public finances; e.g., Geys et al., 2008). While future cross-checks for further

German states are desirable, the paper's focus on the municipalities of one single state has the advantage of a common institutional environment. German states differ, for example, with respect to the municipal duties of service provision, which are, to a considerable extent, defined by state law. Also, the states' grant systems, which partially finance the municipal level and which set incentives for service provision, differ considerably in their generosity and construction. Thus, concentration on one German state eliminates distortions from these types of heterogeneity and still offers considerable variation of municipal characteristics and a sufficiently large number of observations (see below).

Our main results show that, on average, municipalities in Baden-Württemberg produce their output with costs approximately 12% to 14% higher than the most efficient municipalities in the sample. Small municipalities appear particularly inefficient. While this leaves some leeway for improvements in efficiency without resorting to politically costly tax increases to close unbalanced budgets, it suggests that future population decline might put severe strain on some local governments (see also Geys *et al*., 2008). We also find that efficiency estimates are substantially affected by population density and the political fragmentation of local governments – supporting the importance of controlling for environmental characteristics in the measurement of local government efficiency.

The remainder of the paper is structured as follows. Section 2 introduces the institutional setting of the German local governments and thereby clarifies the context of local public decision-making. Section 3 introduces the concept and measurement of government efficiency and presents the results from an assessment of the German municipalities in the year 2001. Conclusions are drawn in section 4.

2. German local institutional setting

Baden-Württemberg consists of 1111 municipalities ranging in size from 98 inhabitants in the smallest municipality (Böllen) to almost 600,000 inhabitants in the largest one (Stuttgart). The institutional setting is the same in all these municipalities (such that our analysis will be unaffected by the institutional design of government). That is, municipal political institutions consist on the one hand of the *local council*, which is elected every five years and is the main decision-making body of the municipalities. On the other hand, there is a directly elected *major* (eight-year terms), who acts as chairman of the municipal council. Both institutions

have their own statutory responsibilities, although the major has significant agenda-setting powers.[1]

Though the municipalities constitute the lowest level of government in Germany, they still assume significant responsibilities at the expenditure side on three types of tasks.[2] Firstly, local governments face *voluntary tasks*. The municipalities are not obliged to perform these tasks but they can assume responsibility for them if they so desire. Examples are cultural affairs (e.g. library, museum, theatre), social affairs (e.g. residential home for the elderly, welfare centre), sport facilities (e.g. public swimming pools, sports fields), entertainment facilities (e.g. hiking trails), traffic facilities (e.g. tram, harbour), partnership with foreign municipalities and municipal business development. The second type of tasks can be labelled as *duties without instruction*. These have to be performed by the municipalities, but do not involve detailed prescriptions imposed by a higher-level government concerning how local governments should perform these tasks. Examples from tasks in this category are the lighting and cleaning of public roads, the creation, support and expansion of graveyards, the construction of (municipal) roads, children playgrounds, the fire department, waste disposal and so on. Finally, there are *duties with instruction*. Local governments are obliged to perform the tasks, and the state imposes detailed regulations on how municipalities should perform them. Therefore, the implementation of these tasks is predetermined by the state. An example would be the running of local police authorities.

The institutional setting is complicated by the existence of a further federal layer in between the municipalities and the state, the districts ("Landkreise"). In Baden-Württemberg, 35 such districts exist, and they have a double function: On the one hand, they are state authorities and the legal supervisors of their municipalities. On the other hand, they also provide municipal services which cannot be efficiently provided by (small) municipalities. Here, they are mainly active in the provision of streets, public transport, hospitals, waste management and some social programmes. The districts are financed through cost-sharing of the municipalities for which the district services are provided. Due to their low number and very distinct function, the districts are not included in our analysis and we return to possible consequences in the discussion of results.

3. German local government efficiency

[1] We should note here that, contrary to the state or federal level, the formation of governing majorities within the local council is not institutionalized in the local law of Baden-Württemberg. Nonetheless, their existence is uncontested. These inter-party cooperations are used to facilitate and, to a certain extent, control the formation of opinions and decision-making.

[2] A more detailed classification and description of these tasks is given in Gern (2005).

Efficiency in the production of public services is one degree of freedom in local communities' policy agenda. Hence, the measurement of efficiency in local public good production lays the methodological basis to study the link between population size and cost pressures. Moreover, it allows a first look at the extent to which municipalities might be able to respond to adverse economic, fiscal or demographic shocks. Low efficiency scores for municipalities today should thereby not be (exclusively) interpreted as leeway for cost savings tomorrow once population shrinkage occurs. This would effectively be rather naive. On the contrary, current inefficiencies are more likely to hint towards poor (historical) performance in terms of adjusting service production to a changing environment and an inability to provide public services in the least costly way. Public entities that are currently inefficient may therefore be expected to be particularly severely hit by the changing size and structure of their population.

Baden-Württemberg is a state with a more stable population compared to most eastern and northern German states, due to its positive migration balance with the rest of Germany. Nevertheless, demographic change also affects this state to a considerable extent. According to current projections (all data cited originate from: Statistisches Landesamt Baden-Württemberg, 2009) the state's population will shrink from 10.7 million inhabitants today to 9.7 million in the year 2050. More dramatic is the change in the age composition, which can affect the production potential and the required types of municipal services: The share of people aged 60 years and above is projected to increase from 24 percent today to 39 percent in the year 2050. Furthermore, the distribution of population across the space is expected to change: Some districts are expected to lose five percent of their current population already by the year 2025 with more dramatic shrinking afterwards.

3.1. Public inputs, outputs and exogenous constraints

Efficiency measurement relies on estimating the relation between inputs and outputs to the public production function, taking into account possible constraints that lie beyond the control of the public service provider. While we will provide more details on the methodology to estimate local government efficiency scores in section 3.2., it is important to first discuss the key ingredients to any efficiency analysis: i.e., inputs, outputs and exogenous constraints. To determine which input, output and background variables to include in the analysis, we rely on previous literature studying local government efficiency (e.g. Vanden Eeckaut *et al*., 1993; De Borger *et al*., 1994; De Borger and Kerstens, 1996; Geys and Moesen, 2009a, b; Kalb *et al*., 2012). Following this 'common standard' has the advantage that our results remain comparable with these studies. As our prime input variable (C), we employ total current

primary expenditures in the municipality in 2001. This includes all spending on the current budget except interest and amortization repayments from local public debts (although including these debt service costs does not affect the results in any significant manner; details available upon request). Spending from the capital budget is ignored as decisions to invest in large infrastructure projects are infrequent events and thus tend to inflate spending in the year they occur. Given the cross-sectional nature of our analysis, focus on the current budget avoids distortions resulting from fluctuating investments.

To measure the level of local public good provision, we include six output variables that relate to important responsibilities of the German local governments with respect to social, educational, recreational and infrastructure services: (a) the number of students in local public schools ("Grund- and Hauptschulen"), (b) the number of kindergarten places,[3] (c) the surface of public recreational facilities, (d) the total population, (e) the population over age 65, and (f) the number of employees paying social security contributions. The same set of variables has also been employed by Kalb *et al*. (2012). While they should best be seen as proxies for the actual outputs provided by the local governments, these various indicators have been chosen in an explicit attempt to cover a large share of actual outlays by the German local governments in terms of their true responsibilities.

Finally, we include two sets of background variables (*socio-economic* and *political*) in the model to accommodate the fact that municipal governments face certain constraints that are beyond their direct control and/or hard to affect substantially in the short term. Controlling for these elements directly in the estimation of public sector efficiency tries to level the playing field between municipalities differentially affected by such constraints, and thus provides a more reasonable estimate of their true (in)efficiency. The socio-economic background variables include population density (inhabitants per are) and the number of unemployed in relation to total population. Population density proxies the rural/urban divide and is included under the argument that it can influence the ability of the authority to concentrate provision of the local public services (Stevens, 2005). Furthermore, it proxies the heterogeneity of property prices, which tend to differ substantially between rural and urban municipalities (and may thereby affect the cost situation of municipalities). While high population density might entail

[3] Only the total number of public *and* private kindergarten places of the year 2002 was available. While it would be preferred to use only the number of public kindergarten places, the addition of private kindergartens may not be overly problematic. The reason is that these places also imply an 'organisational' burden for the local government.

cost advantages due to regional concentration of services, higher property costs in urban areas (and other problems of agglomeration) may render production more costly. The overall effect on efficiency is therefore ambiguous. A similar ambiguity emerges for the unemployment rate since it implies a) higher spending on unemployment and housing benefits (a '*cost effect*') and b) lower demand for high-cost (or high-quality) public services (demand for which is likely to increase with income levels) (a '*preference effect*'). As a political background variable, we include the Herfindahl index to measure political concentration or monopolization in the local council. It is calculated using seat shares of the main national parties (CDU, FDP, SPD, GRÜNE) and of the so-called 'free voter unions'.[4] High concentration (or low fragmentation) may be an indication of low political competition and might therefore reduce efficiency (cf. Ashworth *et al.*, 2006).[5] The summary statistics of the input, output and environmental variables can be found in table A2 of appendix A.

The analysis below will be based on the performance of a single year, 2001, which demands some reflections on possible special period circumstances and their impact. From a business cycle perspective, the year 2001 was a normal year with a real GDP growth of 2.7 percent of Baden-Württemberg – which lies very much in line with the preceding five-year growth average (2.6 percent) (Statistisches Landesamt Baden-Württemberg, 2011b). Later years would be more problematic given the subsequent phase of recession and stagnation lasting from 2002 up to 2005. On the expenditure side of municipalities, the year 2001 was likewise a year without any significant abnormalities: Personal expenditures increased moderately by 1.4 percent (Statistisches Landesamt Baden-Württemberg, 2011a). However, the year 2001 is characterized by increasing municipal debt in Baden-Württemberg, while the level of debt had been declining before the turn of the millenium. This indicates a higher fiscal stress in that particular year. Nevertheless, we are confident that this debt development does not distort our approach in an important way. Our cost measure, as described above, is primary current expenditure and is independent from the financing side of the budget. Our six output measures hardly fluctuate largely in the short-run since they are largely driven by fixed or very slowly moving population characteristics. Only the number of employees paying social security

[4] 'Free voter unions' are loose federations of persons not belonging to specific political parties and exist only at the local level.

[5] Still, even in the absence of (strong) opposition parties, there may still be substantial competition for political office when there is fierce competition *within* the majority party (or parties). While the causal nature of the relations between efficiency and the control variables is not at the heart of the present article, we should also note that efficiency may induce political concentration, rather than the other way around. We are grateful to an anonymous referee for pointing this out.

contributions will react to the business cycle, which is, however, uncritical given the normal cyclical situation in the year of analysis.

3.2. Efficiency estimation: empirical approaches[6]

Determining the efficiency of a given number of decision-making units firstly requires the selection of a set of input-output combinations that designate efficient behaviour (i.e. those combinations where the inputs are most productively used). Then, in a second step, one can designate deviations from this 'best practice frontier' as inefficiency. Both these steps have been addressed in a number of different ways in the literature (for an introduction, see Lovell, 1993). Specifically, the best practice frontier can be generated either parametrically or non-parametrically. In non-parametric approaches such as Data Envelopment Analysis (DEA; Farrell, 1957) or Free Disposal Hull (FDH; De Prins *et al*., 1984), the frontier is generated as a piecewise linear envelopment of the data. Parametric approaches, on the other hand, determine the best practice frontier on the basis of a specific functional form using advanced econometric techniques. In evaluating deviations from this best practice frontier, early studies interpreted any deviation as inefficiency (a deterministic approach). This, however, is problematic since observed levels of inputs and outputs in real-world applications may be subject to measurement errors or other stochastic influences. In addition, even communities with an identical institutional setting may differ substantially in natural (e.g. geographical) or socio-economic (e.g. extent of unemployment etc.) restrictions on public service provision, which may even further distort the picture. To the extent that this is the case, one should attempt to differentiate between these 'errors' and inefficiency (using a stochastic approach).

We build on the stochastic, parametric approach to efficiency measurement developed by Aigner *et al*. (1977) and Meeusen and van den Broeck (1977). At the risk of over-simplification, this methodological approach essentially relies on the estimation of a production or cost function upon which "inefficiency is identified with [the] disturbances in [this] regression model" (Greene, 1993, 68). In other words, observed deviations from the estimated frontier isoquant are interpreted as indicative of the inefficiency of a given decision-making unit. Importantly, however, given the possible presence of measurement errors in the input and output variables employed, not the entire deviation from optimal performance is necessarily reflecting inefficient behaviour (see above). Fortunately, to distinguish between measurement error and inefficiency, stochastic approaches to efficiency measurement provide

[6] For more details, see Geys and Moesen (2009a).

the opportunity to (non-trivially) separate the observed deviations from optimal performance into random white noise and inefficiency. Technically, and employing a translogarithmic specification (cf. Christensen *et al*., 1973), a parametric frontier model can be written as (dropping subscripts for decision-making units for convenience):

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

where C designates the input indicator (which in effect can be interpreted as the money equivalent of multiple inputs), y indicates the various output indicators, s points to the number of outputs incorporated in the model and β_r and λ_{rq} are parameters to be estimated. The translogarithmic function in equation (1) extends the more basic Cobb-Douglas type cost or production function. Specifically, in a Cobb-Douglas function, the third term on the right hand side of equation (1) is absent: i.e. only the (logged) levels of the outputs are included (i.e., $\ln y_r$) and not the squared values, nor the cross-product terms (i.e., $\ln y_r \ln y_q$ with $r, q = 1,\ldots,s$). Obviously, the use of Cobb-Douglas versus translogarithmic functional form can be tested by assessing whether the coefficients λ_{rq} are jointly significantly different from 0, and we report both sets of results below.

As mentioned, the parametric method allows one to distinguish between the effects of measurement error and inefficiency. This is achieved by introducing a composed error term consisting of a symmetric component (v) (generally assumed to be white noise) and a one-sided non-negative component ($u \geq 0$) representing inefficiency. The latter component is mostly assumed to follow a half-normal or a truncated normal distribution (cf. De Borger and Kerstens, 1996; Méon and Weill, 2005). Both error components are assumed to be independent and uncorrelated. While estimation of equation (1) provides values for the composed error term (v + u), Jondrow *et al*. (1982) and Bauer (1983) show that, for any organisation i, the conditional distribution of u_i given ($v_i + u_i$) contains all available information about u_i. As a consequence, this information can be used to generate point estimates for the inefficiency component of any given decision-making unit i. One can thereby either build on the mean or the mode of this conditional distribution (see Jondrow *et al*., 1982; Bauer, 1983), though both generally lead to comparable results in empirical applications (hence, we will only report the results based on the mean of the conditional

distribution in section 3.3). These point estimates indicate to what extent inputs can be reduced without reducing current output levels.[7]

Two possible problems should be mentioned. Firstly, cost function based approaches along the lines of equation (1) could be challenging due to heterogeneity of factor costs across the jurisdictions under scrutiny. Fortunately, factor price divergence is not substantially affecting our application since the costs of labour and capital are identical for the municipalities of Baden-Württemberg (i.e. they face the same interest rates and wages). Interest rate homogeneity is given by the fact that a) all municipalities have access to the same capital market and b) the federal government guarantees the absence of differences in risk premiums for all German jurisdictions. Identical wages are guaranteed via a uniform collective labour agreement.

Secondly, the efficiency estimates as derived from equation (1) treat all municipalities on the same footing. However, exogenous (or non-discretionary) influences may shape local government performance (Battese and Coelli, 1995; Stevens, 2004). Indeed, certain characteristics of a municipality may affect how successful the local government is in carrying out its tasks, even though it cannot affect these elements in the short (or even long) run. Examples of such external forces are the geographic characteristics of the area or the socio-economic make-up or density of the population. A municipality in a hilly region is likely to spend more money on a given level of road infrastructure, but should therefore not necessarily be deemed less efficient in carrying out this task. Disregarding the effect of such background factors can thus lead to an overestimation of government inefficiency. We address this issue by assuming that the inefficiency term (u) in the error of equation (1) is a function of a set of background variables (cf. Battese and Coelli, 1995). In other words, and as discussed in Coelli (1996), u is "assumed to be independently distributed as truncations at zero of the $N(m_{it}, \sigma_u^2)$ distribution where $m_{it} = \delta z_{it}$" (p. 7). In this extension, z_{it} is a vector of background variables (for municipality i and time period t) which are expected to influence (in)efficiency and δ is a vector of parameters to be estimated. Technically, this corrects the derived efficiency measures for the existence of non-discretionary factors and leads to the following modified model:

[7] Building the best practice frontier based on the decision-making units at hand by definition implies that the ensuing efficiency measures are relative rather than absolute measures – and only have meaning within the specific sample employed. This clearly holds for all the procedures brought forward, and should be kept in mind in empirical applications.

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

$$u = \gamma + \sum_{i=1}^{I} \delta_i z_i + w \quad (3)$$

where the error term of equation (3), *w*, is defined by the truncation of the normal distribution with zero mean and variance σ^2 (Battese and Coelli, 1995). The latter assumption assures that the inefficiency component *u* can only take values bigger than or equal to zero. Clearly, a complete coverage of all relevant *y* and z_i would be necessary to derive the real extent of inefficiency – and the possible cost cuts given the municipality's output. As data limitations make this unattainable, we must be cautious to equate observed 'inefficiencies' with realizable cost savings. Nevertheless, even with an incomplete coverage, *u* offers valuable insights in the municipalities' 'value for money'. These subtleties should, however, be kept in mind if we speak about inefficiencies in the following empirical analysis.

3.3. Efficiency results

The results – obtained using FRONTIER 4.1 (developed by Coelli, 1996) – are summarized in Table 1. Specifically, we estimate three related models. The first disregards the effect of background variables and could be seen as a 'baseline' model (presented in columns (1) and (4)). In the second model, we include the socio-economic background variables (unemployment and population density) (columns (2) and (5)) while in the third model we also incorporate the Herfindahl index (columns (3) and (6)). In each case, we estimate both a Cobb-Douglas (columns (1), (2), (3)) and translogarithmic cost function (columns (4), (5), (6)). By definition, the municipalities lying on the best practice frontier reach efficiency scores of one, the other, less efficient exhibit efficiency scores that are bigger than one. Note that the estimated best-practice frontier is effectively shifted outwards until it just 'touches' the most efficient municipality when we calculate the (in)efficiency values reported in Table 1. Hence, only one municipality will generally be 'efficient' and thereby constitute the most efficient comparison case (making the reported efficiency measures relative rather than absolute indicators; see also note 7). Full results of all these estimations are provided in table A1 of appendix A.

Table 1: Summary statistics on the cost efficiency of the local governments in Baden Württemberg in 2001 (N=1021)

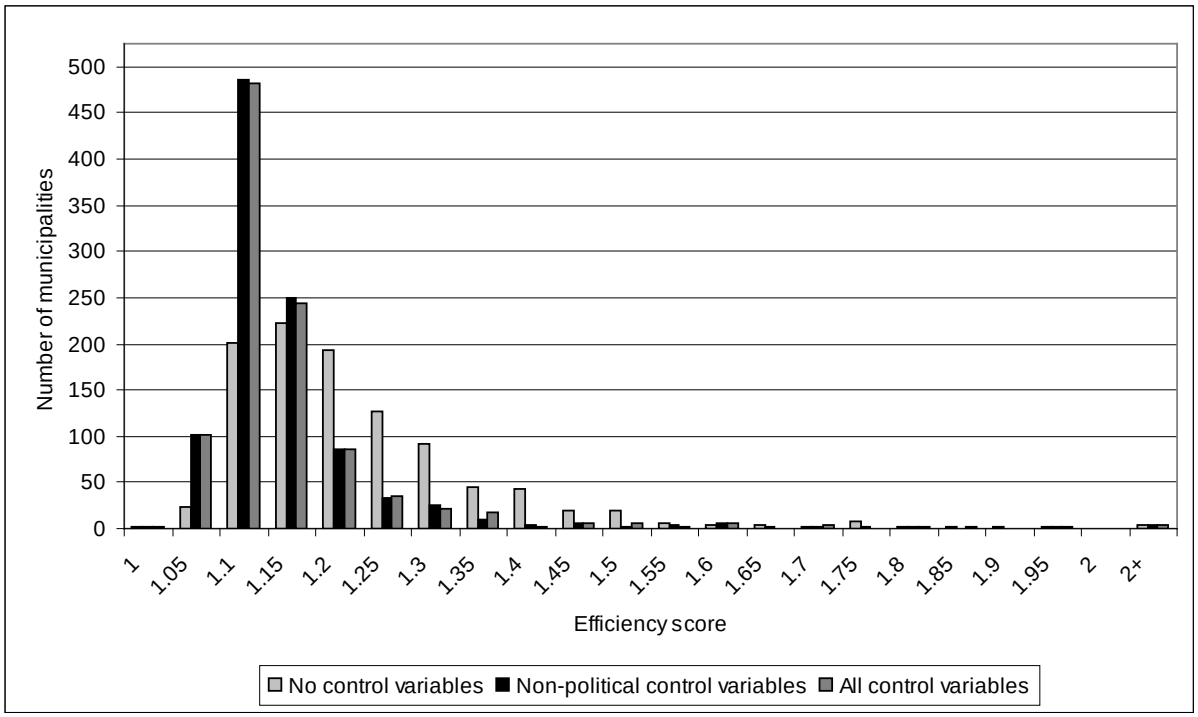
	Cobb-Douglas			**Translog**		
	No control variables	Socio-economic	All control variables	No control variables	Socio-economic	All control variables

	(1)	controls (2)	(3)	(4)	controls (5)	(6)
Average	1.229	1.138	1.141	1.202	1.120	1.122
Standard deviation	0.203	0.176	0.179	0.159	0.134	0.136
Minimum	1	1	1	1	1	1
Maximum	4.355	4.566	4.499	3.500	3.708	3.666
Number efficient	1	1	1	1	1	1

As can be seen from table 1, disregarding background variables (columns (1) and (4)), local governments in Baden-Württemberg are characterized by cost levels which are approximately 20% to 23% above the efficient frontier. When we include political and socio-economic background variables into the estimation, inefficiency is reduced (as expected). Still, costs remain roughly 12% to 14% above the efficient level (column (3) and (6)). Although, as explained above, we should be cautious to equate these inefficiencies with potential cost cuts, it should be kept in mind that the frontier generated by the sample of municipalities will by construction be at least as high as the 'true' frontier. This implies that the efficiency ratings provided in table 1 are best regarded as a lower limit of 'true' inefficiency.

It is clear that the Baden-Württemberg local governments show a substantial heterogeneity with regard to their 'value for money' (as represented by the standard deviation in inefficiency scores). The variation in efficiency ratings is also represented in figure 2. This histogram shows the number of municipalities (on the Y-axis) with a given level of inefficiency (on the X-axis), using results from the translogarithmic specifications. Light-grey cubes are inefficiency scores without control variables, black cubes represent inefficiency scores when controlling for socio-economic background variable and dark-grey cubes depict inefficiency scores when including all control variables.

Figure 2: Baden-Württemberg local governments' cost inefficiency in 2001 (N=1021)



Note: Results based on translogarithmic cost function.

It is obvious from figure 2 that the distribution of inefficiency has a large right-hand tail. Most municipalities have a limited degree of inefficiency, though some are deemed to be very inefficient. Although a positive reading of our results might suggest that currently inefficient municipalities have some leeway for improvements in efficiency without resorting to extensive, and politically costly, tax increases to (re-)balance their budgets, it remains doubtful that such municipalities are able to increase their efficiency under adverse conditions. To the extent that municipalities remain equally (in)efficient in the future, public finances are likely to become more severely constrained in inefficient municipalities (e.g., due to population change, see Geys *et al.*, 2008). Not shown in the figure is that mainly the smaller municipalities (especially those under 3000 inhabitants) are found to be relatively inefficient while municipalities between approximately 6000 and 9000 inhabitants are deemed most efficient (details available upon request). One key driving force behind this relative inefficiency of especially the smallest municipalities appears to be their greater inability to exploit economies of scale in the provision of public goods. Indeed, smaller municipalities in Baden-Württemberg operate under conditions where the cost of public provisions increases significantly slower than one-to-one with population size increases. In other words, costs per capita would reduce by increasing the average scale of production. As also shown in more detail in Geys *et al*. (2008), such economies of scale become (close to) exhausted once population size exceeds the threshold of approximately 5500 to 6000 inhabitants. From a

policy perspective, this suggests that municipal mergers among particularly the smallest municipalities may prove beneficial in reaching a more optimal size of government at the local level (taking, of course, into account the practical feasibility of, and the local sensitivities involved in, such a policy). Still, although economies of scale clearly play an important role in the inefficiency of smaller municipalities, our data, unfortunately, do not allow us to examine the potential importance of other factors such as (concerns about) the relative lack of professional mayors and/or more experiences administrators in smaller municipalities. To the extent that such factors play a role as well, municipal mergers might be insufficient to tackle the relative inefficiency of small jurisdictions, and measures more directly aimed at improvements in local governance should likewise be contemplated.

It must, moreover, be stressed that our analysis excludes the costs of service provision through the district level, which the municipalities finance through their contributions (see section 2). Since these contributions are not part of our dependent variable due to lack of sufficiently detailed data, the analysis remains necessarily incomplete. If district provision of services plays a comparable role for all municipalities, this would not affect our results. However, with standard economies of scale arguments we would expect district provision of services to be more important for smaller municipalities. From that perspective, municipal cost numbers might be biased downwards for smaller municipalities. This would bias our results towards a seemingly larger efficiency of smaller municipalities. This strengthens our belief in our result that mainly the smaller municipalities show larger inefficiencies. Our results could in effect be taken as a conservative estimate of smaller municipalities' inefficiencies.

Before concluding, it may be of interest to point to the findings of the non-discretionary variables included in the model. These results, provided in table A1 of appendix A, indicate that the unemployment rate does not robustly affect inefficiency. Hence, no clear statement of the effect of unemployment on the (technical) efficiency in the municipalities of Baden-Württemberg can be made. Population density, on the other hand, significantly increases measured inefficiency in all specifications. This indicates that cost disadvantages resulting from, say, higher property prices outweigh agglomeration advantages. This result may also reflect the fact that large cities tend to have central place functions, such as the arts and culture (cf. Heilbrun, 1992), which significantly affects their cost structure. Finally, as expected, political concentration (proxied by the Herfindahl index) significantly reduces

efficiency. This indicates that high levels of political competition are associated with high efficiency – a result in line with our theoretical expectations (see also Ashworth *et al.*, 2006).

4. Concluding discussion

This article investigated that overall (or 'global') cost efficiency of local public good provision in German municipalities. We use a sample of more than 1000 municipalities in the state of Baden-Württemberg for the empirical analysis. Our first major finding in this context is the substantial heterogeneity in the efficiency of public service production – even under a uniform institutional setting as it is given for the municipalities in Baden-Württemberg. We show, that, on average, the municipalities of Baden-Württemberg produce their output with costs roughly 12% to 14% above the efficient frontier as identified by means of a stochastic frontier analysis - even when taking account of different socio-economic and political constraints. Such inefficiency seems especially concentrated in smaller municipalities. At first sight, this unexploited potential might appear as a cushion for bad times once population shrinkage materializes. A more pessimistic interpretation, however, is to take these inefficiencies as an indicator of poor performance generally, and with respect to adverse economic and fiscal developments in particular. Following this view, municipalities which are characterized by low efficiency scores under the current demographic situation are likely to incur significant difficulties in the future, when demographic decline gains force. One can indeed expect that inefficiencies augment when these low performing municipalities are faced with the challenge to adjust their public services to, for instance, the needs of a changing and shrinking population.

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Appendix A

Table A1: Results of the multi-output frontier estimation

Variable	**Cobb-Douglas**			**Translog**		
	(1)	(2)	(3)	(4)	(5)	(6)
constant (β_0)	8.303*** (55.864)	8.590*** (58.270)	8.516*** (60.753)	11.455*** (7.946)	11.627*** (6.695)	12.953*** (4.250)
A: students in public schools	-0.008 (-0.924)	-0.009 (-0.953)	-0.002 (-0.202)	0.096 (0.485)	0.017 (0.094)	0.051 (0.255)
B: kindergarten places	0.059* (1.903)	0.077*** (2.661)	0.069** (2.411)	-0.066 (-0.116)	-0.050 (-0.099)	0.181 (0.194)
C: recovery area	0.019** (2.214)	0.020** (2.448)	0.018** (2.158)	0.623*** (2.709)	0.583*** (2.674)	0.552** (2.420)
D: total population	0.680*** (12.066)	0.631*** (11.737)	0.641*** (12.000)	-0.999 (-0.957)	-0.922 (-0.658)	-2.161 (-0.936)
E: population older than 65	0.140*** (3.682)	0.151*** (4.211)	0.157*** (4.367)	-0.022 (-0.024)	-0.099 (-0.095)	0.904 (0.660)
F: number of social insured employees	0.133*** (10.960)	0.137*** (11.798)	0.133*** (12.381)	0.862*** (2.885)	0.908*** (3.475)	0.908*** (3.203)
A^2				-0.004 (-0.517)	-0.002 (-0.235)	-0.002 (-0.209)
B^2				0.021 (0.487)	0.025 (0.596)	0.025 (0.554)
C^2				0.000 (0.039)	0.002 (0.231)	0.002 (0.331)
D^2				0.221 (0.946)	0.189 (0.634)	0.445 (0.997)
E^2				-0.008 (-0.047)	-0.036 (-0.227)	0.071 (0.408)
F^2				0.101*** (6.797)	0.091*** (6.289)	0.091*** (6.219)
F * E				-0.048 (-0.656)	-0.025 (-0.366)	-0.007 (-0.104)
F * D				-0.327*** (-2.902)	-0.331*** (-3.329)	-0.340*** (-3.175)
F * C				0.022 (1.433)	0.017 (1.177)	0.021 (1.412)
F * B				0.153** (2.456)	0.152*** (2.830)	0.145** (2.436)
F * A				0.003 (0.227)	0.005 (0.328)	0.003 (0.195)
E * D				0.159 (0.381)	0.192 (0.444)	-0.182 (-0.336)
E * C				0.104* (1.765)	0.102* (1.818)	0.090 (1.584)
E * B				-0.315 (-1.537)	-0.286 (-1.374)	-0.149 (-0.582)
E * A				0.033 (0.538)	0.008 (0.139)	0.010 (0.154)
D * C				-0.178** (-2.023)	-0.171** (-2.048)	-0.157* (-1.811)
D * B				0.108 (0.513)	0.101 (0.455)	-0.021 (-0.061)
D * A				-0.041 (-0.475)	0.004 (0.046)	-0.002 (-0.025)
C * B				0.004 (0.084)	0.006 (0.133)	-0.004 (-0.076)
C * A				0.008 (0.672)	0.006 (0.529)	0.008 (0.692)
B * A				-0.001	-0.032	-0.031

				(-0.12)	(-0.574)	(-0.484)
constant (δ_0)		-7.394* (-1.780)	-7.539*** (-21.180)		-6.356** (-2.496)	-7.038* (-1.913)
unemployed as share of population		0.085 (0.684)	0.224*** (5.355)		-0.138** (-2.453)	0.111 (1.360)
population density		0.219** (2.070)	0.202*** (21.069)		0.063** (2.405)	0.099* (1.884)
Herfindahl index			3.606*** (21.906)			2.768** (1.974)
Cobb-Douglas vs. translogarithmic				125.376***	111.565***	106.867***

Note: N = 1021; All variables in natural logs except the socio-economic and political variables; *** denotes significance at 1% level, ** at 5% level and * at 10% level. Cobb-Douglas vs. translogarithmic tests the restriction that the coefficients for all quadratic and cross products terms are jointly insignificant. Both tests have a Chi^2-distribution.

Table A2: Summary statistics of the input, output and environmental variables for the 1021 municipalities of Baden-Württemberg in 2001

	Mean	Standard deviation	Minimum	Maximum
Current primary expenditures (in mio. euros)	37.9	134.0	0.7	3230.0
Students in public schools	649.9	1292.8	0.0	26342.0
Kindergarten places	402.1	804.7	25.0	17195.0
Recovery area (in are)	2401.5	5787.8	5.0	107540.0
Total population	10369.7	26594.7	249.0	589037.0
Population older than 65	1668.9	4481.3	35.0	98205.0
Number of social insured employees (at place of work)	3753.2	14919.1	8.0	353801.0
Unemployed as a share of total population (in %)	1.9	0.6	0.3	4.7
Population density (inhabitants per are)	3.3	3.3	0.2	28.4
Herfindahl index	0.5	0.3	0.2	1.0

Source: Statistical office of Baden-Württemberg