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## Voter involvement, fiscal autonomy and public sector efficiency: Evidence from German municipalities

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## ABSTRACT

Social and/or political involvement within the population is often argued to enhance public sector performance. The underlying idea is that engagement fosters political awareness and interest and increases the public's monitoring ability. Still, weak fiscal autonomy can undermine voters' interest in and demand for an efficient production of public services. In our contribution, we test whether and how voter involvement in the political sphere is related to government performance – in terms of its efficiency – using a broad panel of German municipalities. Our results suggest that voter involvement indeed has a positive impact on cost efficiency. Crucially, however, this efficiency-enhancing effect of voter involvement is significantly positively affected by local governments' fiscal autonomy.

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## 1. Introduction

Engagement in social life has been argued not only to increase interest in and understanding of politics, but also to make one more willing and effective in demanding 'good' government (e.g., Boix and Posner, 1998). As such, voter involvement may well help tame the Leviathan. Clearly, however, two crucial assumptions have to be met for this argument to hold. Firstly, civic engagement should foster political awareness and interest. Scheufele et al. (2004), among others, provide some evidence that this is indeed the case. Secondly, this increased interest and involvement in the political sphere should improve government performance. The validity of this second 'assumption', however, has received little attention and was recently described as a "plausible, important but insufficiently tested proposition" (Toka, 2008, p. 31).

The present paper takes a first step to bridge this gap. It empirically assesses whether voters' political involvement improves government performance – and, crucially, whether fiscal autonomy of the local government is a prerequisite for such an effect to establish itself (see below). We thereby define good government performance as higher efficiency of public service provision (or, phrased more negatively, as a reduction in budgetary slack or rent-seeking).<sup>1</sup> The efficiency measure employed is based on the

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<sup>1</sup> Economic efficiency is obviously only one among many public concerns (besides effectiveness, equity, responsiveness, adequateness, appropriateness, and so on; Dunn, 2004, p. 223–231) and our focus on it should not be taken to mean that it is more important than the remaining issues. Yet, efficiency has received increasing amounts of attention in recent years (e.g., in the New Public Management (NPM) discussions since the late 1980s; Lindblad, 2006) and our study intends to add to recent attempts at understanding factors that affect or influence it (see below).

public sector as a whole, rather than on a given area of public good provision: e.g., waste collection, administration, road maintenance, and so on (e.g., [Kalthoff and Rattsø, 1998](#); [De Borger and Kerstens, 2000](#)). This ‘global’ approach is appropriate when “the explanatory variables characterize the local government institution rather than being sector-specific” ([Borge et al., 2008](#), p. 476) – as is here the case. In such a setting, concentrating on “one particular element of service provision may be inadequate (or even misleading)” ([Ashworth et al., 2007](#), p. 12).

While numerous studies examine local government efficiency and its determinants (e.g., [De Borger et al., 1994](#); [De Borger and Kerstens, 1996](#); [Worthington, 2000](#); [Geys, 2006](#); [Balaguer-Coll et al., 2007](#); [Bruns and Himmeler, 2009](#); [Geys and Moesen, 2009a,b](#)), only one of these includes a measure of political involvement (i.e., [Borge et al., 2008](#)).<sup>2</sup> The latter study illustrates that the public's democratic participation tends to improve efficiency – in line with theoretical predictions – even after controlling for numerous political, fiscal and budgetary variables. The present study intends to add to our understanding of the participation-efficiency nexus by diverging from and/or extending upon [Borge et al. \(2008\)](#) in four main ways.

- First, and purely methodologically, we exploit a stochastic frontier approach to measure efficiency (cf. [Aigner et al., 1977](#); [Meeusen and van den Broeck, 1977](#)), whereas [Borge et al. \(2008\)](#) rely on the ratio between aggregate output and local government revenue. Our approach, although itself imperfect (see below), has the benefit of allowing a distinction between measurement error and inefficiency.
- Second, our empirical analysis is based on a broad panel of German municipalities (rather than Norwegian municipalities; cf. [Borge et al., 2008](#)). As a result, we have a larger dataset at our disposal including across-time variation in crucial variables. Moreover, it implies that we analyze the participation-efficiency nexus in a different political and institutional setting – making our results interesting also from a comparative perspective.
- Third, we assess a broad set of indicators of voter involvement – thus going beyond electoral turnout as a measure of citizen involvement (as in [Borge et al., 2008](#)). As such, we are able to examine how different ways through which voters can get politically involved affect government performance.
- Finally, and most importantly, we are – to the best of our knowledge – the first to assess how the participation-efficiency nexus is affected by the degree of local fiscal autonomy. Building on the fiscal illusion literature, fiscal autonomy (in contrast to dependence on external grants) may be seen as a crucial intervening variable since it implies that voters are effectively confronted with the tax bill for their desires. As a result, we argue that an active citizenry is more likely to value the careful use of public money when it originates mainly from own revenue sources rather than external transfers.

The remainder of the article is structured in four main parts. The first of these presents the theoretical background and our main hypotheses. [Section 3](#) then introduces the German institutional and political setting. The empirical analysis is provided in [Section 4](#). We show that voter involvement is indeed linked to increased government cost efficiency and that, in line with theoretical predictions, this effect is stronger in communities with higher fiscal autonomy. Finally, [Section 5](#) reiterates the main findings and discusses some implications.

## 2. Theoretical background and hypotheses

From a theoretical perspective, the link between voter involvement and the efficiency of public policy can be analyzed in a standard principal-agent setting (cf. [Migué and Bélanger, 1974](#); [Niskanen, 1975](#); [Borge et al., 2008](#)). Local government officials act as agents for the population, who – as principals – desire the government to provide as many public goods as possible for a given fiscal cost. That is, “voters want more competent politicians in office, as they can provide more public goods for given levels of taxation and private consumption” ([Alt and Lassen, 2006](#), p. 1404; see also [Shi and Svensson, 2006](#)). However, there is a clear conflict of interest in that politicians (or bureaucrats) in charge of public goods provision may benefit from less productive activities: e.g., higher salaries, lower effort, over-employment within their service, and so on. Given that politicians (or bureaucrats) tend to be better informed about the true cost of providing public goods than the general population, there exists an incentive to invest in such less productive activities. These, however, induce budgetary slack (or inefficiency).

Importantly, the extent of budgetary slack is likely to be affected by the formal as well as informal institutional setting. One crucial element in this respect is whether or not the principal assumes an active role in informing himself about and supervising the actions of his agent. Specifically, agency theory assumes that principals can resolve part of their imperfect information of the agent's work effort through stricter monitoring ([Alchian and Demsetz, 1972](#); [Jensen and Meckling, 1976](#); [Holmström, 1979](#); [Laffont and Tirole, 1986](#)). This reduces information asymmetries between principal and agent, thereby limiting possibilities for wasteful spending and rent extraction by the agent. In other words, the ‘information rent’ extracted by the agent is likely to become considerably smaller with monitoring such that budgetary slack is reduced when the principal is actively involved (e.g., [Moene, 1986](#); [Chan and Mestelman, 1988](#)).<sup>3</sup>

<sup>2</sup> A large and related literature examines the relationship between the quality of institutions and satisfaction with democracy (see, e.g., [Wagner et al., 2009](#); and references therein).

<sup>3</sup> Recent experimental evidence is generally supportive of a disciplining effect of monitoring (e.g., [Nagin et al., 2002](#); [Dickinson and Villeval, 2008](#)). Still, in personal interactions, this disciplining effect may be counterbalanced by a crowding-out effect because supervision diminishes the intrinsic motivation of the agent (see [Frey, 1993a,b](#); [Barkema, 1995](#)). As the principal-agent relation in our setting is impersonal (i.e. voter-government), we assume dominance of the disciplining effect of monitoring.

**Table 1**

Results of local council elections in Baden-Württemberg (% of valid votes).

Source: Statistical Office of Baden-Württemberg.

|                                      | Election year |      |      |      |      |      |      |
|--------------------------------------|---------------|------|------|------|------|------|------|
|                                      | 1975          | 1980 | 1984 | 1989 | 1994 | 1999 | 2004 |
| CDU (Christian Democrats)            | 38.9          | 39.6 | 37.9 | 32.6 | 31.6 | 36   | 33.2 |
| SPD (Social Democrats)               | 29.2          | 30.2 | 26.3 | 25.6 | 24.1 | 21.7 | 19.9 |
| FDP/DVP (Liberals)                   | 5.5           | 5.3  | 3.9  | 4.6  | 3.5  | 3    | 3.7  |
| GRÜNE (Greens)                       | 0             | 1.7  | 6.3  | 5.9  | 7.7  | 5.2  | 8.2  |
| Wählervereinigungen (Voters' unions) | 19.9          | 18.3 | 21.6 | 23.6 | 26.6 | 27.5 | 29.4 |
| Other                                | 6.5           | 4.9  | 4    | 7.7  | 6.5  | 6.6  | 5.6  |

Our empirical analysis below concentrates on political involvement of voters as one means to actively monitor politicians (see also Strumpf, 1998; Borge et al., 2008) and thereby improve policy outcomes. The reason for this focus is that participating citizens have been argued to be more critical, better informed and more vigorous in demanding particular policies (Boix and Posner, 1998; Scheufele et al., 2004). A more active citizenry therefore increases supervision of and pressure on government officials and, following the predictions from agency theory, increases their effort levels. To the extent that higher effort enhances performance, a first hypothesis can thus be stated as follows:

**HYP 1.** Higher voter involvement increases local government performance (i.e. efficiency).

Clearly, Hypothesis 1 rests on the assumption that voters desire efficiency in the provision of local public goods. This, however, is not necessarily always the case. In fact, the extensive literature on fiscal illusion argues that when government revenues employed to finance public goods provision are at least in part unobserved by voters, the latter might have an inaccurate perception of the true cost of public goods provision. This, in turn, affects the behaviour of politicians. One consequence of fiscal illusion is the so-called “flypaper effect” (Heyndels and Smolders, 1994; Hines and Thaler, 1995; Heyndels, 2001) which entails that revenues that a jurisdiction obtains from lump-sum grants are used differently than revenues from own tax sources. In fact, while economic theory would suggest that an increase in revenues from both sources is equivalent and has similar implications on the jurisdiction's spending pattern (Bradford and Oates, 1971), unconditional grants are de facto more likely to be used for additional spending rather than tax cuts (for a review, see Mueller, 2003, p. 221–223).

Another potential consequence of fiscal illusion is that voters may end up caring about government (in)efficiency only when they are directly confronted with the tax bill for public goods provision. When there is an imperfect mapping of citizens who consume and finance public services (or, in other words, when fiscal institutions are not built on the principle of ‘fiscal equivalence’; Olson, 1969), voters' function as efficiency guards may be impaired because other people's money is being wasted. Voters then are likely to put less weight on the careful use of public money (since it, at least in part, originates from external transfers). This line of argument suggests that in transfer-dependent municipalities with low fiscal autonomy, high voter involvement need not be associated with higher efficiency. Fiscal autonomy (in contrast to dependence on external grants) can therefore be seen as a crucial intervening variable in the involvement-efficiency relation.<sup>4</sup> This leads to our second hypothesis:

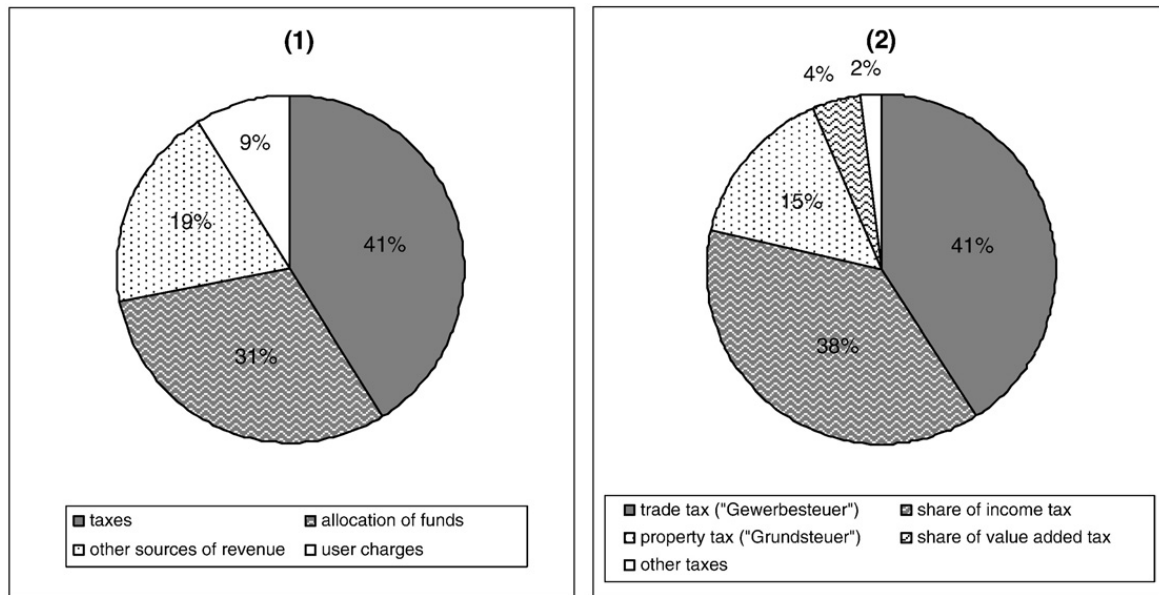
**HYP 2.** The effect of voter involvement on local government performance (i.e. efficiency) is mediated by the degree of local fiscal autonomy.

### 3. German local political and fiscal setting

Baden-Württemberg lies in the southwest of Germany (bordering France and Switzerland) and is the third largest of the 16 German federal states – both in terms of surface area and number of inhabitants. Its 10.7 million inhabitants are currently distributed among 1109 municipalities which currently range in size from about 100 to almost 600,000 inhabitants. Each of these municipalities is governed by a local council (elected on five-year terms) and a directly elected mayor (with an eight-year term). The mayor acts as the chairman of the municipal council and has significant agenda-setting powers. Both council and mayor have their own statutory responsibilities, which are the same across all municipalities.

At the state level, Baden-Württemberg is a traditional stronghold of the Christian Democrats (CDU). Since the state's inception in 1952, the state government has generally been led by CDU prime ministers, often as one-party governments (the sole exception is the 1952–53 government under liberal prime-minister Reinhold Maier). At the municipal level, the CDU has been almost equally dominant (see Table 1). Still, unlike state or federal elections, local elections in Baden-Württemberg are also characterized by the increasing importance of so-called “free voter unions” (*Freie Wählervereinigungen*). The latter can be seen as an indicator of local voter involvement. The reason is that they are a grassroots type of organization that is the result of local initiatives. They are not linked to the

<sup>4</sup> In similar vein, fiscal decentralisation has been argued to increase government efficiency by giving “voters increased electoral control over incumbents” (Barankay and Lockwood, 2007, p. 1198). The reason is that decentralisation strengthens the negative relation between rent extraction and the probability of re-election (e.g., Seabright, 1996; Persson and Tabellini, 2000; Hindriks and Lockwood, 2009). In addition, Kappeler and Vällilä (2008) argue that fiscal decentralisation boosts economically productive public investment (e.g., infrastructure) and curbs economically less productive investment (e.g., recreational facilities).



Source: Ministry of Finance of Baden-Württemberg

Fig. 1. Structure of the total revenue (1) and composition of tax revenue (2) for all municipalities in Baden-Württemberg in 2004.

traditional political ideologies and even explicitly reject the idea of constituting a political party. Also, no national organization of free voters exists that initiates the foundation of free voter unions at the local level. While in some cases they do form networks at the state level, these local groups are independent (and tend to focus on specific affairs within their municipality).<sup>5</sup>

One other institutional characteristic of the Baden-Württemberg municipalities that is of importance for our purpose concerns their degree of fiscal autonomy. German municipalities in general have some – albeit limited – leeway in generating own revenues. To see this, a brief look at their revenue structure is required. Most basically, revenues derive from three main sources: tax revenue (on average 41% of total municipal revenues in 2004), allocation of funds (through, for example, fiscal equalization schemes) (31%) and user charges (9%) (see Fig. 1(1)).<sup>6</sup> Among the tax revenues, however, a substantial part (i.e. 42%) originates from shared taxes (i.e. income tax and VAT) decided upon by the federal and state-level governments. Local governments can only independently decide on five types of taxes (although the federal government even here often sets a regulatory ‘framework’): trade tax (*Gewerbesteuer*), property tax (*Grundsteuer*), tax on keeping dogs, second residence tax and entertainment tax. Only the first two of these yield significant revenues (41% and 15% of total tax revenues in 2004 respectively, see Fig. 1(2)).<sup>7</sup> Overall, revenues from fiscal equalization schemes and shared taxes (over which the municipalities have no control) constitute about half of the municipal revenues and thereby far outweigh revenues from autonomously determined tax sources. Hence, though some leeway exists in generating own revenues, the extensive tax sharing and fiscal equalization payments limit local governments’ budgetary autonomy and responsibility.

Still, and importantly, the degree of fiscal autonomy varies across municipalities in Baden-Württemberg. We more specifically distinguish between two types of municipalities based on their requirement to receive ‘key grants’ (*Schlüsselzuweisungen*) under the horizontal (i.e. inter-municipal) fiscal equalization scheme. This horizontal element of the fiscal equalization scheme tries to balance communities’ economic prowess by comparing the fiscal capacity of each municipality with its fiscal needs:<sup>8</sup> If fiscal capacity exceeds fiscal needs, the jurisdiction obtains no key grants; in case fiscal capacity lies below fiscal needs the municipality receives key grants according to a predetermined formula. Obviously, awarding such key grants to a municipality increases its grant-dependence and reduces its fiscal autonomy. This allows us to distinguish between *independent* municipalities that obtain no key grants and *dependent* municipalities that do receive such grants.<sup>9</sup> In 2004 ‘independent’ municipalities made up approximately 9.4% of all communities.

<sup>5</sup> “Free voter unions” can also be seen as a response to bad politics of the past. But even then, these initiatives can be regarded as an indicator of higher voter involvement since dissatisfied citizens now actively participate in politics and get involved in the political process in order to change something. We return to this issue later.

<sup>6</sup> Note that the numbers do not fully sum to 100%. Other minor sources of revenue include administrative revenue, shares in profits, concession levy, support for debt service and sales revenues.

<sup>7</sup> Nevertheless, the most important autonomous tax source – the trade tax – is not paid by voters in general, but only by larger local firms (smaller firms are tax-exempt due to tax thresholds).

<sup>8</sup> Fiscal capacity (*Finanzkraft*) is calculated out of the municipalities’ sum of the different tax revenues and the key grants received two years ago, whereas fiscal needs (*Finanzbedarf*) are established by the product of a predetermined per capita sum (*Kopfbetrag*) and the number of inhabitants of each municipality (for more details, see, e.g. Ministry of Finance of Baden-Württemberg, 2006).

<sup>9</sup> It should be noted that the classification of a municipality as ‘independent’ and ‘dependent’ can change due to parameter changes of the fiscal equalization scheme. If, for example, the predetermined per capita sum (*Kopfbetrag*) is increased, some of the ‘independent’ municipalities can get ‘dependent’. On the other hand, an increase in the state-wide uniform collections rates (*Anrechnungsbeträge*) (which are used to determine the fiscal capacity of a municipality) would make some of the ‘dependent’ municipalities ‘independent’. The choice of ‘independent’ and ‘dependent’ municipalities as indicators for the degree of fiscal autonomy is therefore rather a *relative* than an *absolute* concept.

**Table 2**

Current expenditures of the municipalities per capita and as a percentage of total current expenditures for selected areas of public good provision in 2004. Source: Statistical Office of Baden-Württemberg and own calculations.

| Scope of functions                                      | Expenditure (in € per capita) | Share of total current expenditure (in %) |
|---------------------------------------------------------|-------------------------------|-------------------------------------------|
| General financial management                            | 702.01                        | 35.08                                     |
| Social security                                         | 269.32                        | 13.46                                     |
| Public facilities, business development                 | 225.56                        | 11.27                                     |
| General administration                                  | 182.32                        | 9.11                                      |
| Architecture, housing, traffic                          | 155.16                        | 7.75                                      |
| Schools                                                 | 123.54                        | 6.17                                      |
| Health, sport, recovery                                 | 101.86                        | 5.09                                      |
| Commercial companies, general basic and separate assets | 93.70                         | 4.68                                      |
| Science, research, culture                              | 81.29                         | 4.06                                      |
| Public safety                                           | 66.66                         | 3.33                                      |
| Sum                                                     | 2001.42                       | 100                                       |

Finally, to get an impression of the main tasks of the municipalities and how much they spend on these tasks, Table 2 provides an overview of municipal spending on selected areas of public good provision for the year 2004 (in per capita values as well as a percentage of total current expenditure). The table reveals that approximately one third of the money is spent on general financial management (like interest and amortization repayments). In contrast, expenditures on social security, public facilities and business development as well as general administration account for roughly 10 to 13% of the budget. Other posts on the budget are somewhat smaller. Architecture, housing and traffic as well as schools account for roughly 7% of the budget, while the last four posts on the budget absorb approximately 3 to 5% of the budget.

## 4. Empirical analysis

### 4.1. Model specification

Our analytical strategy is to identify the impact of voter involvement on municipalities' overall cost efficiency. For that purpose, we build on the stochastic, parametric approach to efficiency measurement developed by Aigner et al. (1977) and Meeusen and van den Broeck (1977). Most generally, and using a translogarithmic specification (cf. Christensen et al., 1973), the empirical model can be written as (with  $i$  and  $t$  subscripts for decision-making units and time respectively):

$$\ln C_{i,t} = \alpha + \sum_{r=1}^s \beta_r \ln y_{r,i,t} + \frac{1}{2} \sum_{r=1}^s \sum_{q=1}^s \lambda_{rq} \ln y_{r,i,t} \ln y_{q,i,t} + v_{i,t} + u_{i,t}, \quad (1)$$

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  $\beta_r$  and  $\lambda_{rq}$  are parameters to be estimated.<sup>10</sup> The advantage of such a parametric approach is that it allows distinguishing measurement error from inefficiency. This is achieved through a composed error term consisting of a symmetric component ( $v$ ) (assumed white noise) and a one-sided non-negative component ( $u \geq 0$ ) representing inefficiency. These error components are assumed to be independent. Note that while Eq. (1) takes the same form as a stochastic frontier production function (as employed in, e.g., Grossman et al., 1999 and Barankay and Lockwood, 2007), we essentially estimate a cost function. As such, we relate one input (i.e. costs) to various outputs, rather than one output (e.g., education attainment) to various inputs. This approach follows, for example, De Borger and Kerstens (1996), Athanassopoulos and Triantis (1998), Tanaka (2006) and Geys and Moesen (2009a,b).

Importantly, the influence of exogenous or non-discretionary influences that might shape local government performance can be introduced into the model above. This is important since certain characteristics of a municipality – such as the extent to which voters are involved in the political process – may affect how efficiently the local government is in carrying out its tasks (Battese and Coelli, 1995; Stevens, 2004). To accommodate such elements, we assume that the inefficiency term ( $u$ ) in Eq. (1) is a function of a set of community characteristics (cf. Battese and Coelli, 1995). In other words, and as discussed in Coelli (1996, p. 7),  $u$  is “assumed to be independently distributed as truncations at zero of the  $N(m_i, \sigma_u^2)$  distribution where  $m_i = \delta z_i$ ”. In this extension,  $z_i$  is a vector of background variables which are expected to influence (in)efficiency and  $\delta$  is a vector of parameters to be estimated. Or:

$$u_{i,t} = \gamma + \sum_{j=1}^J \delta_j z_{j,i,t} + w_{i,t}, \quad (2)$$

<sup>10</sup> This is a more general functional form than the traditional Cobb–Douglas function. Specifically, in a Cobb–Douglas specification, all squared values and cross-product terms are excluded. Statistical tests (not reported) indicated that the coefficients  $\lambda_{rq}$  are jointly significantly different from 0 (and, therefore, that the translogarithmic functional form is to be preferred to a Cobb–Douglas specification).

where  $i$  is the subscript for decision-making units (local governments) and  $t$  the time subscript. The error term of Eq. (2),  $w$ , is defined by the truncation of the normal distribution with zero mean and variance  $\sigma^2$  (Battese and Coelli, 1995). The latter assumption assures that the inefficiency component  $u$  can only take values bigger than or equal to zero.<sup>11</sup>

Before turning to the presentation of the input, output and background variables employed below, it should be mentioned that heterogeneity of factor costs across jurisdictions might complicate our analysis. Fortunately, in our setting, factor price divergence is limited since labour and capital costs are largely identical for the municipalities of Baden-Württemberg. Interest rate homogeneity exists because all municipalities have access to the same capital market in the same currency and the German constitution implies a full bail-out guarantee for all public entities (leading to the absence of risk premium differences across German jurisdictions). Broadly similar wages are guaranteed via a uniform collective labour agreement for the state's public sector.

#### 4.2. Data and explanatory variables

The definition and measurement of public sector outputs is notoriously difficult and fraught with data availability problems (cf. Levitt and Joyce, 1987; De Borger and Kerstens, 1996). Hence, in line with previous analyses of local government efficiency, we are forced to rely on proxies. To allow for maximum comparability, we thereby follow previous work in this field to determine which input and output variables to include in the analysis (e.g., Vanden Eeckhaut et al., 1993; De Borger et al., 1994; De Borger and Kerstens, 1996; Geys and Moesen, 2009a,b). We thereby rely on data for 987 municipalities in the German state Baden-Württemberg for the 3 years 1998, 2002 and 2004 (data availability precluded the use of the remaining 124 municipalities).

Our prime input variable ( $C$ ) is total municipal net current primary expenditures. These include all spending on the current budget minus the difference between debt service and income from interest. We do not include capital spending as this mainly refers to investment spending, which depends on when such projects are agreed upon (and thus tends to inflate spending in the years such projects occur). Note also that debt and amortization payments constitute the bulk of the 'General Financial Management' function in Table 2. Hence, our prime input variable basically constitutes total municipal expenses minus this financial management category.<sup>12</sup>

Local public good provision (i.e. our outputs  $y$ ) is measured through six variables tapping into various important responsibilities of the German local governments with respect to social needs, education, recreation and infrastructure: (a) the number of students in local public schools (*Grund- and Hauptschulen*), (b) the number of kindergarten places,<sup>13</sup> (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. With reference to Table 2 above, variable (a) relates to the 'Education' function of local governments, variable (b) to 'Education' and 'Social Security', variable (c) to 'Health, Sport, Recovery' and 'Public Facilities', variable (d) to 'General Administration', variable (e) to 'Social Security', and variable (f) to 'Business development'.<sup>14</sup> As mentioned, some of these measures should be considered as, at best, rather crude proxies for the level of public goods provision (see also De Borger et al., 1994; De Borger and Kerstens, 1996). Population, for example, proxies the extent of administrative tasks (such as issuing various types of documents) whereas the number of elderly indicates service provision to the elderly (e.g., retirement homes). Neither, however, is a direct output variable. 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 and Kerstens, 1996, p. 153–154).

The crucial part of the model refers to the background variables we introduce in the vector  $z_{i,t}$ . These are of two kinds: namely, measures for voter involvement and 'other' controls. To start with the former – as they intend to test our core hypotheses – we introduce three measures indicating the extent of voters' political involvement in the municipality. These capture various means through which voters are able to voice their concerns to politicians, and may affect efficiency in differing ways.

- The first measure of political involvement is voter turnout, defined as the number of votes cast relative to the number of eligible voters of the municipality. Voter turnout is strongly positively related to people's interest in and knowledge of politics (e.g.,

<sup>11</sup> Note that we do not include fixed effects in the estimation system for two reasons. First, time series variation in some of our explanatory variables is limited, such that fixed effects estimates will be imprecise. Secondly, the fixed effects estimator for frontier models recently developed by Greene (2005) produces inconsistent parameter estimates with small  $T$  (in our case  $T=3$ ). Moreover, it is subject to significant small sample bias and would not allow us to assess the effects of our exogenous variables in the way explained above.

<sup>12</sup> Alternatively, we re-estimated the model using as our input variable the sum of expenditures on the spending categories for which we have output proxies (detailed below). This mitigates the concern that expenses that fall outside our six output indicators are interpreted as inefficiency, and lead to biased inferences. Our main findings are largely unaffected by this alternative specification, emphasizing the robustness of our estimation results (see Table A2 of the Appendix). We are grateful to an anonymous referee for pointing this out to us.

<sup>13</sup> Data about kindergarten places was only available for the years 1998 and 2002. We therefore took the data of 2002 to approximate the kindergarten places of the year 2004. Also, we only observe the total number of public and private kindergarten places. While it would clearly be preferred to use only the number of public kindergarten places, such data were not available. Still, public kindergarten places make up a large fraction of total kindergarten places (43% and 44% in 1998 and 2002 respectively).

<sup>14</sup> We diverge from the output proxies used in De Borger and Kerstens (1996) in three respects. First, we cannot include the number of beneficiaries of minimal subsistence grants due to lack of data. Second, we include kindergarten places as an additional proxy for services on 'Education' and 'Social security'. Third, we include the number of employees paying social security contributions as a proxy for infrastructure and business development services (based on the idea that such services are associated with employment). Note in this respect that, importantly, social security contributions do not represent revenues for the municipality but for the federal government (and, as such, are not linked to the municipal budget other than as a proxy for infrastructure and business services).

**Table 3**

Descriptive Statistics (987 municipalities over 3 years: 1998, 2002 and 2004).

Source: Statistical Office of Baden-Württemberg.

| Variable                                              | Mean      | Standard deviation | Minimum | Maximum |
|-------------------------------------------------------|-----------|--------------------|---------|---------|
| <i>Input variable</i>                                 |           |                    |         |         |
| Net current primary expenditures (in million euros)   | 20.40     | 86.30              | 0.35    | 2890.00 |
| <i>Output variables</i>                               |           |                    |         |         |
| Students in public schools                            | 662.14    | 1308.41            | 0       | 27,126  |
| Kindergarten places                                   | 417.85    | 825.17             | 0       | 17,554  |
| Recovery area (in are)                                | 2480.27   | 5901.94            | 0       | 110,841 |
| Total population                                      | 10,525.13 | 26,837.23          | 242     | 589,231 |
| Population older than 65                              | 1747.26   | 4625.50            | 31      | 105,289 |
| Number of social insured employees (at place of work) | 3769.91   | 14,788.02          | 10      | 355,536 |
| <i>Voter involvement variables</i>                    |           |                    |         |         |
| Voter turnout (in %)                                  | 63.219    | 8.337              | 37.216  | 88.736  |
| Free voter unions                                     | 0.957     | 0.203              | 0       | 1       |
| Ratio of eligible voters to total population (in %)   | 73.122    | 3.307              | 60.978  | 99.753  |
| <i>Other control variables</i>                        |           |                    |         |         |
| Unemployment rate (in %)                              | 6.574     | 1.321              | 2.900   | 12.700  |
| Population density (inhabitants per are)              | 3.358     | 3.328              | 0.207   | 28.416  |
| Herfindahl index                                      | 0.515     | 0.247              | 0.211   | 1       |
| Share of left-wing parties (SPD + GRÜNE) (in %)       | 17.838    | 14.680             | 0       | 65      |
| 'Independent' municipalities                          | 0.082     | 0.275              | 0       | 1       |

Squire et al., 1987; Brady et al., 1995). As such, high turnout indicates a politically interested electorate that has the ability (in terms of knowledge and interest) and desire (given that it actively turns out to vote) to supervise and hold accountable its politicians.

- The second measure of voter involvement is an indicator variable for the existence of free voter unions. As argued in Section 3, the existence of free voter unions indicates that at least some citizens are ready to incur the cost of organization to resolve local policy issues. Since free voter unions cannot rely on support from a state- or country-wide party apparatus, personnel and financial resources, their members must feel sufficiently politically involved to create such an organization. The direction of their effect on efficiency is, however, a priori uncertain. On the one hand, their presence could benefit municipal efficiency given the oft-cited beneficial role of associations for socio-political and economic outcomes (Putnam 1993; Stolle and Rochon, 1998; Paxton, 2002; Coffé and Geys, 2007, 2008; Geys and Murdoch, 2008). On the other hand, the economic literature on special interest groups suggests the reverse effect since accommodation of special interest groups might also lead to less efficient policies (e.g., Mueller and Murrell, 1986).
- Our third and final measure of voter involvement is the share of eligible voters to total population. This captures the extent to which inhabitants of a given municipality are *able to* control their politicians through the ballot box (not the extent to which they actually do, which is captured by the voter turnout measure above). When a substantial share of taxpayers has no voting rights (e.g., because they are of non-EU nationality), popular intervention through the electoral process is likely to be reduced.

To assess how the degree of fiscal autonomy affects the involvement-efficiency nexus (cf. Hypothesis 2), we interact each of the above measures with a dummy variable for 'independent' communities (see Section 3). Since these municipalities exhibit the highest degree of fiscal autonomy – making the tax price for local expenditures more visible – we expect the effect of voter involvement to be stronger in these municipalities. The reason, as mentioned, is that citizens are likely to put more weight on the careful use of public money which originates from own revenue sources than from external transfers (cf. the literature on fiscal illusion). Hence, a more active citizenry is more likely to be a force for efficiency in fiscally more 'independent' municipalities.

The second set of background variables included in the vector  $z_{i,t}$  concerns various elements describing the municipality's socio-economic and political constraints. The former is accounted for through population density (measured as inhabitants per are) and the unemployment rate. While the former picks up the rural/urban divide (Stevens, 2005) and the heterogeneity of property prices (which might affect the cost situation of municipalities), unemployment implies higher spending on social benefits (a 'cost effect') as well as lower demand for high-cost or high-quality public services (a 'preference effect').<sup>15</sup> The political

<sup>15</sup> Additional factors can be conceived here – such as the geographical location or territorial characteristics – but lack of data makes inclusion of such factors difficult.

constraints are captured through a Herfindahl index measuring political concentration in the local council (higher concentration of power is expected to reduce efficiency; see also Ashworth et al., 2007)<sup>16</sup> and the seat share of left-wing parties (i.e. SPD, Grüne). For the latter variable there are two interpretations. First, given that the Christian Democrats have a dominating position in Baden-Württemberg (see Section 3), the share of the left-wing parties can be seen as an indicator of political competition. Second, however, it measures the impact of ideology. This ideological effect is not easy to determine a priori. While left-wing parties are often assumed to have a preference for a larger government size, this need not imply less efficient governments. Descriptive statistics for all variables are given in Table 3 below.

## 5. Results

The results – obtained by using FRONTIER 4.1 (Coelli, 1996) – are summarized in Table 4. The first three columns provide the results using our three different indicators of voter involvement separately. Column 4 includes all three involvement measures at the same time to check the robustness of the individual findings and assess how the relation between all three measures affects their respective findings. In the last three columns, we assess the mediating effect of fiscal autonomy by including interaction effects between voter involvement and fiscal autonomy. Before discussing our findings, it should be noted that the variance parameter gamma is close to one in all specifications and highly significant (see bottom row of Table 4). This indicates that the majority of the variation in the composed error term is due to the inefficiency component,  $u_{i,t}$  (see Section 4.1). Moreover, one-sided generalized likelihood ratio tests of the inefficiency effects indicate that in all specifications the null hypothesis that the inefficiency effects are absent from the model(s) can be strongly rejected. This implies that all covariates of the inefficiency model (given in Eq. (2) above) are jointly significant. Hence, the stochastic frontier model we chose seems to be an adequate representation of the data.

To start the discussion of our findings with the control variables, we first of all observe a robust negative effect of unemployment. This suggests that the *preference*-effect (i.e. relating to lower demand for high-quality public services among the unemployed) outweighs the *cost*-effect (i.e. higher spending on unemployment and housing benefits). Secondly, densely populated municipalities appear to have significant cost advantages from agglomeration economies. Thirdly, a low degree of political competition – as indicated by a high Herfindahl index or, given the dominant position of the CDU in Baden-Württemberg, a low share of left-wing parties – is associated with lower efficiency (see also Ashworth et al., 2007, for a similar finding in a different setting).<sup>17</sup> Finally, the positive effect found for financially ‘independent’ municipalities suggests that these can afford more (or qualitatively higher) public goods and services due to their higher economic power.

Turning now to the central voter involvement variables, Table 4 shows that all three indicators of voter involvement add significantly to the explanatory power of the model – both independently (cf. columns (1) through (3)) and jointly (cf. column (4)). Hence, a first conclusion clearly is that voter involvement matters for local government (in)efficiency. A closer look reveals, moreover, that all three measures of voter involvement have a *positive* impact on cost efficiency. This provides support for Hypothesis 1. Interestingly, the size of the coefficient estimates indicates that a one standard deviation change in voter involvement has the largest effect on efficiency in the case of free voter unions and the smallest effect in case of voter turnout. This relative size of the effects makes intuitive sense. Indeed, establishing a free voter union is a very active way of involvement compared to the simple act of voting, which is often seen as the easiest and least costly – both in terms of money, time and other resources – way of participating in politics (see Milbrath, 1965; Verba and Nie, 1972).<sup>18</sup> As such, it can be expected to have less far-reaching consequences in the conduct of political decision-making.<sup>19</sup>

Finally, columns (5) to (7) provide significant support for Hypothesis 2. That is, the interactions between the dummy variable for fiscally autonomous (i.e. ‘independent’) municipalities and voter turnout (IM\*VT) as well as its interaction with the presence of free voter unions (IM\*FVU) show highly significant negative coefficients. The coefficient of the third

<sup>16</sup> Technically, the Herfindahl index is measured as the sum of the squared seat shares of the main national parties (CDU, FDP, SPD, GRÜNE) and local parties.

<sup>17</sup> While this might indicate that electoral competition promotes efficiency (see Section 4), an alternative argument might be that political stability leads to higher quality of public services. We are grateful to an anonymous referee for pointing this out to us.

<sup>18</sup> It should be noted that reverse causality may be an issue. Indeed, since inefficiency might lead to the creation of free voter unions or stimulate people to turn out to vote (see above), the coefficient of the free voter unions (FVU) and voter turnout (VT) variables may suffer from endogeneity bias. Nevertheless, to the extent that this reversed channel of causation exists, the FVU and VT coefficients in column (2) are biased upwards and our results provide an under-estimate of the true effect.

<sup>19</sup> Two other reasons might explain the stronger impact of free voter unions. First, they can be interpreted as a highly independent political actor in political negotiations and monitoring activities (which, given the positive effect on efficiency, does not appear to work as a narrowly defined interest group with very specific efficiency-detering demands). Second, the presence of free voter unions might intensify political competition since it implies a non-ideological player entering the political stage. As also discussed above, political monopolies are prone to administrative slack and inefficiencies in public service production. Free voter unions can be seen as undermining such political monopolies.

**Table 4**  
Determinants of Baden-Württemberg's local government cost efficiency.

| Variable                                                | (1)                 | (2)                 | (3)                 | (4)                 | (5)                 | (6)                 | (7)                 |
|---------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <i>Production environment and political constraints</i> |                     |                     |                     |                     |                     |                     |                     |
| Unemployment Rate                                       | −0.0247** (−3.5136) | −0.0514** (−6.7206) | −0.0439** (−5.7417) | −0.0365** (−4.5828) | −0.0235** (−2.5856) | −0.0490** (−6.8962) | −0.0410** (−4.3281) |
| Population density                                      | −0.0555** (−6.3933) | −0.0464** (−7.4453) | −0.0485** (−7.4488) | −0.0409** (−5.9351) | −0.0529** (−5.8337) | −0.0468** (−7.6972) | −0.0447** (−5.9409) |
| Herfindahl index                                        | 0.3453* (5.0724)    | 0.1254* (2.4019)    | 0.1264* (2.6597)    | 0.0036 (0.0779)     | 0.3317** (3.8551)   | 0.1607** (2.6988)   | 0.1343* (2.0125)    |
| Share of left                                           | −0.0025* (−2.4930)  | −0.0090** (−4.9833) | −0.0015 (−1.4163)   | −0.0058** (−4.4367) | −0.0015 (−1.2759)   | −0.0090** (−4.0450) | −0.0005 (−0.4546)   |
| Dummy independent municipality (IM)                     | 2.5062** (6.1182)   | 2.2549** (6.0632)   | 1.7430** (7.6678)   | 1.6732** (6.4256)   | 2.7270** (5.3425)   | 3.3852** (5.9887)   | 1.1467* (1.9620)    |
| <i>Voter involvement</i>                                |                     |                     |                     |                     |                     |                     |                     |
| Voter turnout (VT)                                      | −0.0124** (−4.6643) | −                   | −                   | −0.0045* (−2.4775)  | −0.0056* (−2.4660)  | −                   | −                   |
| Dummy free voter union (FVU)                            | −                   | −0.6658** (−6.5112) | −                   | −0.5210** (−6.1659) | −                   | 0.1469* (2.3723)    | −                   |
| Ratio eligible voters/population                        | −                   | −                   | −0.0631** (−8.0803) | −0.6020** (−6.4779) | −                   | −                   | −0.0608** (−5.3781) |
| (Ratio EV/POP)                                          | −                   | −                   | −                   | −                   | −0.0079* (−2.0309)  | −                   | −                   |
| IM * VT                                                 | −                   | −                   | −                   | −                   | −                   | −1.2045** (−5.7661) | −                   |
| IM * FVU                                                | −                   | −                   | −                   | −                   | −                   | −                   | 0.0078 (0.8322)     |
| IM * Ratio EV/POP                                       | −                   | −                   | −                   | −                   | −                   | −                   | 0.1984** (7.7788)   |
| Sigma-squared                                           | 0.2976** (6.5733)   | 0.2689** (6.5343)   | 0.2113** (8.2073)   | 0.1976** (6.8306)   | 0.2499** (6.5530)   | 0.2693** (6.1351)   | 0.9349** (103.7188) |
| Gamma                                                   | 0.9559** (140.2274) | 0.9518** (139.0069) | 0.9392** (131.9161) | 0.9334** (96.7381)  | 0.9470** (119.0643) | 0.9517** (116.1515) | 0.9349** (103.7188) |
| Log-likelihood                                          | 1393.22             | 1394.94             | 1399.64             | 1403.48             | 1391.88             | 1397.87             | 1399.75             |

Note: N = 2961. Dependent variable: net current primary expenditures. \*\* (\*) denotes significance at the 5% (10%) level. Coefficients of the output indicators (and their quadratic and cross-product terms) as well as the constant terms of the frontier and the inefficiency model are not reported for space reasons (see Appendix). Note also that the estimation accounts for both technical change in the stochastic cost frontier and time-varying inefficiency effects.

interaction variable ( $IM \cdot RatioEV/POP$ ) is unexpectedly positive but remains insignificant. These findings strongly suggest that in municipalities with a higher degree of fiscal autonomy, the positive effect of voter involvement on municipal cost efficiency is more powerful. This is most strongly the case in column (6).<sup>20</sup> There we actually observe that the positive effect of free voter unions on municipal efficiency is driven by those municipalities that are fiscally autonomous. In municipalities that are strongly dependent on external funds, the effect of voter involvement is positive (and statistically significant). One explanation for this result, as suggested above, is that an active citizenry is likely to put more weight on the careful (i.e. cost-efficient) use of public money when these public funds originate from own revenue sources rather than external transfers.

## 6. Conclusions

In this paper we investigate the relation between voter involvement and local jurisdictions' cost efficiency. While higher social and political involvement within the population is often argued to be beneficial for the performance of the public sector, it remains unclear from a theoretical point of view whether higher voter involvement necessarily results in a higher or lower performance of (local) governments. One reason is that voters may only care about the careful use of public money when it originates from own (tax) revenue sources rather than external transfers. As a consequence, high voter involvement is more likely to result in better (or more efficient) performance *only* in municipalities with a high – rather than low – degree of fiscal autonomy.

Our empirical analysis – using a broad panel of 987 German municipalities for the years 1998, 2002 and 2004 – illustrates that higher voter involvement is on the whole associated with higher rather than lower levels of cost efficiency. This conclusion is in line with previous findings by Borge et al. (2008) for Norwegian municipalities – despite the differences in institutional setting, methodological approach and measurement of government efficiency between their study and ours. Compared to their results, however, our analysis allows for two more detailed conclusions. First, we find that this positive relation between voter involvement and government efficiency is supported also for measures of involvement other than voter turnout: i.e. the presence of free voter unions in the local council, and the ratio of eligible voters to total population. Interestingly, the effect is found to be weakest for voter turnout. Second, and crucially, our results reveal that this positive relation between voter involvement and government efficiency is not automatic. Rather, it is stronger when the degree of fiscal autonomy of the municipality is higher. As a consequence, stimulating civic engagement in politics is especially desirable when the institutional setting is such that the fiscal burden of public policies falls on those voting for these policies (i.e. a high degree of fiscal equivalence; cf. Olson, 1969).

In future research, it would be of interest to replicate the current study using data from specific government outputs. Although we do not necessarily believe that the relation we observe for the local government sector as a whole must necessarily also be present for each and every government output independently, it would certainly be interesting to analyze for which government sectors the relation uncovered in our analysis holds and for which it does not. Such a cross-policy approach would also allow assessing what drives these differences and for which policy areas voter involvement and fiscal autonomy are critical.

While proper caution is due when drawing policy implications from our analysis (given that we are forced to rely on proxies for voter involvement), our results clearly provide some food for thought. At first sight, they suggest that one should try to encourage citizens to be more active in the political process (e.g., via casting a ballot). Indeed, higher levels of voter involvement on the whole increase government performance. This is, however, not an easy route to take. Voter involvement in Baden-Württemberg (as elsewhere) is *de facto* decreasing. For example, in the period considered here voter turnout in local council elections fell from approximately 67% in 1994 to 52% in 2004. A more detailed reading of our results, however, shows that this is not the only way to increase local government performance. Indeed, an alternative route is to increase the degree of local governments' fiscal (or revenue) autonomy. Our results suggest that the effect of voter involvement is stronger in fiscally more autonomous (and therefore less dependent on external transfers) municipalities. Even though actual involvement declines (see above), higher budgetary slack can then still be avoided by making municipalities depend to a stronger degree on own funding. In such a setting, an active citizenry will put more weight on the careful use of public money.

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<sup>20</sup> While the signs of all coefficient estimates are robust to excluding the number of employees paying social security contributions as an output variable, the effects of voter turnout on efficiency lose statistical significance in this case (full results available upon request). Hence, also in this case, voter involvement effects are weakest for voter turnout and strongest for free voter unions.

## Appendix A

Table A1

Complete results of the multi-output frontier estimation.

| Variable                              | (1)                    | (2)                    | (3)                    | (4)                    | (5)                    | (6)                    | (7)                    |
|---------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| <i>Stochastic frontier</i>            |                        |                        |                        |                        |                        |                        |                        |
| Constant                              | 13.0831**<br>(17.3273) | 13.0077**<br>(17.3178) | 13.1690**<br>(17.5426) | 13.2472**<br>(17.6644) | 12.9712**<br>(17.0529) | 12.9762**<br>(17.2719) | 12.9268**<br>(17.0307) |
| A: Students in public school          | 0.1297<br>(1.4091)     | 0.1261<br>(1.3491)     | 0.1447<br>(1.5744)     | 0.1556*<br>(1.6834)    | 0.1272<br>(1.3744)     | 0.1285<br>(1.3627)     | 0.1469<br>(1.6144)     |
| B: Kindergarten places                | 0.5836*<br>(2.1895)    | 0.6137*<br>(2.3180)    | 0.6094*<br>(2.2803)    | 0.5807*<br>(2.2498)    | 0.5630*<br>(2.1181)    | 0.5836*<br>(2.2088)    | 0.5527*<br>(2.1213)    |
| C: Recovery area                      | 0.4265**<br>(3.7748)   | 0.4189**<br>(3.7472)   | 0.4110**<br>(3.6441)   | 0.4097**<br>(3.6851)   | 0.4358**<br>(3.9515)   | 0.4241**<br>(3.7747)   | 0.4275**<br>(3.9533)   |
| D: Total population                   | −2.1708**<br>(−3.8502) | −2.1479**<br>(−3.8262) | −2.2452**<br>(−3.9976) | −2.3001**<br>(−4.0987) | −2.0837**<br>(−3.6670) | −2.1281**<br>(−3.7923) | −1.9993**<br>(−3.4750) |
| E: Population older than 65           | 0.4689<br>(1.0869)     | 0.4569<br>(1.0722)     | 0.4981<br>(1.1627)     | 0.5565<br>(1.3154)     | 0.4123<br>(0.9731)     | 0.4533<br>(1.0619)     | 0.2912<br>(0.6793)     |
| F: Number of social insured employees | 0.7946**<br>(5.1448)   | 0.7794**<br>(5.0693)   | 0.8180**<br>(5.3491)   | 0.8230**<br>(5.3313)   | 0.7812**<br>(5.1547)   | 0.7842**<br>(5.0996)   | 0.8121**<br>(5.4090)   |
| A <sup>2</sup>                        | −0.0053<br>(−1.3451)   | −0.0055<br>(−1.4093)   | −0.0045<br>(−1.1445)   | −0.0042<br>(−1.0776)   | −0.0051<br>(−1.3191)   | −0.0055<br>(−1.3951)   | −0.0042<br>(−1.1150)   |
| B <sup>2</sup>                        | 0.0243**<br>(2.5927)   | 0.0256*<br>(2.4510)    | 0.0250**<br>(2.6013)   | 0.0239*<br>(2.7472)    | 0.0242*<br>(2.4644)    | 0.0242*<br>(2.4970)    | 0.0246*<br>(2.5470)    |
| C <sup>2</sup>                        | 0.0022<br>(0.5882)     | 0.0026<br>(0.7302)     | 0.0027<br>(0.7046)     | 0.0029<br>(0.7739)     | 0.0021<br>(0.6026)     | 0.0025<br>(0.7076)     | 0.0024<br>(0.6746)     |
| D <sup>2</sup>                        | 0.3614**<br>(3.0547)   | 0.3618**<br>(3.0646)   | 0.3764**<br>(3.1935)   | 0.3879**<br>(3.2825)   | 0.3441**<br>(2.9090)   | 0.3569**<br>(3.0275)   | 0.3222**<br>(2.6795)   |
| E <sup>2</sup>                        | −0.0439<br>(−0.5818)   | −0.0354<br>(−0.4743)   | −0.0406<br>(−0.5415)   | −0.0280<br>(−0.3721)   | −0.0463<br>(−0.6374)   | −0.0373<br>(−0.5017)   | −0.0666<br>(−0.9188)   |
| F <sup>2</sup>                        | 0.0480**<br>(5.2278)   | 0.0485**<br>(5.2535)   | 0.0485**<br>(5.2462)   | 0.0472**<br>(5.2196)   | 0.0481**<br>(5.3775)   | 0.0494**<br>(5.3744)   | 0.0490**<br>(5.4751)   |
| F * E                                 | 0.0520<br>(1.3939)     | 0.0486<br>(1.3297)     | 0.0633*<br>(1.7040)    | 0.0651*<br>(1.7959)    | 0.0478<br>(1.3037)     | 0.0475<br>(1.2870)     | 0.0588<br>(1.6052)     |
| F * D                                 | −0.3014**<br>(−5.2010) | −0.2977**<br>(−5.1877) | −0.3102**<br>(−5.4021) | −0.3109**<br>(−5.3834) | −0.2966**<br>(−5.2233) | −0.2977**<br>(−5.1659) | −0.3061**<br>(−5.4184) |
| F * C                                 | 0.171*<br>(1.9666)     | 0.0161*<br>(1.8674)    | 0.0156*<br>(1.8026)    | 0.0157*<br>(1.8185)    | 0.0170*<br>(2.0280)    | 0.0168*<br>(1.9568)    | 0.0163*<br>(1.9388)    |
| F * B                                 | 0.1326**<br>(4.2382)   | 0.1346**<br>(4.2850)   | 0.1298**<br>(4.1563)   | 0.1301**<br>(4.1632)   | 0.1332**<br>(4.3391)   | 0.1321**<br>(4.1842)   | 0.1283**<br>(4.1667)   |
| F * A                                 | 0.0105<br>(1.1284)     | 0.0098<br>(1.0370)     | 0.0089<br>(0.9661)     | 0.0096<br>(1.0206)     | 0.0098<br>(1.0839)     | 0.0099<br>(1.0365)     | 0.0091<br>(1.0098)     |
| E * D                                 | 0.0452<br>(0.2438)     | 0.0388<br>(0.2109)     | 0.0271<br>(0.1471)     | 0.0018<br>(0.0098)     | 0.0649<br>(0.3597)     | 0.0437<br>(0.2381)     | 0.1084<br>(0.5960)     |
| E * C                                 | 0.0921**<br>(3.1953)   | 0.0890**<br>(3.1064)   | 0.0893**<br>(3.0789)   | 0.0863**<br>(3.0808)   | 0.0941**<br>(3.3635)   | 0.0897**<br>(3.1277)   | 0.0925**<br>(3.3370)   |
| E * B                                 | −0.2060*<br>(−2.3771)  | −0.2069*<br>(−2.3975)  | −0.1940*<br>(−2.2362)  | −0.1983*<br>(−2.2633)  | −0.2165*<br>(−2.5143)  | −0.2082*<br>(−2.4103)  | −0.2199*<br>(−2.5469)  |
| E * A                                 | −0.0088<br>(−0.3407)   | −0.0100<br>(−0.3837)   | −0.0133<br>(−0.5206)   | −0.0093<br>(−0.3576)   | −0.0101<br>(−0.3885)   | −0.0097<br>(−0.3651)   | −0.0128<br>(−0.4970)   |
| D * C                                 | −0.1310**<br>(−3.0948) | −0.1279**<br>(−3.0644) | −0.1265**<br>(−2.9988) | −0.1243**<br>(−3.0309) | −0.1345**<br>(−3.2680) | −0.1297**<br>(−3.0891) | −0.1322**<br>(−3.2643) |
| D * B                                 | −0.0538<br>(−0.5971)   | −0.0600<br>(−0.6694)   | −0.0635<br>(−0.7037)   | −0.0566<br>(−0.6304)   | −0.0433<br>(−0.4764)   | −0.0517<br>(−0.5761)   | −0.0359<br>(−0.3971)   |
| D * A                                 | −0.0441<br>(−1.2612)   | −0.0417<br>(−1.1776)   | −0.0421<br>(−1.2199)   | −0.0461<br>(−1.3327)   | −0.0418<br>(−1.1822)   | −0.0426<br>(−1.1886)   | −0.0422<br>(−1.2166)   |
| C * B                                 | −0.0202<br>(−0.9299)   | −0.0197<br>(−0.9095)   | −0.0205<br>(−0.9382)   | −0.0201<br>(−0.9309)   | −0.0189<br>(−0.8788)   | −0.0198<br>(−0.9018)   | −0.0184<br>(−0.8572)   |
| C * A                                 | 0.0092<br>(1.5046)     | 0.0088<br>(1.4362)     | 0.0093<br>(1.5172)     | 0.0087<br>(1.4835)     | 0.0094<br>(1.6267)     | 0.0092<br>(1.4981)     | 0.0090<br>(1.5559)     |
| B * A                                 | 0.0400*<br>(1.6878)    | 0.0394<br>(1.6348)     | 0.0388*<br>(1.6513)    | 0.0376*<br>(1.6641)    | 0.0383<br>(1.6187)     | 0.0397<br>(1.6374)     | 0.0377<br>(1.6169)     |
| Year1                                 | 0.0339**<br>(8.3878)   | 0.0344**<br>(8.7181)   | 0.0332**<br>(7.4540)   | 0.0324**<br>(7.4079)   | 0.0352**<br>(7.5768)   | 0.0357**<br>(8.7792)   | 0.0328**<br>(6.7549)   |
| <i>Inefficiency model</i>             |                        |                        |                        |                        |                        |                        |                        |
| Constant                              | −1.6025**<br>(−4.1933) | −1.1508**<br>(−3.3095) | 3.1445**<br>(9.4701)   | 4.0774**<br>(7.5925)   | −1.6503**<br>(−3.7218) | −1.9804**<br>(−3.8106) | 2.9785**<br>(5.3281)   |
| Unemployment rate                     | −0.0247**<br>(−3.5136) | −0.0514**<br>(−6.7206) | −0.0439**<br>(−5.7417) | −0.0365**<br>(−4.5828) | −0.0235**<br>(−2.5856) | −0.0490**<br>(−6.8962) | −0.0410**<br>(−4.3281) |

(continued on next page)

**Table A1** (continued)

| Variable                                      | (1)                    | (2)                    | (3)                    | (4)                    | (5)                    | (6)                    | (7)                    |
|-----------------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| <i>Inefficiency model</i>                     |                        |                        |                        |                        |                        |                        |                        |
| Population density                            | −0.0555**<br>(−6.3933) | −0.0464**<br>(−7.4453) | −0.0485**<br>(−7.4488) | −0.0409**<br>(−5.9351) | −0.0529**<br>(−5.8337) | −0.0468**<br>(−7.6972) | −0.0447**<br>(−5.9409) |
| Herfindahl index                              | 0.3453**<br>(5.0724)   | 0.1254*<br>(2.4019)    | 0.1264**<br>(2.6597)   | 0.0036<br>(0.0779)     | 0.3317**<br>(3.8551)   | 0.1607**<br>(2.6988)   | 0.1343*<br>(2.0125)    |
| Share of left                                 | −0.0025*<br>(−2.4930)  | −0.0090**<br>(−4.9833) | −0.0015<br>(−1.4163)   | −0.0058**<br>(−4.4367) | −0.0015<br>(−1.2759)   | −0.0090**<br>(−4.0450) | −0.0005<br>(−0.4546)   |
| Dummy independent municipality (IM)           | 2.5062**<br>(6.1182)   | 2.2549**<br>(6.0632)   | 1.7430**<br>(7.6678)   | 1.6732**<br>(6.4256)   | 2.7270**<br>(5.3425)   | 3.3852**<br>(5.9887)   | 1.1467*<br>(1.9620)    |
| Voter turnout (VT)                            | −0.0124**<br>(−4.6643) | –                      | –                      | −0.0045*<br>(−2.4775)  | −0.0056*<br>(−2.4660)  | –                      | –                      |
| Dummy free voter union (FVU)                  | –                      | −0.6658**<br>(−6.5112) | –                      | −0.5210**<br>(−6.1659) | –                      | 0.1469*<br>(2.3723)    | –                      |
| Ratio eligible voters (EV) / population (POP) | –                      | –                      | −0.0631**<br>(−8.0803) | −0.6020**<br>(−6.4779) | –                      | –                      | −0.0608**<br>(−5.3781) |
| IM * VT                                       | –                      | –                      | –                      | –                      | −0.0079*<br>(−2.0309)  | –                      | –                      |
| IM * FVU                                      | –                      | –                      | –                      | –                      | –                      | −1.2045**<br>(−5.7661) | –                      |
| IM * RatioEV/POP                              | –                      | –                      | –                      | –                      | –                      | –                      | 0.0078<br>(0.8322)     |
| Year2                                         | −0.1326**<br>(−5.2779) | −0.0945**<br>(−5.8795) | −0.0131<br>(−0.9589)   | −0.0411*<br>(−2.4968)  | −0.1359**<br>(−4.5517) | −0.0949**<br>(−6.1454) | −0.0101<br>(−0.5494)   |
| Sigma-squared                                 | 0.2976**<br>(6.5733)   | 0.2689**<br>(6.5343)   | 0.2113**<br>(8.2073)   | 0.1976**<br>(6.8306)   | 0.2490**<br>(6.5530)   | 0.2693**<br>(6.1351)   | 0.1984**<br>(7.7788)   |
| Gamma                                         | 0.9559**<br>(140.2274) | 0.9518**<br>(139.0069) | 0.9392**<br>(131.9161) | 0.9334**<br>(96.7381)  | 0.9470**<br>(119.0643) | 0.9517**<br>(116.1515) | 0.9349**<br>(103.7188) |
| log-likelihood                                | 1393.22                | 1394.94                | 1399.64                | 1403.48                | 1391.88                | 1397.87                | 1399.75                |

Note:  $N = 2961$ . Dependent variable: net current primary expenditures. The dependent as well as the output variables are in natural logs. \*\* (\*) denotes significance at the 5% (10%) level. The variables “year1” and “year2” accounts for both technical change in the stochastic cost frontier and time-varying inefficiency effects.

**Table A2**

Sensitivity analysis: The determinants with an alternative definition of the municipalities' expenditure.

| Variable                                                | (1)                    | (2)                    | (3)                    | (4)                    | (5)                    | (6)                    | (7)                    |
|---------------------------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| <i>Production environment and political constraints</i> |                        |                        |                        |                        |                        |                        |                        |
| Unemployment Rate                                       | −0.0245**<br>(−3.6669) | −0.2449**<br>(−3.1444) | −0.1473**<br>(−5.3444) | −0.0272**<br>(−3.9264) | −0.0362**<br>(−4.6356) | −0.2249**<br>(−3.1408) | −0.2208**<br>(−3.6254) |
| Population density                                      | 0.0010<br>(1.3341)     | 0.0098*<br>(1.6863)    | 0.0033<br>(0.7970)     | 0.0008<br>(0.3824)     | 0.0033<br>(1.1387)     | 0.0115**<br>(2.2251)   | 0.0074*<br>(1.8273)    |
| Herfindahl index                                        | 0.0882**<br>(2.4189)   | 0.7770**<br>(3.4419)   | 0.5060**<br>(5.7243)   | 0.1101**<br>(2.5103)   | 0.1206**<br>(2.6476)   | 0.6613**<br>(3.0193)   | 0.7347**<br>(3.2288)   |
| Share of left                                           | 0.0010**<br>(4.9282)   | 0.0003<br>(0.2293)     | 0.0019*<br>(1.7175)    | 0.0014*<br>(1.8311)    | 0.0002<br>(0.2313)     | 0.0001<br>(0.0893)     | 0.0009<br>(0.9103)     |
| Dummy independent municipality (IM)                     | 0.0753**<br>(4.7770)   | 0.4933**<br>(3.4264)   | 0.3087**<br>(6.6730)   | 0.0849**<br>(4.5565)   | 0.1533<br>(0.8899)     | 1.3621**<br>(3.4727)   | 6.3988**<br>(2.2542)   |
| <i>Voter involvement</i>                                |                        |                        |                        |                        |                        |                        |                        |
| Voter turnout (VT)                                      | −0.0035**<br>(−3.7717) | –                      | –                      | −0.0042**<br>(−2.8652) | −0.0046**<br>(−2.5355) | –                      | –                      |
| Dummy free voter union (FVU)                            | –                      | −0.2463**<br>(−2.0133) | –                      | 0.0025<br>(0.0717)     | –                      | 0.1512**<br>(2.3611)   | –                      |
| Ratio eligible voters/population (Ratio EV/POP)         | –                      | –                      | −0.0067**<br>(−2.1565) | −0.0032<br>(−1.4963)   | –                      | –                      | 0.0130**<br>(2.2831)   |
| IM * VT                                                 | –                      | –                      | –                      | –                      | −0.0004<br>(−0.1486)   | –                      | –                      |
| IM * FVU                                                | –                      | –                      | –                      | –                      | –                      | −1.0142**<br>(−3.4911) | –                      |
| IM * Ratio EV/POP                                       | –                      | –                      | –                      | –                      | –                      | –                      | −0.0826**<br>(−2.1667) |
| Sigma-squared                                           | 0.0312**<br>(205.4895) | 0.1491**<br>(3.3643)   | 0.0973**<br>(6.5987)   | 0.0309**<br>(27.9620)  | 0.0369**<br>(11.0568)  | 0.1296**<br>(3.3156)   | 0.1427**<br>(3.1744)   |
| Gamma                                                   | 0.0096<br>(0.0919)     | 0.8371**<br>(16.0853)  | 0.7518**<br>(18.8513)  | 0.0167<br>(0.5868)     | 0.2771**<br>(3.2544)   | 0.8127**<br>(14.0780)  | 0.8318**<br>(14.7760)  |
| Log-likelihood                                          | 949.44                 | 946.84                 | 946.21                 | 951.27                 | 948.58                 | 950.10                 | 949.24                 |

Note:  $N = 2961$ . Dependent variable: Sum of expenditures on the six spending categories used as output factors (defined in Section 4.2): (1) Total population includes the expenditures on general administration, (2) number of students those on education, (3) number of kindergarten places and (4) population over age 65 those on social security, (5) surface of public recreational facilities those on 'Health, Sport, Recovery' and 'Public Facilities', and (6) number of employees paying social security contributions includes the expenditures on business development. For the shares of the different expenditure categories see Table 2. \*\* (\*) denotes significance at the 5% (10%) level.

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