

Discussion Paper No. 14-017

**Direct Democracy and
Local Government Efficiency**

Zareh Asatryan and Kristof De Witte

ZEW

Zentrum für Europäische
Wirtschaftsforschung GmbH

Centre for European
Economic Research

Discussion Paper No. 14-017

Direct Democracy and Local Government Efficiency

Zareh Asatryan and Kristof De Witte

Download this ZEW Discussion Paper from our ftp server:

<http://ftp.zew.de/pub/zew-docs/dp/dp14017.pdf>

Die Discussion Papers dienen einer möglichst schnellen Verbreitung von
neueren Forschungsarbeiten des ZEW. Die Beiträge liegen in alleiniger Verantwortung
der Autoren und stellen nicht notwendigerweise die Meinung des ZEW dar.

Discussion Papers are intended to make results of ZEW research promptly available to other
economists in order to encourage discussion and suggestions for revisions. The authors are solely
responsible for the contents which do not necessarily represent the opinion of the ZEW.

Direct Democracy and Local Government Efficiency

Zareh Asatryan*[†]

(ZEW Mannheim *and* University of Freiburg)

Kristof De Witte[‡]

(Maastricht University *and* KU Leuven)

February, 2014

Abstract

This paper studies the role of direct democracy in ensuring efficient and cost-effective provision of goods and services in the public sector. The sample consists of the population of municipalities in the German State of Bavaria, where in the mid-1990s considerable direct democratic reforms granted citizens with wide opportunities to directly participate in local affairs through binding initiatives. Using information on the municipal resources and the municipal provision of public goods, and applying a fully non-parametric approach to estimate local government overall efficiency, the analysis shows that more direct democratic activity is associated with higher government efficiency. This result suggests that more inclusive governance through direct decision-making mechanisms may induce more accountable and less inefficient governments.

Keywords: Direct democracy, Public sector efficiency, Conditional efficiency.

JEL codes: C14, D7, H7.

*Zareh Asatryan, ZEW, L7 1, 68161 Mannheim, Germany; Tel.: (+49)6211235392; Email: asatryan@zew.de

[‡]Kristof De Witte. Address: Top Institute for Evidence Based Education Research, Maastricht University, Kapoenstraat 2, 6200 MD Maastricht, the Netherlands; Tel.: (+31) 433848437; k.dewitte@maastrichtuniversity.nl. Address (ii): Faculty of Economics and Business, KU Leuven, Naamsestraat 69, 3000 Leuven. kristof.dewitte@kuleuven.be.

[†]We gratefully acknowledge Benny Geys, Friedrich Heinemann and Wim Moesen for valuable comments.

1 Introduction

It has been long established that public bureaucracies often lack the appropriate incentives to provide public goods and services in an efficient and cost-effective manner (e.g. Ostrom and Ostrom, 1971). These incentive schemes are governed by a set of accepted rules (i.e. political institutions), the functionality of which, among other things, ultimately determines public sector efficiency. Institutions to constrain the inefficient behavior of budget maximizing bureaucrats usually aim at inducing competition between elected representatives (Niskanen, 1968). But what happens if voters (in addition to their representatives) are granted decision-making mechanisms to directly choose (or block) laws and policies? More specifically, can direct citizen participation through direct democratic institutions (e.g. initiatives) increase public sector efficiency? This is the question we visit in the current paper.

A large amount of applied work has attempted to study the determinants of public sector efficiency both in public firms and national or local governments.¹ Regarding the production of decentralized public goods and services, unsurprisingly, democratic institutions such as citizen participation (Borge et al., 2008; Geys et al., 2010) or political competition (Eeckaut et al., 1993; Ashworth et al., 2006) have been shown to be significant determinants of local government efficiency (measured as some ratio of input-to-output indicators). The arguments and the supporting empirical evidence, however, do not go beyond the idea that higher participation (e.g. measured by election turnout) improves efficiency by a better monitoring of local politicians' activities and through a positive impact on their effort levels.

Scholars of direct democracy, on the other hand, have extensively argued that direct democracy allows the general public to participate in law making and policy decisions which may alleviate all kinds of possible principal-agent problems. It is argued, that through initiatives voters in a direct democratic system act as an additional veto-player and, thus, are able to reject inefficient spending projects and petition for better ones, de-

¹See Kalb (2010b) for a recent literature review of the commonly used methods and their applications.

mand more productive public sector investments, induce competitive bidding on public auctions, lower production costs by fighting public sector unions or other established interest groups, etc. In general, the introduction of direct democratic elements to complement institutions of representative democracy is expected to increase government efficiency by breaking the established status quo and inducing more accountable governments (for a general overview see Matsusaka, 2004).

Contributions in this second strand of literature (i.e. effects of direct democracy), however, concentrate on general economic (e.g. growth, employment etc.) and fiscal (e.g. government spending, taxation, borrowing etc.) effects of direct democratic institutions, and to a lesser extent on their effects on government efficiency. Several exceptions emerge. Pommerehne (1983), one of the first empirical studies, finds an efficiency-enhancing effect of direct democracy on (publicly managed) trash collection in Swiss cities. In an interesting recent contribution, Matsusaka (2009) shows that US direct democratic legislation cuts the inefficiently high levels of public sector employment (and wages) by breaking the political power of patronage of public sector unions. Nguyen-Hoang (2012), with school-district level data from the US, finds that budget referenda increase student-teacher ratios.² These findings are not surprising, since voters arguably have much clearer positions against inefficient governments than regarding the level of its expenditures or taxes.

These studies, although suggestive, only concentrate on a specific sector of government service (i.e. trash collection, public sector employment, primary education). Clearly, direct democracy may potentially affect the efficiency of any production sector over which initiatives are not prohibited by law. Hence, it is important to understand the “overall”

²There are several further studies related to efficiency, which, however, contain less direct evidence. Feld and Savioz (1997) demonstrate greater total factor productivity in Swiss Cantons with more direct democracy, which then translates into higher output. Blomberg et al. (2004) find that American States with the initiative legislation host more productive workers and have higher (both private and public) capital to labor ratios. Blume et al. (2009) study the economic effects of direct democracy in a cross-country setting, where next to common indicators such as output or spending, aggregated indices of government quality such as (broadly defined) effectiveness, corruption, tax morale etc., are also employed. Evidence of a different sort comes from Santerre (1986) where in a Tiebout-type voting context consumer-voters are willing to pay a premium (in real estate prices) to live in communities with direct democratic rules, since they perceive these to be more efficient.

or “global” efficiency-related effects of direct democracy. The lack to do so can perhaps be explained by the methodological and data-driven complexity of measuring government’s overall efficiency. Similar to the arguments of reversed causality, direct democracy on itself can influence the level of the municipal resources and provided public goods. Any direct democracy related effects should therefore be immediately accounted for within an efficiency model. This so called “separability condition” is often neglected in earlier work, and can bias the estimates (for a discussion see Simar and Wilson, 2007). In this paper, we bridge this gap with an attempt to tackle these methodological issues.

The first strand of literature (on the determinants of government efficiency mentioned above) is also prone to methodological issues. In the current paper, we define efficiency as a relative concept (in contrast to, e.g. Borge et al., 2008) without making any *a priori* assumptions on the functional form of the production frontier (in contrast to semi-parametric models applied in, e.g. Geys et al., 2010). As argued by Yatchew (1998), the functional form of the production process is often unobserved to researchers. Hence, specification biases might arise if parametric assumptions are explicitly set by the researcher. On the other hand, the traditional non-parametric methods as the popular Data Envelopment Analysis (applied in De Borger et al., 1994; De Borger and Kerstens, 1996) have a deterministic nature in that they ignore measurement errors and bias in the data. The efficiency estimates might therefore infer from outlying observations, which make them less reliable.

We avoid similar drawbacks by employing a fully non-parametric approach to measure overall efficiency.³ In contrast to earlier literature, the approach is not deterministic and allows us to account for heterogeneity among municipalities. In a second step, we test the role of direct democratic activity in explaining the observed differences in efficiency scores across local government units. Such global approach is more appropriate because of the wide coverage and applicability of direct democratic instruments in various sectors of social life. Even more so for our setting of local governments in the German State

³See Emrouznejad and De Witte (2010) for a practical introduction to non-parametric analysis.

of Bavaria, where in mid-1990 a bottom-up reform introduced significant rights of direct democracy at virtually all sectors of local public good provision.⁴

Moreover, this reform went hand-in-hand with a wave of public administration reforms across German States, often referred to as New Public Management reforms, aiming to make the local public sector more efficient and competitive (e.g. Wollmann, 2000; Reichard, 2003). The new institutions of direct democracy allowed citizens wide opportunities to participate in local affairs through binding initiatives, and were meant to complement to the public management reforms with the important element of citizen participation. As Wollmann (2000) describes, the direct democratic reforms brought a “participatory revolution” in an obvious reaction and an attempt to counteract the economic and fiscal one-sidedness of administrative reforms. Wollmann’s strong narrative is perhaps not even exaggerated as this innovation has quickly become a popular policy tool and an important decision-making institution resulting in more than 2,500 petitions for initiatives (around half of them successful) in the population of around 2,000 Bavarian municipalities (from the 1995 reform until 2011). The topics of initiatives apply to a wide range of issues⁵ under the responsibility of local authorities,⁶ thus we expect a good proportion of them to be of central relevance to local public good provision efficiency.

Against this background, we introduce a clear hypothesis: *inclusive governance*, defined as municipalities with *more direct democratic activity*, *increases public sector efficiency*. To test this proposition, we collect data (date, type, topic, turnout, result etc.) on all the 1,095 initiatives - on average this equals to an initiative in every second municipality - that

⁴See Asatryan et al. (2013) and Asatryan (2014) for summaries of direct democratic institutions, respectively, in Bavaria and across all German States. As shown in these studies, Bavaria has far more lenient institutions of direct democracy than other German States. This is precisely the reason for us to concentrate on the case of Bavaria.

⁵Topics of initiatives include transportation projects (23.6%); economic projects (23.5%); public social and educational institutions (14.2%); public infrastructure and utilities (12.7%); urban development laws (10.1%); cultural projects (4.2%); waste disposal projects (3.5%); residential planning projects (1.6%); local government reform (1.5%); charges and fees (1.2%); laws and by-laws (0.9%) and other (3%). Source: Datenbank Bürgerbegehren, <http://www.mehr-demokratie.de/bb-datenbank.html>.

⁶Local governments in Bavaria, similar to all German municipalities, on average spend around 2,200 Euros per capita (2011 figures) in the following areas: general administration (27%); social welfare (19%); education (13%); construction, housing and traffic (12%); security (9%); public facilities (9%); science and research (5%); health, sports and leisure (4%) and municipal firms (2%). Source: Bayerisches Landesamt für Statistik und Datenverarbeitung (2013).

took place in Bavarian towns between 2003 and 2011. To measure efficiency we employ input data on the size (population) and relative wealth (per capita government spending) of municipalities, and output indicators on key municipal functions (i.e. education, public facilities, health care, social welfare, public sector employment and health, sports and leisure). The results suggest that, given a set of town-level characteristics, those municipalities which hosted *more initiatives* on average produce the observed outputs *more efficiently* per unit of given resource.

These findings, although empirically robust and theoretically consistent, can be potentially exposed to several objections. First, the efficiency scores are only imperfect measures of local government efficiency. They may potentially omit further dimensions of local public goods, as well as certain (unobservable) qualitative features of these goods. However, this critique is common to the literature, while our study, as explained above, is a one step forward. Second, our identification does not allow to directly account for endogeneity. A serious source of such bias might, for example, come from reverse causation. However, the possibility that such bias is deriving our results can be at least partially ruled out. The idea behind a reverse effect is that voters do not have to wait until the next elections (to punish politicians), but may react to inefficient government behavior by opting for more initiatives. We would thus expect a negative effect of efficiency on direct democratic activity, which, if true, would bias our results towards zero. Therefore, it is possible that we are even underestimating the effect of direct democracy on local government efficiency. We return to these issues more thoroughly after presenting the results.

The remainder of this paper is structured as follows: In Sections 2 and 3 we develop our methodological approach and describe the data. The subsequent Section 4 presents our empirical findings and performs robustness checks, followed by conclusions in Section 5.

2 A Conditional Efficiency Model

Performance of municipalities is estimated against a frontier consisting of best practice observations. In this sense, performance estimation is a relative concept in line with seminal work of Farrell (1957). We apply an efficiency model which is based on the Free Disposal Hull (FDH) methodology (Deprins et al., 1984). The model is well-suited to the setting at hand because of four reasons. First, it is a fully non-parametric methodology which does not require any information on the production process. This is convenient as information on the relationship between the resources and the produced outputs is often unavailable to researchers (e.g. Yatchew, 1998). As parametric models assume a priori a functional form on this relationship, they might be wrongly specified which leads to biased estimation results (Hjalmarsson et al., 1996). Second, given its linear programming nature, the FDH model does not rely on price information (Deprins et al., 1984). This is convenient for the current application as information on output prices is often unavailable. Third, we use a recent extension of the traditional FDH model which mitigates the influence of outlying observations (e.g., arising from measurement errors or atypical observations; so-called “robust FDH”; Cazals et al. 2002) and exogenous variables (“robust conditional FDH”; Daraio and Simar 2005). The robust estimates have been shown to possess attractive properties: i.e., they are consistent (i.e., estimate the “true” inefficiency) and have a fast rate of convergence (see Jeong et al., 2010). Finally, the model is able to adapt the efficiency scores for the heterogeneity among municipalities; so-called “robust and conditional FDH”. We briefly present the model in three steps: (step 1) the basic FDH model, (step 2) the robust FDH model and (step 3) the robust and conditional FDH model. For an in depth discussion, we refer to Daraio and Simar (2007) and Fried et al. (2008).

2.1 The Free Disposal Hull model

Consider a set χ of n municipalities, which is characterized at the level of the municipality by p heterogeneous and non-negative inputs x ($x_1 \dots x_p$) and q heterogeneous and non-negative outputs y ($y_1 \dots y_q$). The sample χ is then denoted by $\chi = \{(X_i, Y_i) = 1, \dots, n\}$. The FDH model assumes that the input-output combinations are certainly feasible and that the inputs and outputs are freely disposable. Free disposability means that it should be possible to produce the output y also with more inputs and to produce less outputs with a given input set x . Formally: $\forall (x, y) \in \Psi, x \geq x$ and $y \leq y$ then $(x, y) \in \Psi$ [where Ψ denotes the production technology set: $\Psi = \{(x, y) \mid x \in \mathfrak{R}_+^p, y \in \mathfrak{R}_+^q, (x, y) \text{ is feasible}\}$]. The best practice production set is defined as a free disposable hull of undominated input-output combinations:

$$\Psi_{FDH} = \{(x, y) \in \mathfrak{R}_+^{p+q} \mid x \leq X_i, y \leq Y_i \in \chi\} \quad (1)$$

In the study at hand, we evaluate efficiency from an output-oriented perspective: with the given resources, what is the output shortfall for a municipality if it would produce as efficient as the observations on the best practice frontier? The output-oriented inefficiency estimates, $\lambda(x_0, y_0)$, measure the distance to the best practice frontier (for further details see Fried et al., 2008):

$$\lambda(x_0, y_0) = \sup\{\lambda \mid x_0, \lambda y_0\} \in \Psi_{FDH} \quad (2)$$

As an efficient observation is located on the best practice frontier, it obtains an efficiency score λ equal to 1. An inefficient observation obtains an efficiency score λ larger than 1. The inefficiency $(\lambda - 1)$ indicates the potential percentage increase in output if the observation would produce as efficient as its reference partner.

2.2 The robust FDH model

The FDH model in equation (2) is deterministic and may be problematic in presence of outlying observations as these heavily influence the best practice frontier. Outlying observations might arise because of measurement error or atypical observations. Cazals et al. (2002) suggested to mitigate the impact of outlying observations in the FDH model, by drawing with replacement subsamples of size $m < n$ among those observations with fewer inputs than the evaluated observation (i.e., among those Y_i such that $x_0 \geq X_i$). Cazals et al. (2002) shows that the convergence rate of this order- m estimator is comparable to parametric estimators. Therefore, this estimator avoids the curse of dimensionality problem. Performance is assessed relative to this smaller sample. Following Daraio and Simar (2005), the partial sample size is determined as the value for which the number of super-efficient observations (i.e., $\lambda > 1$) is relatively constant. In the setting at hand, m corresponds to 100, although alternative values delivered similar outcomes.

After repeating the sampling and efficiency evaluation B times, where B is sufficiently large (larger than 2,000), the robust efficiency scores $\lambda^m(x_0, y_0)$ are obtained by taking the arithmetic average of the B inefficiencies.⁷

Thanks to the smaller sample size, an outlying observation will not constitute the reference sample in every draw. This will mitigate the impact of outlying observations. In case the evaluated observation (x_0, y_0) does not constitute its own reference set in every of the B drawings, the efficiency score λ^m will be smaller than 1. This so-called super-efficiency indicates that the evaluated observation is performing better than the average m observations in its reference sample (Daraio and Simar, 2007).

⁷Cazals et al. (2002) also suggested a perfectly equal integral formulation of this bootstrap. Given its computational efficiency, the code underlying our analysis uses this integral formulation. Our code in R is available upon request from the authors.

2.3 The robust and conditional FDH model

The robust FDH scores can be easily adapted to include heterogeneity among municipalities (Daraio and Simar, 2005). Denote the exogenous variables, which can – at least in the short run – not be influenced, by z ($z_1 \dots z_\gamma$).⁸

Daraio and Simar (2005) suggested to draw the subsamples of size m by a given probability, which is determined by a Kernel function around the continuous exogenous variables z . Observations (X, Y) with similar exogenous characteristics are drawn with a higher probability than observations which are less similar in z . Similar to before, the robust conditional FDH model draws B times the reference sample of size m with replacement, but now with a probability

$$\frac{\frac{K(z_0 - Z_i)}{h}}{\sum_{j=1}^n \frac{K(z_0 - Z_j)}{h}}$$

among those Y_i such that $X_i \leq x_0$; where $K(\cdot)$ denotes a Kernel function and h the appropriate bandwidth (estimated by cross-validation) (for more information on bandwidth selection, see Badin et al., 2010). Finally, the B efficiency evaluations are averaged to obtain the robust conditional efficiency estimates $\lambda^m(x_0, y_0 \mid z_0)$. The interpretation of the efficiency scores is similar to the robust FDH model. The convergence rate of the conditional estimator of Daraio and Simar (2005) depends on the dimension of Z , implying that the curse of dimensionality is not completely avoided but may exist for the continuous variables due to the smoothing in z .

De Witte and Kortelainen (2013) studied the possibility to also include discrete variables in the model, compared to only continuous environmental variables. They propose a standard multivariate product Kernel for continuous, ordered discrete and unordered discrete variables, in order to smooth these mixed variables. Although the convergence

⁸Various alternative techniques to capture heterogeneity exist. In contrast to alternatives, the robust conditional efficiency model assumes that the exogenous variables Z directly influence the shape of the best practice frontier (i.e., the conditional FDH model does not assume a separability condition). Efficiency estimates are thus determined by both the inputs, outputs and exogenous variables (see Fried et al. (2008), for an extensive discussion).

rate of the conditional efficiency estimator depends on the number of environmental variables, nonparametric statistics and econometric theory tells us that the convergence rate of non parametric estimators for conditional density and distribution functions involving mixed variables do not depend on the number of discrete variables but only on the number of continuous variables.

The conditional efficiency estimates allow us to examine the direction of the influence of the exogenous variation on municipality performance. In particular, the ratio of the conditional [i.e., accounting for heterogeneity; $\lambda^m(x_0, y_0 | z_0)$] to the unconditional [i.e., ignoring heterogeneity; $\lambda^m(x_0, y_0)$] estimates can be (non-parametrically) regressed on the exogenous factor Z (Daraio and Simar, 2005, 2007). Daraio and Simar (2005) use a smooth nonparametric Kernel regression to estimate the regression model. This approach allows one to detect positive, negative and neutral effects of the environmental factors on the production process. However, the marginal coefficient on the median is less meaningful, since we regress on a ratio. When Z is continuous and univariate, the visualization is straightforward, as one can use scatter plots of the ratio of conditional to unconditional efficiency scores against Z , and as a smoothed nonparametric regression curve can illustrate the effect of Z on the production process. In an output-oriented efficiency, a horizontal line implies no effect and an increasing (decreasing) smoothed regression curve shows that Z is favorable (unfavorable) to the production process. If Z is multivariate, one can use *partial regression plots* for the visualization of the effect. This means that only one environmental variable is allowed to change and other variables are kept at a fixed value.

Based on the work of Li and Racine (2007), De Witte and Kortelainen (2013) present a non-parametric bootstrap procedure to obtain statistical inference on the direction of the influence. They propose a local linear regression estimation and use recently developed nonparametric tests and a nonparametric naive bootstrap procedure to estimate the finite-sample distribution and a critical value of the nonparametric test statistics. Standard errors and p-values of the significance of the influence of Z on λ^m can be obtained.

This model does not suffer from similar inference problems as two-stage models with the traditional and deterministic FDH models.

3 Data and Model Specification

The sample consists of the universe of around 2,000 Bavarian municipalities. For this sample we compile data on i) direct democratic activity, ii) input indicators, iii) output indicators, and iv) a number of control variables. Below we discuss these variables in detail. Summary statistics can be found in Table 1.

The main tool of direct democracy in Bavaria (and other German States) are the initiatives (“Bürgerbegehren”), which can be initiated either by citizens (by collecting a minimum number of signatures of 3-10% of municipal population depending on size - around 90% of all initiatives) or by the city councils (by a two-thirds majority - around 10% of all initiatives) on issues within the competencies of the municipality (with several exclusions, such as initiatives on the internal organization of the municipal administration or ones directly on the local budgets).⁹ We collect information on all the 1,095 petitions for initiatives that took place in Bavarian towns between 2003 and 2011, and define *initiative* to be a binary variable indicating whether a given town has hosted at least one initiative in the period between 2003-2011. In case an initiative successfully passes the legislative process (e.g. signature collection) and is put to vote (“Bürgerentscheid”), we also observe the *turnout rate* which might be an indicator of voters’ relative (dis)interest in the given topic.¹⁰

The *input variables* in the model are the size of the municipality (measured by total population) and relative wealth of the municipality as measured by total gross expendi-

⁹See Asatryan et al. (2013) and Asatryan et al. (2014) for more details on this institution.

¹⁰We have further experimented with alternative specifications for the main variable of interest, *initiatives*. For example, we specified initiatives as a continuous term representing the years since the last initiative, or we changed the time period to include only recent initiatives. We have also tested the robustness with respect to those initiatives which have actually reached to the polls as an alternative definition of direct democratic activity. While the direction of the correlation was stable in all robustness tests (available upon request), its significance level dropped. This is probably due to the low discriminatory power of the variables.

tures in 2005 Euros. The former variable captures the scale economies. As the efficiency analysis only compares municipalities with less input variables, it effectively accounts for scale and income economies.

In line with earlier literature (e.g. De Borger et al., 1994; De Borger and Kerstens, 1996; Geys et al., 2010; Kalb, 2010a, etc.), we collect *output variables* to cover as many functions under the direct control of local governments as data allows. We have information on the following six output variables: i) the number of pupils per teacher and ii) the number of children per staff member in kindergartens to capture the role of a local governments in providing public secondary and basic (pre-school) education; iii) treated persons in elderly care centers relatively to the number of available places measuring the efficiency of utilizing capacity in public health-care facilities; iv) the share of land used for green and recreational area as an indicator for public (health, sports and leisure) facilities; v) the share of employees paying social security contributions in working age population¹¹ to account for the government's role in guaranteeing social welfare services for its citizens; and vi) the amount of spending on municipal personnel. Indicators similar to (i), (ii) and (iv) have been used by De Borger et al. (1994); De Borger and Kerstens (1996); Geys et al. (2010) and (v) by Geys et al. (2010). To account for the provision to the elderly these studies adopt an indirect measure or a proxy for such services, by including the share of elderly in total population. In contrast, our data allows to directly measure such health care services by indicator (iii). Additionally, our output indicator (vi) allows to measure local government's vulnerability to excessive hiring. This is motivated by Matsusaka (2009) who shows that bureaucrats often tend to pad the public payroll with patronage workers, while direct democracy can be a mean to check such inefficient behavior. Overall, although not perfect, these indicators serve as proxies for several key municipal functions (i.e. education, public facilities, health care, social welfare, public sector employment and health, sports and leisure).

¹¹Note that the variable on the employees paying social security is measured at the workplace, while the denominator is at the town-level, so that the ratio doesn't necessarily have to be less than a unity.

Table 1: Summary Statistics

Variable	Description	Period	Obs	Mean	St Dev	Min	Max
<i>Direct democracy:</i>							
Initiative	Dummy if there was (at least one) petition for an initiative in that town	2003-2011	2,056	0.533	-	0	1
Turnout rate	Turnout rate (share of eligible votes in total population) on initiatives	2003-2011	522	0.518	0.160	0.130	0.915
<i>Inputs:</i>							
Pc expenditure	Annual per capita government expenditure net of transfers, 2005 Euros	2011	2,056	2.017	952	773	24,046
Total population	Total annual population	2011	2,056	6,126	33,950	259	1,378,176
<i>Outputs:</i>							
Student-teacher	Ratio of the number of students to teachers at secondary schools	2011	1,573	15.7	2.7	8.7	41.0
Children-personnel	Ratio of the number of children to personnel at kindergartens	2005	2,004	21.9	4.4	10.3	104.0
Elderly patients	Ratio of the number of treated persons to places in elderly care centers	2010	739	0.925	0.102	0.250	1.041
Green and recreational area	Share of green and recreational area in total municipal area	2011	1,999	0.006	0.009	0.000	0.113
Employees paying social security	Share of employees paying social security in working age population	2011	2,056	0.335	0.267	0.015	2.450
Pc expenditure on personnel	Annual per capita government expenditure on personnel, 2005 Euros	2011	2,056	286	103	29	1,276
<i>Controls:</i>							
Pc revenue	Annual per capita government revenue net of transfers, 2005 Euros	2011	2,056	2,065	998	600	24,304
Share of young	Share of population aged 18 or below	2011	2,056	0.180	0.021	0.086	0.255
Left share	Share of the sum of SPD, "Grüne" and "Die Linke" party delegates at local council	2011	2,056	0.122	0.145	0.000	0.680

Notes: Summary statistics - coverage period, number of observations, mean, standard deviation, minimum and maximum - are presented for the universe of 2,056 Bavarian municipalities. The data on initiatives (rows:1-2) is available at: <http://www.mehr-demokratie.de/bb-datenbank.html>. The input (rows: 3-4), output (rows: 5-10), and control variables (rows: 11-13) come from the Bavarian statistical office.

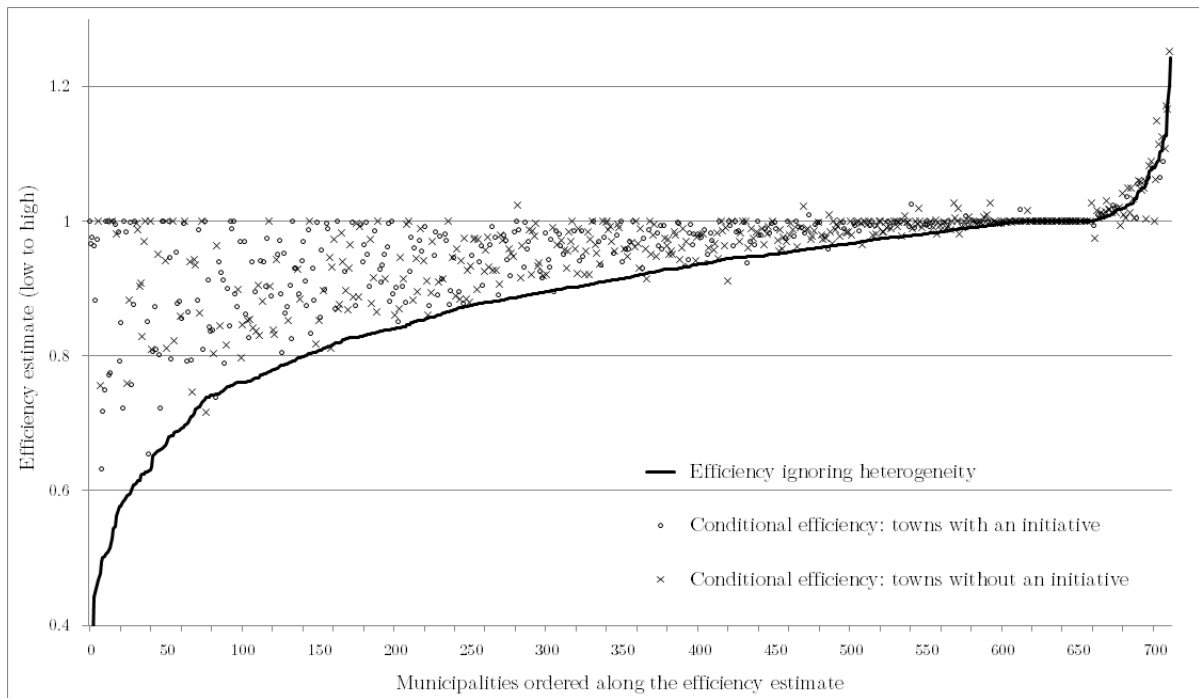
To test for robustness and to account for the difference between municipalities, in additional specifications we include three standard *control variables* that control for ideological differences, age structure of the population and per capita revenues (in line with De Witte and Geys, 2011).

4 Results

In a first step, we analyze the efficiency scores of the robust FDH model. These scores measure (for given population size and expenditure level) the shortfall in outputs by comparing each municipality relatively to the best practice observations. Thus they do not account for the heterogeneity among municipalities. The distribution of the efficiency scores is presented in Figure 1. The average efficiency amounts to 88%, indicating that the average municipality could increase its provision of outputs by 12% if it would work as efficient as the best practice observations. We also observe significant amount of variation around the mean (standard deviation of 0.126). The poorest performing municipality, with its given population size and income, can increase the outputs by almost 80%, while the best performing municipality is producing 24% more outputs than what could be expected relatively to its best practices.

In a second step, we discuss the efficiency scores of the conditional efficiency model (thus including the operational environment). The conditional efficiency scores are presented in Figure 1, where we differentiate between municipalities which hosted at least one initiative in the period under consideration (indicated with circles) and those that did not host any initiatives (indicated with diagonal crosses). By accounting for the fact that municipalities differ in their voting preferences (% of left wing votes), age structure (% young people) and relative wealth (per capita revenue), we can explain a significant part of the initial inefficiency scores. The average inefficiency of the municipalities in the sample decreases to 4% (efficiency of 96.0%). Also the variation around the mean decreases by half to standard deviation of 0.06. The least efficient municipality acquired an efficiency

Figure 1: Scatter of efficiency scores of Bavarian municipalities in 2011



Notes: Figure presents the scatter for the efficiency scores derived by the robust FDH and the conditional and robust FDH models. For the latter, estimates are presented separately for initiative and non-initiative towns. The sample is the population of Bavarian municipalities for which all the six output variables are available.

score of 0.63, while the most efficient municipality produces 25% more outputs that what can be expected. It is also clear from Figure 1 that, due to controlling for the operational environment, most (some) municipalities increase (decrease) their relative efficiency, i.e. are situated above (below) the unconditional efficiency curve. The distinction between initiative and non-initiative towns does not yield a clear-cut picture, thus in the next step we proceed to a more formal analysis.

In a third step, we use the model developed by De Witte and Kortelainen (2013) to explore which of the control variables matter most for municipal efficiency. The results are summarized in Table 2. Our main variable of interest - *initiative* - has a significantly favorable association with government efficiency (Model 1) robust to the inclusion of control variables (Model 2), i.e. municipalities with (at least) one initiative in the last decade on average obtain higher value for tax money. Likewise for the *turnout rate*, we find that higher quorum is associated with significantly more efficient provision of local

public goods. These findings are in line with the theoretical predictions discussed in the introduction.

Table 2: Main Results

Variable	<i>Model-1</i>		<i>Model-2</i>		<i>Model-3</i>	
	Influence	P-Value	Influence	P-Value	Influence	P-Value
Initiative dummy	Favorable	***	Favorable	***		
Turnout rate (%)	Favorable	*			Favorable	***
Young people (%)			Unfavorable		Unfavorable	*
Left wing votes (%)			Favorable	***	Favorable	***
Real p.c. revenue			Favorable	***	Favorable	***
R^2		0.193		0.246		0.575
Observations		712		712		712

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Table presents estimates of the robust and conditional Free Disposal Hull model discussed in Section 2. Model 1 is the baseline specification, Models 2 and 3 additionally account for a set of control variables. Favorable indicates an efficiency-enhancing association.

Regarding the control variables specified in Models 2 and 3 of Table 2, we observe a negative (but not robust) association between efficiency and the percentage of young people in the municipality. The share of left wing seats at local councils is positively correlated to efficiency. This is in line with earlier findings of De Witte and Geys (2011) who observed a significant influence of left ideology on library efficiency. Per capita revenues have a positive sign, indicating that richer municipalities are able to produce more outputs with the given set of inputs.

One concern with the models summarized in Table 2, is that they do not estimate the models on the whole sample. The reason is that around a third of municipalities - particularly the small ones - do not have elderly care centers. Thus the results could be potentially biased to selection (of only large municipalities). In Table 3, as a robustness

test, we re-estimate the same models but without the output variable on elderly care centers. Because the estimation of the resulting sample of around 1,500 observations (around one quarter of the total of 2,000 municipalities do not have secondary schools, so we have to eliminate them) is computationally prohibitive, we split the sample into two equally sized sub-samples of *small* and *large* municipalities according to the median population (which is around 3,640).

The previous findings of an efficiency enhancing effect of direct democracy are confirmed in the baseline regressions of both samples (Models 1 and 3). This result is also robust to the inclusion of additional control variables for the sample with population sizes less than the median (Model 3), whereas for larger ones the model does not yield to any significant effects (Model 4). The stronger results of the former case seem to be intuitive. One reason can be the relative homogeneity of the municipalities in that sample. In contrast, the sample with larger populations includes municipalities as small as having a few thousand inhabitants to cities like Bavaria's capital Munich with populations of over a million. Although we effectively control for population size, the larger urban areas also imply different political institutions as well as a different set of public goods that need to be provided. Another plausible explanation is that we are underestimating the effect of direct democracy in larger compared to smaller towns, since our binary variable of direct democracy only captures the first initiative and not the total number of initiatives (which, of course, increase by size).

Finally, we want to stress that these findings, although suggestive, should be interpreted with some care. In particular, our employed robust and conditional FDH model does not allow to account for the possible *endogeneity* between direct democratic activity and government efficiency. Such endogeneity may arise, for example, because of voters' (unobserved) preferences that might simultaneously determine both their propensity towards exploiting their direct democratic rights (i.e. initiatives) and their preferences for local (efficiency-related) policies (see Asatryan et al. (2013) for a discussion and treatment for such bias). Also, the model specification might suffer from endogeneity issues

Table 3: Robustness to sample selection

	<i>Model-1</i>		<i>Model-2</i>		<i>Model-3</i>		<i>Model-4</i>	
Sample:	Small Municipalities				Large Municipalities			
Variable	Influence	P-Value	Influence	P-Value	Influence	P-Value	Influence	P-Value
Initiative dummy	Favorable	***	Favorable	***	Favorable	***	Unfavorable	
Turnout rate (%)	Favorable				Favorable			
Young people (%)			Favorable				Unfavorable	
Left wing votes (%)			Favorable	***			Favorable	
Real p.c. revenue			Favorable				Favorable	
R^2		0.401		0.333		0.29		0.135
Observations		778		778		778		778

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Table presents estimates of the robust and conditional Free Disposal Hull model discussed in Section 2. Columns 1 and 2 (3 and 4) estimate the model on a sub-sample of municipalities with populations smaller (larger) than the median. Favorable indicates an efficiency-enhancing association.

arising from unobserved heterogeneity. For example, selection of more educated people to certain municipalities (and their governments) can be an issue, since the level of education (and other characteristics) may simultaneously influence the number of initiatives and the levels of efficiency.

Another, and possibly more serious source of bias, might come from *reverse causation*. However, the possibility that such bias is driving our results can be at least partially ruled out for two main reasons. First, rather than a simultaneous relation, we are studying the correlation between current efficiency scores and initiatives observed over the past decade. Second, the idea behind a reverse effect is that voters do not have to wait until the next elections (to punish politicians), but may react to inefficient government behavior by opting for more initiatives. We would thus expect a negative effect of efficiency on direct democratic activity, which, if true, would bias our results towards zero. Therefore,

it is possible that we are even underestimating the effect of direct democracy on local government efficiency.

5 Conclusion

A large body of literature has studied the effects of complementing a representative form of government with direct democratic institutions. The focus was on general economic (e.g. growth) and fiscal (e.g. government spending) effects of such reforms, while the evidence primarily came from Switzerland and the US. In this paper we extend the discussion to the introduction of the right to initiate (binding) direct democratic legislation into the local government code in the German State of Bavaria. This institutional innovation has quickly gained popularity resulting in a significant amount of initiatives (on average every second municipality hosted an initiative in the decade under consideration) on a broad range of topics under the responsibility of local authorities. We hypothesize that such direct decision-making mechanisms induce inclusive governance at the local level by increasing the role of citizens as an additional veto player on local bureaucrats' decisions. Our results suggest that more direct democratic activity is associated with higher government efficiency in the provision of goods and services per unit of collected resource.

Our findings can be seen as a generalization of earlier results on efficiency-enhancing effects of direct democracy in certain sectors of government service (i.e. trash collection, public sector employment, primary education) to overall government efficiency. We overcome the complexity of measuring overall government efficiency by estimating a fully non-parametric conditional efficiency model (so that we do not make assumptions on the government's production function) with output data on key municipal functions (i.e. education, public facilities, health care, social welfare, public sector employment and health, sports and leisure). Our results also shed some light on the positive role of voters' direct

participation (as a complement to electing representatives) in improving the quality of locally accepted laws and policies.

The current austerity forces public institutions (municipalities, countries, supra-national organizations) to show value for tax money. Resources should be spend as effective and efficient as possible. This paper shows that instruments of direct democracy might provide a tool to further increase the efficiency of public good provision. It is a way to involve citizens (which is often difficult, definitely for supra-national organizations) and keep bureaucrats focused.

While the current paper has focused on correlational evidence, further research should seek for direct causal tests on the relationship between direct democracy and government efficiency. A second stream of further research can focus on the resources. Current work considered the resources as given, but obviously, they are determined in a complex interplay between the institutions, the provided public goods and the underlying population. By disentangling this puzzle, additional insights can be obtained on how to keep government budgets under control.

References

- Asatryan, Z. (2014). The indirect effects of direct democracy: Local government size and non-budgetary voter initiatives. Discussion Paper 14-004, ZEW.
- Asatryan, Z., T. Baskaran, T. Grigoriadis, and F. Heinemann (2013). Direct democracy and local public finances under cooperative federalism. Discussion Paper 13-038, ZEW.
- Asatryan, Z., T. Baskaran, and F. Heinemann (2014). The effect of direct democracy on the level and structure of local taxes. Discussion Paper 14-003, ZEW.
- Ashworth, J., B. Geys, and B. Heyndels (2006). Determinants of tax innovation: The case of environmental taxes in Flemish municipalities. *European Journal of Political Economy* 22(1), 223–247.
- Badin, L., C. Daraio, and L. Simar (2010). Optimal bandwidth selection for conditional efficiency measures: A data-driven approach. *European Journal of Operational Research* 201(2)], 633–640.
- Bayerisches Landesamt für Statistik und Datenverarbeitung (2013). Gemeindefinanzen und Realsteuervergleich in Bayern 2012, Ergebnisse der vierteljährlichen Kassenstatistik. *München*.
- Blomberg, S. B., G. D. Hess, and A. Weerapana (2004). The impact of voter initiatives on economic activity. *European Journal of Political Economy* 20(1), 207–226.
- Blume, L., J. Müller, and S. Voigt (2009). The economic effects of direct democracy - a first global assessment. *Public Choice* 140(3-4), 431–461.
- Borge, L. E., T. Falch, and P. Tovmo (2008). Public sector efficiency: The impact of political and budgetary institutions, fiscal capacity and democratic participation. *Public Choice* 136(3-4), 475–495.

- Cazals, C., J.-P. Florens, and L. Simar (2002). Nonparametric frontier estimation: A robust approach. *Journal of Econometrics* 106, 1–25.
- Daraio, C. and L. Simar (2005). Introducing environmental variables in nonparametric frontier models: A probabilistic approach. *Journal of productivity analysis* 24(1), 93–121.
- Daraio, C. and L. Simar (2007). *Advanced robust and nonparametric methods in efficiency analysis - methodology and applications*. New York: Springer Science.
- De Borger, B. and K. Kerstens (1996). Cost efficiency of Belgian local governments: A comparative analysis of FDH, DEA, and econometric approaches. *Regional Science and Urban Economics* 26(2), 145–170.
- De Borger, B., K. Kerstens, W. Moesen, and J. Vanneste (1994). Explaining differences in productive efficiency: An application to Belgian municipalities. *Public Choice* 80(3-4), 339–358.
- De Witte, K. and B. Geys (2011). Evaluating efficient public good provision: Theory and evidence from a generalised conditional efficiency model for public libraries. *Journal of Urban Economics* 69(3), 319–327.
- De Witte, K. and M. Kortelainen (2013). What explains the performance of students in a heterogeneous environment? Conditional efficiency estimation with continuous and discrete environmental variables. *Applied Economics* 45(17), 2401–2412.
- Deprins, D., L. Simar, and H. Tulkens (1984). Measuring labor efficiency in post offices. In M. Marchand, P. Pestieau, and H. Tulkens (Eds.), *The performance of public enterprises: Concepts and measurement*, pp. 243–267. Amsterdam, North-Holland: Elsevier.
- Eeckaut, P. V., H. Tulkens, and M.-A. Jamar (1993). Cost efficiency in Belgian municipalities. In H. Fried, C. Lovell, and S. Schmidt (Eds.), *The Measurement of Productive*

- Efficiency - Techniques and Applications*, pp. 300–334. New York: Oxford University Press.
- Emrouznejad, A. and K. De Witte (2010). COOPER-framework: A unified process for non-parametric projects. *European Journal of Operational Research* 207(3), 1573–1586.
- Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society. Series A (General)* 120(3), 253–290.
- Feld, L. P. and M. Savioz (1997). Direct democracy matters for economic performance: An empirical investigation. *Kyklos* 50(4), 507–538.
- Fried, H. O., K. C. A. Lovell, and S. S. Shelton (Eds.) (2008). *The measurement of productive efficiency and productivity growth*. Oxford: Oxford University Press.
- Geys, B., F. Heinemann, and A. Kalb (2010). Voter involvement, fiscal autonomy and public sector efficiency: Evidence from German municipalities. *European Journal of Political Economy* 26, 265–278.
- Hjalmarsson, H., M. Gevers, and F. de Bruyne (1996). For model-based control design, closed-loop identification gives better performance. *Automatica* 32(12), 1659–1673.
- Jeong, S.-O., B. U. Park, and L. Simar (2010). Nonparametric conditional efficiency measures: Asymptotic properties. *Annals of Operations Research* 173(1), 105–122.
- Kalb, A. (2010a). The impact of intergovernmental grants on cost efficiency: Theory and evidence from German municipalities. *Economic Analysis and Policy* 40(1), 507–538.
- Kalb, A. (2010b). *Public Sector Efficiency: Applications to Local Governments in Germany*. Wiesbaden: Springer.
- Li, Q. and J. S. Racine (2007). *Nonparametric econometrics: Theory and practice*. Princeton: Princeton University Press.

- Matsusaka, J. G. (2004). *For the many or the few: The initiative, public policy, and American democracy*. Chicago: University of Chicago Press.
- Matsusaka, J. G. (2009). Direct democracy and public employees. *American Economic Review* 99(5), 2227–2246.
- Nguyen-Hoang, P. (2012). Fiscal effects of budget referendums: evidence from New York school districts. *Public Choice* 150(1-2), 77–95.
- Niskanen, W. A. (1968). Nonmarket decision making: The peculiar economics of bureaucracy. *American Economic Review* 58(2), 293–305.
- Ostrom, V. and E. Ostrom (1971). Public choice: A different approach to the study of public administration. *Public Administration Review* 31(2), 203–216.
- Pommerehne, W. (1983). Private vs. öffentliche Müllabfuhr: Nochmals betrachtet. *Finanzarchiv* 41, 466–475.
- Reichard, C. (2003). Local public management reforms in Germany. *Public Administration* 81(2), 345–363.
- Santerre, R. (1986). Representative versus direct democracy: A tiebout test of relative performance. *Public Choice* 48(1), 55–63.
- Simar, L. and P. W. Wilson (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of Econometrics* 136(1), 31–64.
- Wollmann, H. (2000). Local government modernization in Germany: Between incrementalism and reform waves. *Public Administration* 78(4), 915–936.
- Yatchew, A. (1998). Nonparametric regression techniques in economics. *Journal of Economic Literature* 36(2), 669–721.