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Public sector efficiency: the roles of political and budgetary institutions, fiscal capacity, and democratic participation

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Abstract The purpose of this paper is to investigate whether efficiency in public service provision is affected by political and budgetary institutions, fiscal capacity, and democratic participation. In order to address this issue we take advantage of a new global efficiency measure for Norwegian local governments. We find that high fiscal capacity and a high degree of party fragmentation contribute to low efficiency. In addition there is some evidence that democratic participation increases efficiency, while a centralized top-down budgetary procedure is associated with low efficiency.

Keywords Public sector efficiency · Political and budgetary institutions · Fiscal capacity · Democratic participation

JEL Classification H72 · H75

1 Introduction

Governments all over the world are concerned with efficiency in public service provision. The sources of inefficiencies are many, but the working of the political system is obviously important. The organization and financing of the specific services are politically determined, and restructuring and reorganization that may improve efficiency are often controversial politically. The purpose of this paper is to analyze public sector efficiency, and in particular to characterize political systems that are successful in terms of efficient provision of public services.

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The analysis focuses on the local public sector in Norway, the main provider of welfare services in a large welfare state. Our focus on local governments is in line with earlier contributions to the literature on public sector efficiency. The advantages of using local government data are that local governments within the same country are more comparable than different countries and that richer data on service provision and efficiency can be utilized. A few recent studies (e.g., Afonso et al. 2005; Afonso and Aubyn 2005) have performed efficiency analyses using OECD data, but they make no attempt to explain variations in efficiency across countries.

We take advantage of a new measure of total output in Norwegian local governments that is very comprehensive and based on a large number of indicators of production. Efficiency is measured as the ratio between total output and available resources. The efficiency measure is global in the sense that it relates to overall service provision, and not to the provision of a particular service. We think the use of a global efficiency measure is highly appropriate when the explanatory variables characterize the local government institution rather than being sector-specific. The main advantage compared to previous studies using global efficiency measures (see the overview by De Borger and Kerstens 2000) is that we have access to a better and a larger number of indicators of service production.

With this improved efficiency measure at hand we analyze how the degree of inefficiency is related to political and budgetary institutions, fiscal capacity, and democratic participation. The analysis is related to the large empirical literature on the political economy of debt and deficits starting with the seminal contributions by Roubini and Sachs (1989a, 1989b) and Von Hagen (1991, 1992). Roubini and Sachs showed that weak or fragmented governments lead to high budget deficits in OECD countries, whereas Von Hagen found that strict budgetary procedures were associated with low budget deficits in the US states and the EU countries. The following empirical literature has to a large extent focused on the impacts on fiscal policy, including taxes and public spending in addition to debt and deficits (see e.g., Crain and Muris 1995; Kontopoulos and Perotti 1999; Volkerink and De Haan 2001). In this paper we move beyond fiscal policy and provide an empirical analysis of the political economy of public sector efficiency. Earlier studies analyzing determinants of global efficiency include the Belgian studies by De Borger et al. (1994), De Borger and Kerstens (1996), Ashworth et al. (2006), and Geys (2006), the U.S. studies by Hayes and Chang (1990) and Hayes et al. (1998), and the Spanish study by Balaguer-Coll et al. (2007). Earlier Norwegian contributions have focused on specific efficiency measures for nursing homes (Kalseth 2003) and lower secondary education (Borge and Naper 2006).

The rest of the paper is organized as follows. We proceed in Sect. 2 by introducing and discussing the three efficiency measures used in the analysis. Hypotheses regarding the impact of political and budgetary institutions, fiscal capacity, and democratic participation are developed in Sect. 3. Section 4 discusses econometric specification and data, while the results of the econometric analyses are presented in Sect. 5. In Sect. 6 we discuss the results and relate them to the findings in earlier studies. Finally, Sect. 7 concludes.

2 Measuring output and efficiency

In Norway, as in the other Scandinavian countries, local governments are the main providers of welfare services, i.e., education, health, and social services. Important welfare services provided by higher level governments are upper secondary education (county responsibility) and hospitals (state responsibility). The local governments have substantial discretion in the

allocation of resources between service sectors, but are heavily regulated on the revenue side. The main revenue sources are local taxes and grants from the central government. Most taxes are of the revenue-sharing type, where effective limits on tax rates have been in place for the last 30 years. Local government revenues amount to 15% of GDP, and the efficiency in the use of these resources is obviously an important issue.

The main challenge for analyses of efficiency in the public sector is how to measure output. In the present study we take advantage of an aggregate output measure developed by the Norwegian Advisory Commission on Local Government Finances (*Det tekniske beregningsutvalg for kommunal og fylkeskommunal økonomi, TBU*) which has been published annually since 2001.[1] The commission's idea was to establish a measure of aggregate output based on indicators of production for several service sectors. Six service sectors are included: care for the elderly, primary and lower secondary education (1st to 10th grade), daycare, welfare benefits, child custody, and primary health care. On average these sectors account for nearly 75% of the local government budgets.[2] In all sectors service provision is arranged by the local government, and local governments do not provide financial support to citizens in order to purchase services from private providers. In cases of outsourcing, private production financed by the local government is included in the output measure.

The aggregate output measure is based on 17 indicators of production for the six service sectors, and the indicators for the 2005 version are reported in Table 1.[3] Care for the elderly is the largest service sector. The local governments are responsible for nursing homes and for care in private homes. The quantity of services provided is captured by the fraction of elderly (80 years and above) in nursing homes and the fraction of elderly that receives home-based care. The two additional indicators capture the quality in nursing homes (the share of single rooms) and the amount of services provided in home-based care (the share of users receiving both practical help and nursing).

The educational sector is the second largest service sector, and the main indicator of educational output is the number of teacher hours per student. Basically one teacher hour is produced when one teacher teaches one class for one hour. The schools do also provide daycare services before and after the school day for 1st through 4th graders. This is captured by two indicators: the fraction of children that uses daycare facilities and the fraction of users that attends more than 15 hours per week.

For daycare the main indicator of production is hours of attendance in local government daycare centers per child in the relevant age group (0–5 years). The indicator reflects both the fraction of children that is enrolled in local government daycare centers, whether they are on full or part time, and the age composition of the children.[4] Play and outdoor area per child is included as an indicator of quality. In daycare there is substantial private provision. On average 40% of the children are in private daycare, and most local governments

[1] The authors of this paper were all involved in the development of the output measure. In a report to the commission (Borge et al. 2001) we discussed the general properties of the aggregate output measure and showed how it could be implemented. Unfortunately, the report is available only in Norwegian.

[2] The rest of the spending involves general administration (10%) and some minor service sectors that we take into account in the second alternative efficiency measure presented below.

[3] The definition of the aggregate output measure has been quite stable during the period 2001–2005. However, the weights are updated yearly according to new budgetary information and there has been a few minor changes in the indicators due to changes in data availability.

[4] Infants require more resources than older children. According to national regulations, the maximum children-adult ratio increases with the age of the children. The number of hours of attendance is adjusted on the basis of this rule and information on the age composition of the children in daycare.

Table 1 Indicators and weights in the aggregate output measure, 2005

Service sectors and indicators	Indicator weights (β_{si})	Sector weights (α_s)
Care for the elderly		0.374
Share of inhabitants above 80 years of age receiving home-based care	0.269	
Share of inhabitants above 80 years of age in nursing homes	0.231	
Share of single rooms in nursing homes	0.231	
Share of users of home-based care receiving both practical help and nursing	0.269	
Primary and lower secondary education		0.339
Teaching hours per student	0.947	
Share of children 6–9 years in day-care facilities for school children	0.0265	
Share of users in day-care facilities with attendance above 15 hours a week	0.0265	
Daycare		0.129
Attendance in local government daycare institutions per child 0–5 years	0.864	
Play and outdoor area per child	0.064	
Financial support to private daycare institutions per child 0–5 years	0.072	
Welfare benefits		0.069
Share of inhabitants aged 20–66 receiving economic assistance	0.500	
Average support per month	0.500	
Child custody		0.034
Number of investigations as share of inhabitants aged 0–17	0.307	
Number of children receiving help as share of inhabitants aged 0–17	0.693	
Primary health care		0.055
Man-hours by doctors per 10000 inhabitants	0.405	
Man-hours physiotherapists per 10000 inhabitants	0.405	
Man-hours by nurses per 10000 inhabitants 0–6 years	0.190	

Note: The weight for each sector reports the sector's weight in the aggregate output measure, while the weights for the individual indicators are their weight within the sector. Both the weights of the individual indicators within the same sector and the weights of the sectors sum to unity

provide financial support to private providers. Since the degree of financial support varies substantially across local governments, the financial assistance to private daycare centers is included as indicator of production instead of hours of attendance in private daycare.

The local governments provide welfare benefits and advice for low income households that are not eligible for benefits from the national social security system. Most recipients are alcohol or drug addicts and younger adults with weak connections to the labor market. The included indicators are the share of inhabitants 20–66 years of age receiving social assistance and the average amount per recipient. Child custody includes activities such as foster homes, children's homes, and advice and help to families with children at risk. As indicators of production we include the number of investigations and the number of children that receives some kind of assistance. Both indicators are measured per inhabitant 0–17 years of age.

The local governments are also responsible for primary health care to all citizens. They provide general practitioners and physiotherapists, run health centers, and arrange emergency wards. Lacking better indicators, man-hours by doctors, nurses and physiotherapists are included as indicators of production.[5]

The calculation of the aggregate output measure is based on the following formula

$$\text{OUTPUT}^j = \sum_{s=1}^{S}\left(\alpha_s\left(\sum_{i=1}^{I_s}\beta_{si}\frac{x_{si}^j}{\bar{x}_{si}}\right)\right), \quad \sum_{s=1}^{S}\alpha_s = 1, \ \sum_{i=1}^{I_s}\beta_{si} = 1, \tag{1}$$

where x_{si}^j is indicator i in sector s in local government j, $\bar{x}_{si}$ is the weighted sample mean (weighted by population size), and α and β are, respectively, sector and indicator weights. In the calculation, the indicators are first made comparable by measuring them as percentages of their sample means $x_{si}^j/\bar{x}_{si}$. Second, an output measure for each service sector is calculated as a weighted average of the indicators of production. The weights (β_{si}) assigned to each indicator are equal to their average share of the sector's expenditure and are presented in Table 1.[6] Lastly, the aggregate output measure is calculated as the weighted average of the output measures for the individual service sectors using the average spending shares as weights. The sector weights (α_s) are presented in the last column of Table 1.

Output must be related to economic resources to create an indicator of efficiency. We operationalize available resources as "real" per capita revenue, which is based on a measure of revenue published by the Ministry of Local Government. The starting point is the sum of block grants and local tax revenues. Since high per capita revenue to some extent is compensation for unfavorable cost conditions, the revenues must be "deflated" in order to capture the real differences across local governments. In the official measure the cost index from the spending needs equalization system is used as deflator.[7] It captures unfavorable cost conditions related to population size, settlement pattern, the age composition of the population, and social factors.

The importance of deflating can be illustrated through an example. Consider a small and sparsely populated local government that is unable to exploit economies of scale. It will have high per capita revenues because the unfavorable cost conditions are compensated through the grant system, but output will not be in tandem with the revenues. If revenues were not deflated, this local government would be labeled inefficient simply because of the unfavorable cost conditions. Since the local taxes are of the revenue-sharing type, the revenue measure can be interpreted as an indicator of fiscal capacity. Differences in fiscal capacity reflect differences in tax bases and the design of the grant system.

Figure 1 presents a plot between this measure of available resources, denoted local government revenue, and the aggregate output measure. Both variables are given a weighted average of 100 such that the numerical value of each observation can be interpreted as deviation from the means in percentage terms. As expected, there is a positive relationship between aggregate output and local government revenue, i.e., local governments with high revenues are able to provide more output to their citizens than local governments with low revenues.

[5] In line with the general handling of outsourcing, the indicators include private doctors and physiotherapists who operate on a contract with the local government.

[6] In cases where it is impossible to divide expenditures between two or more indicators, the indicators under consideration are given equal weight. This is the case for welfare benefits and primary health care, see Table 1.

[7] The calculation of the cost index is documented in Ministry of Local Government (2006). In this study we also take into account that the payroll tax rate differs across regions.

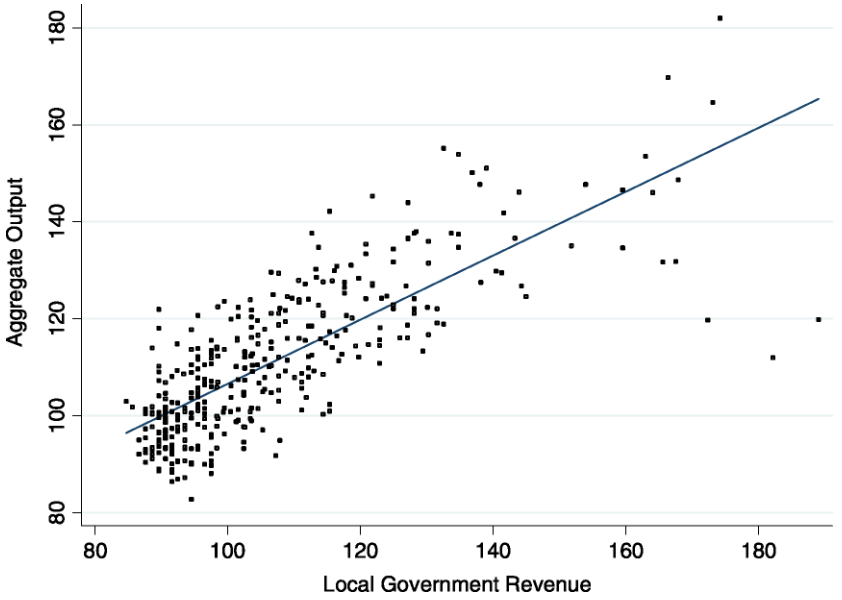

Fig. 1 Aggregate output and local government revenue, 2005.
Note: Output and revenue are normalized such that the weighted averages equal 100. The same normalization is used in the official reporting. In order to ease visual interpretation of the plot, two local governments with revenue above 200 are excluded from figure. The *straight line* is the regression line

We also observe substantial variation in aggregate output between local governments with similar levels of revenue, i.e., some local governments seem to be more efficient than others in the sense that they get more services out of their revenues. The efficiency measures we develop are based on this reasoning, and are defined as the ratio of aggregate output to local government revenue. In the baseline efficiency measure (E^B) we use the official output and revenue measures described above. In addition, we develop two alternatives that take account of some weaknesses in the baseline measure.

The baseline output measure captures activities and services that, in most cases, are clearly distinguished from inputs. However, a few of the indicators in our aggregate output measure can be questioned. Teacher hours in education and man hours in health care would typically be considered as inputs in specific analyses of education or health care.[8] We are particularly concerned with the main indicator in the second largest service sector, and as the first alternative to the baseline efficiency measure we use an alternative output measure for education. The number of teacher hours is replaced by an indicator of student achievement developed by Borge and Naper (2006). Student achievement is measured by assessment grades in the final year of lower secondary education (10th grade), adjusted for a large number socioeconomic characteristics capturing family background, and can be interpreted as the schools' contribution to achievement.[9] The efficiency measure where teacher

[8]Notice, however, that since the level of revenues is our (implicit) measure of input, the baseline efficiency measure is still meaningful. In the context of efficiency it is relevant to ask how many man-hours devoted to service production comes out of a given budget. This understanding is in line with De Borger and Kerstens (2000), who consider the amount of teaching as an intermediate output.

[9]We refer to Borge and Naper (2006) for a further description of the procedure.

Table 2 Descriptive statistics for the three efficiency measures, 2005

Efficiency measure	Min	Q_1	Median	Q_3	Max	St. dev.
Baseline efficiency (E^B)	45.4	97.6	104.8	110.9	135.4	10.5
Alternative 1 (E^{A1})	38.7	94.2	100.9	106.6	133.9	11.1
Alternative 2 (E^{A2})	64.2	96.2	102.0	108.1	132.9	9.3

Note: The efficiency measures are normalized such that the weighted averages equal 100. The number of observations is 374. Data for 59 local governments are missing

hours is replaced by student achievement in the core subjects Norwegian, English and mathematics (each subject is given equal weight) is denoted E^{A1}.

In the second alternative efficiency measure we take account of two other weaknesses in the baseline efficiency measure. First, the official output measure does not include indicators for the (minor) service sectors culture, communication, infrastructure, and housing. The budget shares for these services vary across local governments and, other things equal, the baseline efficiency measure will tend to overestimate efficiency in local governments with low budget shares in the services that are left out. Second, there is not a one-to-one correspondence between the official revenue measure and resources devoted to service provision. Local governments supplement taxes and grants by user charges, some of the revenues cover interest and debt service, and they run surpluses or deficits. There will be a tendency to overestimate efficiency in local governments with high user charges, low interest payments and debt service, and large deficits. Left out sectors and imperfect correspondence between revenues and resources devoted to service provision can be accounted for by regressing the baseline efficiency measure on the budget shares for the services that are left out, user charges, interest and debt service, and net operating surplus. The results from the year-specific regressions are reported in Table 6 in the Appendix. The signs of the coefficients are in line with the above discussion and most of them are statistically significant. As the second alternative efficiency measure (E^{A2}) we use the residuals from these regressions.

Table 2 reports descriptive statistics for the three efficiency measures. As are output and revenues, the efficiency measures are normalized such that the weighted averages equal 100. We observe a substantial variation in efficiency across local governments, and the baseline measure (E^B) indicates that the most efficient local government is nearly three times as efficient as the least efficient. The efficiency of the middle half of the local governments varies within a range of 12–13 percentage points. Since the sample mean is equal to 100, we get the implicit efficiency potential by subtracting 100 from the maximum value. This implicit efficiency potential is strikingly similar across the three efficiency measures. Output could on average be raised by 33–35% if all local governments increased the ratio between output and revenue to the highest value in the sample.

Despite the large similarity in efficiency potential, the three efficiency measures rank the local governments quite differently. The rank correlations are 0.80 (between E^B and E^{A1}), 0.79 (between E^B and E^{A2}), and 0.65 (between E^{A1} and E^{A2}). However, there is substantial agreement on the most and least efficient units. Three local governments are ranked among the five most efficient by all three efficiency measures, and another three are ranked consistently among the five least efficient.

We will argue that the global efficiency measures developed here, although not ideal, represent a clear improvement compared to existing measures.[10] The improvement first and

[10]The baseline efficiency measure is also used by Revelli and Tovmo (2007) in an analysis of the spatial patterns of efficiency.

foremost is due to access to a larger number of indicators of production than in previous studies. Whereas our measure of aggregate output is based on nearly 20 indicators, none of the earlier studies use more than 6 indicators.[11] Moreover, in the Belgian studies (De Borger et al. 1994; De Borger and Kerstens 1996) that have the largest number of indicators, variables like total population and population above 65 years of age are in our view better characterized as spending needs than as outputs.

3 Political and budgetary institutions, democratic participation, fiscal capacity, and efficiency

Inefficiency in public service provision is usually understood as a principal-agent problem originally formulated by Niskanen (1971, 1975) and Migué and Bélanger (1974). The context is that production is delegated to a service-producing agency (bureau) that is better informed about costs than politicians (sponsor), and there is a conflict of interest because the agency has preferences for budgetary slack. Budgetary slack can be interpreted as encompassing a variety of non-productive activities, including low effort, over-employment and extra salary. Thus, budgetary slack is conceptually equal to inefficiency.

Later theoretical contributions have focused on how budgetary slack is affected by the institutional setup and the use of incentive schemes. The literature on institutional setups (e.g., Moene 1986; Chan and Mestelman 1988) emphasizes that budgetary slack can be reduced if the sponsor takes on a more active role in the budgetary process. One way of being more active is to impose a hard budget constraint in the sense that the agency faces a fixed budget. A hard budget constraint will contribute to lower budgetary slack because the agency no longer is able to increase its budget by reducing efficiency. In a similar type of model, Falch (2001) shows that a hard budget constraint will reduce public sector wages. The literature on incentive schemes, summarized by Dixit (2002) in a public sector context, emphasizes that budgetary slack can be further reduced with a financing scheme that rewards the bureau for high production. However, because of specific features of the public sector, such as measurement problems, multi-tasking, and multiple principals, the general recommendation is that incentives should be low-powered rather than high-powered.

Although hard budget constraints and incentive schemes can improve efficiency, they may be difficult to implement in a political context. To make a hard budget constraint credible it may be necessary to accept periods with low production, and strong public sector unions tend to resist the introduction of incentive schemes.

In this paper we focus on the roles of political and budgetary institutions, fiscal capacity, and democratic participation, and we now turn to the discussion of how these factors are expected to affect public sector efficiency. Starting with political factors, a natural point of departure is the weak government hypothesis. The hypothesis was first introduced and tested by Roubini and Sachs (1989a, 1989b), and basically says that a strong government has an advantage in keeping debt and deficits low. We will argue that political strength, measured by party fragmentation in the local council and the support for the mayor and the deputy mayor (see Sect. 4), also is likely to promote efficiency. A strong political leadership may find it easier to impose a hard budget constraint because it is more likely to resist pressure to

[11] However, we depart from earlier analyses of global efficiency in local governments by not utilizing frontier techniques like Data Envelopment Analysis (DEA), Free Disposable Hull (FDH) or Stochastic Frontier Analysis (SFA). The reason is that we have a large number of indicators of production, in which case frontier techniques would tend to produce an unreasonable large number of efficient units.

accommodate low efficiency (and thereby low output) with larger budgets. Moreover, strong political leaderships may have more power in internal bargains with public sector unions about the implementation of incentive schemes and other means of increasing performance.

Regarding political ideology, the basic hypothesis in political economy is that socialists prefer a larger public sector than non-socialists. Strong preferences for public services can make it harder to impose a hard budget constraint because the temptation to accommodate cost increases will be larger. In addition, socialist parties have strong ties to public sector unions and do often support the unions' wage claims and resistance towards incentive schemes and other reforms of the public sector. The finding of Strøm (1995) that socialist influence increases local government wages is indicative of the ties to the unions, and does also suggest that socialist influence may increase costs through higher wages. We expect socialist influence to be associated with low efficiency.

The literature on budgetary institutions and budget deficits, initiated by Von Hagen (1991, 1992), argues that strict budgetary rules tend to reduce public spending and budget deficits. Crain and Muris (1995) find that that both revenues and expenditures in US states are affected by the organization of the budgetary process in the legislature. If budgetary rules affect spending and revenues, they may also affect efficiency. In this paper we separate between a top-down centralized procedure and a bottom-up decentralized procedure. A centralized procedure can be understood as a mean of imposing a hard budget constraint that reduces the influence of the service-producing agencies and thereby contributes to higher efficiency. The finding of Tovmo (2007) that a centralized budgetary procedure reduces the budget deficits in Norwegian local governments is in line with this hypothesis.

The fiscal capacity of the local government may contribute to lower efficiency for several reasons. First, local governments with high fiscal capacity will have reasonably good service standards even if they are not fully efficient. The politicians may then be less eager to implement incentive schemes and other reforms that may be controversial politically or in conflict with the preferences of the unions. Second, high fiscal capacity tends to go along with larger operating surpluses and less fiscal stress (Borge 2005; Tovmo 2007), in which case a hard budget constraint is less likely to be credible.

Information asymmetry and conflict of interest are prevalent also between voters and politicians. But the instruments voters have to influence the decisions of politicians are very different from the instruments in the hands of the politicians as sponsors of public agencies. Voting is the fundamental relationship between voters and politicians. A high degree of democratic participation in terms of voter turnout may reduce inefficiencies in public service provision through more efficient monitoring of politicians. The argument is that a higher turnout may give politicians incentives to implement policies that improve efficiency and benefit the electorate at large, at the expense of policies benefiting public sector unions and other special interests.

4 Econometric specification and data

The econometric analysis is based on the following model

$$E_{jt} = \delta_t + \delta_2 Z_{jt} + \varepsilon_{jt}, \tag{2}$$

where E_{jt} is efficiency in local government j in year t, Z_{jt} is a vector of explanatory variables representing political and budgetary institutions, fiscal capacity, and democratic participation, δ_t is a year-specific constant term, and ε_{jt} is the error term. We do not control

for structural characteristics, such as population size and settlement patterns, since they are already taken into account in the definition of efficiency by deflating revenues (see Sect. 2). Before the detailed description of the explanatory variables, we provide a brief summary of the political system and the budgetary process in Norwegian local governments.

The political system is a representative democracy where the members of the local council are elected every fourth year. The national parties are important players, and the national struggle between the socialist and the non-socialist camps is mirrored at the local level. Compared to national politics, a main difference is that the majority coalition does not form a cabinet. Rather, an executive board with proportional representation from all major parties is established. The executive board is led by the mayor, and the members of the executive board, including the mayor and the deputy mayor, are elected from the members of the local council. On average nearly 30% of the council members are also members of the executive board. The working of the budgetary process is that the executive board puts forward a budget proposal for the local council. Parties and representatives in the council are free to amend the executive board's proposal and to work out alternative budget recommendations. In the end, the local council determines the final budget. The budget includes decisions regarding revenues, current spending, and investment activity, and also detailed spending plans and service targets for each service sector.

Following earlier studies of Norwegian local governments we measure political strength by a Herfindahl-Hirschman index and a 4-way classification of political regimes.[12] The Herfindahl-Hirschman index (HH) is inversely related to party fragmentation, and is calculated as

$$HH = 100 \sum_{p=1}^{P} SH_p^2, \tag{3}$$

where SH_p is the share of seats in the local council held by party p and P is the total number of parties in the council. The index captures the number of parties in the local council and the distribution of seats among them. It can be interpreted as the probability that two randomly drawn members of the council belong to the same party. The value of the index is reduced (fragmentation increases) when the number of parties increases and when the seats are more equally divided among a given number of parties. Within the Norwegian institutional setting, where all major parties are represented in the executive board, the Herfindahl-Hirschman index is highly correlated with the party fragmentation in the executive body.

The 4-way classification of political regimes is based on the party affiliation of the mayor and the deputy mayor and the share of seats held by their parties:

Same party, majority: The mayor and the deputy mayor are from the same party, and their party is in a majority position.

Different parties, majority: The mayor and the deputy mayor are from different parties and, when combined, their parties are in a majority position.

Same party, minority: The mayor and the deputy mayor are from the same party, and their party is in a minority position.

Different parties, minority: The mayor and the deputy mayor are from different parties, and, when combined, their parties are in a minority position.

[12] These studies include, among others, Falch and Rattsø (1997) analyzing school spending, Kalseth and Rattsø (1998) analyzing administrative spending, Borge (2000) analyzing user charges, Kalseth (2003) analyzing efficiency in nursing homes, Borge (2005) analyzing budget deficits, and Borge and Naper (2006) analyzing educational efficiency.

At the outset we expect that the strength of the different types of political leaderships follows the above ordering, i.e., "same party, majority" is expected to be the strongest type and "different parties, minority" to be the weakest type. This ordering is, however, not imposed in the empirical analysis, where we use a dummy variable approach with the type "same party, majority" as reference. The advantage of the 4-way classification is that it provides a direct measure of the type of political leadership, whereas the Herfindahl-Hirschman index is a more indirect indicator. On the other hand, the 4-way classification is somewhat crude for the minority cases, which constitute 60% of the sample, since the classification does not capture the number of additional parties that supported the election of the mayor and the deputy mayor. Under the likely assumption that the additional number of parties increases with the fragmentation of the local council, this will to some extent be captured by the Herfindahl-Hirschman index.

Political ideology is captured by socialist influence in the local council. Socialist parties are defined as the social democratic party (The Labour Party) and all parties to its left. Socialist influence is measured in two ways: by a dummy variable for socialist majority and by the share of socialist representatives in the local council.

With respect to budgetary institutions we utilize survey information collected by the Norwegian Institute for Urban and Regional Research (*NIBR*). It distinguishes between a top-down centralized procedure and a bottom-up decentralized procedure, and it is the early stages of the budgetary process that differs between the two procedures. The starting point for the decentralized procedure is that each department works out a budget proposal. Then the chief administrative officer or the executive board coordinates the proposals and prepares an overall budget to be approved by the local council. In contrast, under a centralized budgetary procedure the chief administrative officer or the executive board presents an overall budget proposal to the departments, including the budget size for each department, and the departments are only allowed to propose changes within the given budgetary limits. In the econometric analysis we use a dummy variable set equal to one for centralized budgetary procedure.

Democratic participation is measured as voter turnout, i.e., the number of votes in the previous election as a percentage of the number of eligible voters. As indicator of fiscal capacity we use the revenue concept introduced in Sect. 2, i.e., block grants and tax revenues adjusted for spending needs and payroll tax differences.[13]

Multicollinearity is a potential problem for the econometric analysis. However, in most cases the explanatory variables are not highly correlated. Fiscal capacity, democratic participation, and the budgetary dummy are weakly correlated with all other variables; all coefficients of correlation are below 0.3 in absolute value. Because the socialist camp is dominated by the Labour Party and the non-socialist camp is more fragmented, the indicators of socialist influence are positively correlated with the indicators of political strength. But all correlations are below 0.5, and are not likely to create a multicollinearity problem. The strongest correlation is between the Herfindahl-Hirschman index and the 4-way classification of political regimes, where the highest correlation is nearly 0.7. We will for the most part use the Herfindahl-Hirschman index and the 4-way classification of political regimes as alternative indicators of political strength.

Because data on output and efficiency are not available for all local governments, our panel dataset is unbalanced. The baseline efficiency measure (E^B) is available each year

[13] Descriptive statistics for the explanatory variables are reported in Table 7 in the Appendix.

(2001–2005) for between 362 and 384 local governments, and with a total number of observations equal to 1,856 the sample covers around 85% of the local governments on average.[14] Since there are a few missing observations for the political variables, a maximum of 1,853 observations is available for estimation. In the cases where the 4-way classification of political regimes and the dummy for centralized budgetary procedure are included as explanatory variables the sample is further reduced. The first alternative efficiency measure (E^{A1}), where teacher hours is replaced by student achievement, is available only for 2004 and 2005. The second alternative efficiency measure (E^{A2}) can be calculated for all units where the baseline efficiency measure is available.

The main advantage of using panel data in the present setting is that efficiency most likely is measured with some noise. If the noise varies within local governments over time, repeated observations give more credible information than a single cross section. Because the time series variation in some of the explanatory variables is limited, we will not report results from fixed effects models.[15] We will for the most part report results from pooled OLS regressions where the cross-sectional variation in the data also is utilized in the estimation of the parameters. It is well known that pooled regressions may underestimate the standard errors and thereby overestimate the t-values. We deal with this problem by reporting t-values based on clustered standard errors taking into account that the error terms from the same local government are correlated. As an alternative to OLS with clustered standard errors, we also estimate models that allow for random effects. In the random effects model the correlation between error terms from the same local government is taken into account in the estimation of the parameters. The random effects estimates are more efficient than the OLS estimates, but the calculation of the standard errors is based on more restrictive assumptions. We refer to Wooldridge (2003) for a more detailed discussion of the methods.

5 Estimation results

The estimation results for the baseline efficiency measure are presented in Table 3. As a starting point (Model I) we choose a specification that maximizes the number of observations. This is achieved by using the Herfindahl-Hirschman index as an indicator of political strength and by not including the budgetary dummy. Socialist influence is captured by the dummy for socialist majority.

It appears that all four explanatory variables come out as significant and in line with the hypotheses developed in Sect. 3. The negative effect of local government revenue is consistent with the hypothesis that high fiscal capacity decreases efficiency. According to the estimate a revenue increase of 10 percentage points is predicted to reduce efficiency by 3.2 percentage points. The positive effect of democratic participation is consistent with the hypothesis that high turnout improves the monitoring of politicians and thereby leads to more efficient provision of local public services. An increase in democratic participation by 10 percentage points is predicted to increase efficiency by 2.5 percentage points. The positive sign of the Herfindahl-Hirschman index means that a high degree of party fragmentation in the local council leads to low efficiency. If the Herfindahl-Hirschman index is reduced by 10 percentage points (indicating more party fragmentation), efficiency is expected to be reduced by 2.4 percentage points. Finally, socialist influence is associated with low efficiency. A socialist majority is expected to reduce efficiency by 2.3 percentage points.

[14] Around 95% of the local governments are included in the sample at least one of the years.

[15] The time series variation is particularly limited for the political variables and the budgetary dummy, which change only every fourth year, and in our case they only change from 2003 to 2004.

Table 3 Determinants of local government efficiency, the baseline efficiency measure (E^B)

	I	II	III	IV	V	VI	VII	VIII
Local government revenue	−0.320 (17.46)	−0.320 (−17.30)	−0.319 (−17.38)	−0.318 (−17.12)	−0.312 (−14.45)	−0.303 (−14.45)	−0.327 (−17.83)	−0.373 (−26.81)
Democratic participation	0.245 (3.70)	0.265 (3.99)	0.230 (3.36)	0.266 (3.85)	0.268 (3.46)	0.299 (3.85)	0.234 (3.43)	0.173 (3.92)
Socialist majority	−2.258 (−2.76)	−1.922 (−2.20)			−2.544 (−2.68)	−2.225 (−2.27)	−2.376 (−2.75)	−0.558 (−1.04)
The share of socialists in the local council			−0.059 (−1.99)	−0.032 (−1.12)				
Herfindahl-Hirschman index (inverse party fragmentation)	0.244 (4.51)		0.248 (4.32)		0.223 (3.69)		0.220 (2.89)	0.116 (3.39)
Different parties, majority		−3.751 (−2.96)		−3.416 (−2.66)		−3.978 (−2.94)	−0.821 (−0.57)	
Same party, minority		−4.249 (−2.95)		−4.023 (−2.77)		−4.341 (−2.85)	−1.402 (−0.90)	
Different parties, minority		−5.737 (−4.36)		−5.133 (−3.92)		−5.400 (−3.93)	−1.731 (−1.01)	
Centralized budgetary procedure					−2.166 (−2.26)	−2.049 (−2.08)		
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	Random effects
Observations	1,853	1,684	1,853	1,684	1,342	1,215	1,684	1,853
Estimation period	2001–2005	2001–2005	2001–2005	2001–2005	2001–2005	2001–2005	2001–2005	2001–2005
R^2	0.414	0.380	0.413	0.378	0.406	0.359	0.388	

Note: The t-values for Models I–IV are based on clustered standard errors. Time dummies (not reported) are included in all equations

In Model II, the Herfindahl-Hirschman index of party fragmentation is replaced by the 4-way classification of political regimes. The strongest type of political regime (same party, majority) is used as reference. The three weaker types do all come out with significantly negative coefficients, confirming the hypothesis that political strength is associated with high efficiency. Moreover, the ordering of the coefficients is in line with the ordering of regimes suggested in Sect. 4 and the hypothesis of equal coefficients of the three variables can be rejected.[16] The estimated efficiency difference between the strongest and weakest type of political leadership is more than 5 percentage points. The impacts of local government revenue, democratic participation, and the dummy for socialist majority are not affected by this modification of the model. In Models III and IV we use the share of socialist representatives as an indicator of socialist influence. Since the share of socialists is less significant than the dummy variable for socialist majority, we use the latter in the remaining specifications.

[16]The F-statistic with df1 = 4 and df2 = 411 is 3.56 and the corresponding p-value is 0.029.

The budgetary dummy is included in Models V and VI. Contrary to our expectations, it comes out with a negative sign and is statistically significant. The estimates indicate that introduction of a centralized top-down budgetary procedure reduces efficiency by 2 percentage points. Although the inclusion of the budgetary dummy reduces the number of observations substantially (by nearly 30%), the impacts of the other explanatory variables are very similar to Models I and II.

In Model VII both the Herfindahl-Hirschman index and the 4-way classification of political regimes are included as explanatory variables. Despite the relatively high correlation between the two indicators, we are able to isolate the effects. The Herfindahl-Hirschman index remains significant and seems to be the superior indicator of political strength. The three variables capturing the 4-way classification of political regimes all become insignificant.

In Model VIII we reestimate Model I using random effects instead of pooled OLS regression with clustered standard errors. It appears that the two methods of handling correlation between error terms from the same local government yield somewhat different results. The main difference is that the dummy for socialist majority becomes insignificant and close to zero. In addition the quantitative effect of the Herfindahl-Hirschman index is reduced by a half and the quantitative effect of democratic participation by nearly 30%. However, party fragmentation and democratic participation are still statistically significant.

Table 4 reports the results when the two alternative efficiency measures are used as dependent variables. In Models I–IV we use the efficiency measure E^{A1}, where student achievement is the main output in the educational sector. It appears that the sign and significance of local government revenue, party fragmentation, and the budgetary dummy are the same as with the baseline efficiency measure, i.e., high levels of revenue, a high degree of party fragmentation, and a centralized budgetary procedure are associated with low efficiency. There are, however, quite sizeable changes in the quantitative effects. While the magnitude of local government revenue increases, the magnitude of party fragmentation is reduced by a half. Neither democratic participation nor the dummy for socialist majority is significant with the alternative measure of educational production.

The efficiency measure E^{A2} that controls for left out sectors, user charges, net operating surplus, and interest payment and debt service, is the dependent variable in Models V–VIII. Again it is the case that high levels of local government revenue and a high degree of party fragmentation significantly contribute to lower efficiency.[17] However, the coefficient of local government revenue is substantially reduced compared to the two other efficiency measures and the coefficient of the Herfindahl-Hirschman index is reduced by a half compared to the baseline measure. Democratic participation, which became insignificant with efficiency measure E^{A1}, now comes out as highly significant. The budgetary dummy becomes insignificant and the dummy for socialist majority is still insignificant.

Compared to the results using the baseline efficiency measure, the impact of the 4-way classification of political regimes is weaker with the alternative measures of educational productivity. This is particularly the case when alternative E^{A1} is used, in which case the three variables are not jointly significant. Again the Herfindahl-Hirschman index seems to be the superior indicator of political strength. This is confirmed when we include the Herfindahl-Hirschman index and the 4-way classification in the same equation (not reported). We then obtain the same result as with the baseline efficiency measure in Table 3. The Herfindahl-Hirschman index remains significant, while the three included variables capturing the 4-way classification become insignificant.

[17] The Herfindahl-Hirschman index does not come out as significant in Model VII where the budgetary dummy is included. The reason for this is not the inclusion of the budgetary dummy, but the substantial reduction in the number of observations.

Table 4 Determinants of local government efficiency, the alternative efficiency measures

	I	II	III	IV	V	VI	VII	VIII
Local government revenue	−0.410 (−13.00)	−0.405 (−13.44)	−0.394 (−9.12)	−0.416 (−30.69)	−0.166 (−3.89)	−0.192 (−6.02)	−0.149 (−2.87)	−0.213 (−15.52)
Democratic participation	0.061 (1.00)	0.097 (1.53)	0.066 (0.89)	0.066 (1.08)	0.123 (1.91)	0.129 (2.03)	0.154 (2.11)	0.109 (2.22)
Socialist majority	−1.237 (−1.61)	−0.557 (−0.70)	−1.562 (−1.59)	−1.075 (−1.34)	−1.309 (−1.76)	−0.975 (−1.29)	−1.430 (−1.67)	−0.379 (−0.64)
Herfindahl-Hirschman index (inverse party fragmentation)	0.111 (2.24)		0.116 (1.93)	0.120 (2.78)	0.131 (2.16)		0.083 (1.19)	0.069 (1.87)
Different parties, majority		−1.787 (−1.48)				−2.323 (−2.09)		
Same party, minority		−2.285 (−1.71)				−2.299 (−1.81)		
Different parties, minority		−1.742 (−1.34)				−3.490 (−2.78)		
Centralized budgetary procedure			−2.412 (−2.64)				−1.231 (−1.45)	
Efficiency measure	E^{A1}	E^{A1}	E^{A1}	E^{A1}	E^{A2}	E^{A2}	E^{A2}	E^{A2}
Estimation method	OLS	OLS	OLS	Random effects	OLS	OLS	OLS	Random effects
Observations	736	721	490	736	1,853	1,684	1,342	1,853
Estimation period	2004–2005	2004–2005	2004–2005	2004–2005	2001–2005	2001–2005	2001–2005	2001–2005
R^2	0.675	0.672	0.657		0.173	0.198	0.154	

Note: The t-values in columns I–III and V–VII are based on clustered standard errors. Time dummies (not reported) are included in all equations

In Table 5 we investigate whether the results are sensitive to extreme observations and outliers. The motivation is that there are a few observations with very low levels of efficiency, and also a few observations with quite high levels of efficiency. For 2005 the minimum value for the baseline efficiency measure is 45, but only 1% of the observations are below 65. At the other end of the distribution the maximum value is 135, but only 1% of the observations are above 125. It cannot be ruled out that some of the extreme observations reflect measurement error, and it is therefore important to investigate whether some of the results presented above are driven by outliers. This issue is investigated in Table 5 where, for each efficiency measure, only the observations with efficiency between 80 and 120 are included. It appears that the results are very robust to this reduction of the sample size.

6 Discussion

The empirical results reveal that the impacts of the explanatory variables vary somewhat across the specifications reported in Tables 3–5. The quantitative effects are sensitive to

Table 5 Sensitivity analyses excluding observations with high and low efficiency

	I	II	III
Local government revenue	−0.241 (−13.08)	−0.415 (−20.46)	−0.130 (−3.32)
Democratic participation	0.245 (4.33)	0.094 (1.63)	0.123 (2.14)
Socialist majority	−2.129 (−2.87)	−1.106 (−1.43)	−1.091 (−1.62)
Herfindahl-Hirschman index (inverse party fragmentation)	0.194 (3.80)	0.134 (3.12)	0.113 (2.02)
Efficiency measure	E^B	E^{A1}	E^{A2}
Estimation method	OLS	OLS	OLS
Observations	1,723	690	1,794
Estimation period	2001–2005	2004–2005	2001–2005
R^2	0.231	0.482	0.125

Note: Local governments with efficiency below 80 or above 120 are excluded. The t-values are based on clustered standard errors. Time dummies (not reported) are included in all equations

which efficiency measure we apply. The qualitative effects appear to be more robust and, except for the budgetary dummy, in line with the hypotheses developed in Sect. 3. In the following we discuss the qualitative robustness and relate the results to earlier findings in the literature.

The most robust result is that high fiscal capacity is associated with low efficiency. This finding is in line with earlier analyses of global efficiency in Belgian (De Borger et al. 1994; De Borger and Kerstens 1996),[18] Spanish (Balaguer-Coll et al. 2007) and US local governments (Hayes et al. 1998), as well as with Norwegian studies of nursing homes (Kalseth 2003) and education (Borge and Naper 2006). US studies of educational efficiency (e.g., Duncombe et al. 1997; Eom and Rubenstein 2006) also document a negative relationship between efficiency and fiscal capacity. A possible objection regarding the interpretation of the revenue effect is that it may pick up that local governments with high levels of revenue provide services of higher quality, and that quality is not well captured by our output measure. However, this argument is weakened by the fact that the quantitative effect of revenue increases when we include student achievement as the main output measure in the educational sector.

With respect to political institutions, the Herfindahl-Hirschman index measuring political strength by party fragmentation has the most consistent impact. It comes out as significant in all but one equation, and indicates that a strong political leadership contributes to higher efficiency.[19] For efficiency measures E^B and E^{A2}, the importance of political strength is

[18] The effect of fiscal capacity is more ambiguous in more recent Belgian studies. Ashworth et al. (2006) find that increased tax revenues contribute to lower efficiency, whereas grants increase efficiency. Geys (2006) also reports that grants increase efficiency.

[19] It could be objected that the Herfindahl-Hirschman index captures sociological fragmentation, which may also effect efficiency since efficiency may be harder to obtain when preferences are heterogeneous. Since the population is quite homogeneous in terms of ethnicity and religion, we have tried to control for this

confirmed by the estimates of the 4-way classification of political regimes. There is some tendency for socialist influence to be associated with low efficiency, but the effect is not very robust since it is significant only for the OLS estimates using the baseline efficiency measure. The findings with respect to political strength are line with the earlier Norwegian studies by Kalseth (2003) and Borge and Naper (2006), but in contrast to us they provide stronger evidence that socialist influence is associated with low efficiency. The Belgian studies by De Borger et al. (1994) and De Borger and Kerstens (1996) also include political variables. They do not find any significant effect of party fragmentation (measured by the number of coalition partners), but there is some tendency for socialist influence to increase efficiency. Ashworth et al. (2006), in a more recent study of Belgian local governments, find that single party governments contribute to higher efficiency, whereas socialist influence is associated with low efficiency.

Democratic participation is associated with high efficiency, and the effect is statistically significant for two of the three efficiency measures. The effect is consistent with the hypothesis that politicians are more effectively monitored when voter turnout is high, but could also mean that turnout is affected by such factors as political competition or the level of education (see Mueller 2003, pp. 308–320) that may have a positive effect on efficiency. Moreover, reverse causality may be a problem if efficiency affects turnout. However, it is not necessarily the case that the estimated coefficients are biased upwards. They would rather be biased downwards if local governments with low efficiency tend to have high turnout. Anyway, it is interesting that we, in contrast to earlier studies, find that democratic participation may have favorable effects on policy outcomes. Mueller and Stratmann (2003) find no systematic evidence of democratic participation on growth in a large sample of democratic countries, while Fabrizio and Mody (2006) estimate a negative effect on budget balance in a sample of central and eastern European countries. There is definitely need for more research on how voter turnout affects policy outcomes.

For two of the three efficiency measures a centralized top-down budgetary procedure is associated with low efficiency. The effect is in contrast to the hypothesis developed in Sect. 3, but may indicate that bottom-up information flow is important for efficiency, as suggested by Poterba (1996, pp. 48–49). However, since our budgetary variable only captures the initial stages of the budgetary process, one should be cautious in concluding that strict budgetary procedures in general contribute to lower efficiency.

7 Concluding remarks

This paper contributes to the literature on the empirical understanding of efficiency in public service provision. The analysis takes advantage of a new global efficiency measure for Norwegian local governments. The main improvement compared to existing measures in the literature is that it is based on a large number of indicators of production. We find that high fiscal capacity and a high degree of party fragmentation contribute to low efficiency. These results are robust to the efficiency measure we apply, to the choice of estimation method,

by including educational fragmentation (based on four categories of educational attainment) as an additional regressor. Educational fragmentation does not have any significant impact on efficiency and does not affect the estimates of party fragmentation. This result indicates that the Herfindahl-Hirschman index does not capture sociological fragmentation. But given that it is not obvious how to measure sociological fragmentation, we cannot totally rule out that possibility.

and also to outliers. Moreover, there is some evidence that increased democratic participation increases efficiency and that a centralized top-down budgetary procedure is associated with low efficiency.

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Appendix

Table 6 The regressions underlying efficiency measure E^{A2}. The dependent variable is E^B

	2001	2002	2003	2004	2005
Budget share culture	−2.329	−1.990	−1.706	−1.718	−2.406
	(−6.16)	(−5.76)	(−4.14)	(−5.40)	(−5.69)
Budget share communication	−1.456	−0.246	−2.018	−1.797	−1.018
	(−2.82)	(−0.40)	(−3.15)	(−3.36)	(−2.13)
Budget share housing	−0.510	−0.205	−0.300	0.064	−0.260
	(−3.46)	(−1.50)	(−1.70)	(0.40)	(−1.85)
Budget share infrastructure	0.031	0.506	−0.581	−1.296	−0.730
	(0.08)	(1.87)	(−1.53)	(3.44)	(−1.99)
Net operating surplus	−0.722	−0.379	−0.399	−0.947	−0.931
	(−3.69)	(−1.71)	(−2.09)	(−5.30)	(5.21)
Interest and debt service	−0.230	−0.259	−0.404	−0.766	−0.871
	(−1.38)	(−1.21)	(−2.37)	(−4.32)	(5.03)
User charges daycare	0.073	0.534	0.456	0.583	0.646
	(0.81)	(6.40)	(5.86)	(7.86)	(7.54)
User charges nursing homes	0.292				
	(1.22)				
User charges home-based care	0.419				
	(1.28)				
User charges care for elderly		1.320	0.956	0.868	0.552
		(5.39)	(4.16)	(4.07)	(2.49)
Observations	362	384	374	362	374
R^2	0.249	0.327	0.314	0.406	0.365

Note: The t-values in parentheses are based on robust standard errors. Budget shares, net operating surplus, and interest and debt service are measured in percent of total expenditures, while revenues from user charges are measured as percent of expenditures in the corresponding sector. Due to availability of data, the specification for 2001 differs slightly from the specification for the other years. More precisely, since 2002 it has not been possible to split user charge revenues in the care for the elderly sector on nursing homes and home-based care

Table 7 Descriptive statistics for the explanatory variables, 2001–2005

Variable	Description	Mean (st.dev)
Local government revenue	The sum of local taxes and lump-sum grants from the central government. Measured per capita and adjusted for spending needs and pay roll tax. Normalized such that the weighted average equals 100 each year	107.47 (22.81)
Democratic participation	The number of votes in the local election as share of the number of eligible voters, percent	61.68 (5.63)
Socialist majority	A dummy variable set equal to 1 if the share of socialist seats in the local council exceeds 50%	0.190 (0.392)
The share of socialists in the local council	The share of socialists in the local council, percent	37.74 (14.06)
Herfinahl-Hirschman index	The inverse of the party fragmentation in the local council	24.85 (13.57)
Same party, majority	A dummy variable set equal to 1 if the mayor and the deputy mayor are from the same party and their party is in a majority position	0.077 (0.266)
Different parties, majority	A dummy variable set equal to 1 if the mayor and the deputy mayor are from different parties and their parties are in a majority position	0.298 (0.458)
Same party, minority	A dummy variable set equal to 1 if the mayor and the deputy mayor are from the same party and their party is in a minority position	0.137 (0.344)
Different parties, minority	A dummy variable set equal to 1 if the mayor and the deputy mayor are from different parties and their parties are in a minority position	0.484 (0.500)
Centralized budgetary procedure	A dummy variable set equal to 1 if the initial stages of the budgetary process is top-down centralized	0.840 (0.367)

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