Partisan bias, electoral volatility, and government efficiency

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Abstract

Electoral agency models suggest that government efficiency is better when voters penalize poor performance, and party competition is balanced. Uncertainty in the electoral mechanism dillutes the incentive to produce efficiently. We test this proposition on panel data on local governments. The dataset includes a broad set of indicators on service output and quality, which facilitates the measurement of cost efficiency. We use historical data on local voting in national elections to measure partisan bias, while electoral volatility is measured on past variations in neighboring municipalities. The empirical analyses show that partisan bias lowers cost efficiency, particularly in municipalities with large electoral volatility.

Key Words*: Party competition; Voter behavior; Local government efficiency*

Introduction

Efficiency in public service production falls when the electorate is ideologically biased in favor of one party bloc.[1] Furthermore, this effect is stronger the stronger is performance-unrelated swings in elections. We contribute to the literature by showing that the postulated interaction between partisan bias and electoral volatility is present in data.[2] Our formal model of electoral agency delivers this prediction.[3] Using exogenous sources of variation for both partisan bias and electoral volatility allows us to interpret our findings causally. Our findings are robust to a number of alternative econometric specifications.[4] The detrimental effect of biased and volatile electorates on efficiency turns out to be economically substantial. Thus, electoral competition can—under identifiable circumstances—be an important cause of efficiency in public service production.

The effects of partisan bias and electoral volatility are intuitive in simple environments. Incumbent parties need to excert costly effort to achieve efficient public production. Voters have heterogenous motivations. Non-partisans want performance and care little about ideology, while partisans vote for labels and care little about high performance. If competing parties attract identical shares of partisans, or if non-partisans outnumber partisans, the non-partisan voters become decisive. In the absence of popularity shocks, and provided there's an unambiguous relationship between effort and performance, it is straight forward for non-partisans to condition reelection on performance. This means that the incumbent has an incentive to provide services efficiently. Voters are then protected by competition. Obviously, if the incumbent is supported by a majority of partisans it may be reelected even if it does not provide effort.

Voting behavior is also influenced by events that are unrelated to both performance and ideology. The list of such incidents is endless. Voting can be influenced by economic shocks that are beyond local government control; media coverage may be partly or completely arbitrary; unforeseen personal scandals, celebrity events or international crises can overshadow policy issues that are relevant in the local election campaigns; successes or failures of local sports teams can impinge on the political atmosphere; weather conditions on election day may affect voter turnout and indirectly influence the election outcome, and so on and on. When electoral volatility is high, the election outcome has

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[1] Low efficiency means that production can be increased for a given level of costs, or alternatively, that costs can be reduced while holding production constant.

[2] By "partisans" we understand voters that vote for party lables and do not care about performance. A "partisan bias" is taken to mean that one party block has more partisans than its competitor. By "electoral volatility" we mean performance-unrelated swings in voteshares, or "popularity shocks".

[3] Our model is dynamic and allow for both moral hazard and adverse selection to occur as equilibrium phenomena. Furthermore, punishment of incumbents based on observed behavior is possible. This is in contrast to static models of rent-taking in politics, in which candidates promise to limit their rent taking and such promises are credible by assumption, see for instance Polo (1998) and the discussion in Persson & Tabellini (2000: chapter 4).

[4] Robustness tests are commented on in the text, and are found in Supplementary materials (attached).

a random component that permits poor performers to survive. Clearly, this weakens the incentive to provide effort.

It is not evident that these intuitions hold in more complex environments. For example, how do non-partisans respond when they are less informed about the relationship between effort and performance than the incumbent? And, how do they respond if only a fraction of politicians are rent-takers? To generate precise hypothesis about the relationship between performance, partisan bias and electoral volatility in more complex environments it is useful to build on formal modelling. Appendix A contains our model.[5] Below we provide a verbal description of the models' structure and main implications. The core prediction of the model is that efficiency requires *both* low levels of partisan bias and electoral volatility.

It is not trivial to investigate the model predictions in data. An analysis where efficiency is regressed against levels and changes in vote shares is unlikely to yield causal effects, particularly as a consequence of reverse causality.[6] We need instruments that identify performance-unrelated vote support and volatility, and are able to separate partisan from non-partisan voters. We supply such measures and discuss them thoroughly below.

Our data set contains consistent information on service output by Norwegian local authorities. Cost efficiency is assessed by analyzing an index of total service output divided by exogenous government revenues. Efficient provision of local government services constitutes a fairly direct measure of incumbent performance. The polities in our data set work within a similar institutional framework, providing a credible testing ground for electoral agency models. Indicators of electoral volatility and partisan bias are based on historical election statistics. Our panel-data regressions for the period 2001-2010 includes more than 400 local governments per year.

Our findings shed light on a more general debate. It is well known that partisan attachment has declined in West-European democracies in the post war period (Dalton 2002), while the net change in the voting support of parties between elections (net volatility) generally has increased over the

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[5] The development of electoral agency models has flourished over the last few decades. A number of dynamic models of electoral agency do exist, starting with the moral hazard models of Barro (1973) and Ferejohn (1986), and ending with models that combine moral hazard and adverse selection, such as Austen-Smith & Banks (1989); Banks & Sundaram (1993); Fearon (1999); Maskin & Tirole (2004). See Besley (2006) for an excellent review.

[6] For instance, in the municipality of Søgne the Conservative block has held a dominant position in every local election from 1947 to 2011, obtaining an average vote share of 69.8 and never less than 58.7. The volatility of the vote shares in Søgne has been moderate compared to the national average over these elections. Søgne performs well below the national average with respect to efficiency in public production. Are poor results due to a large partisan bias favoring the Concervative block? Or is it the other way around: Is the Conservative block dominant because it has produced efficiently, given the particular conditions of this municipality? Evidently, in order to gain traction we need a measure of bias that separate voters in partisans and non-partisans. In addition we need measures of partisan bias and electoral volatility that are performance-unrelated. Finally, we need to control for the particular conditions—such as demographics and other demand components—of a municipality.

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same period (Pedersen 1979; Drummond 2006; Hix & Marsh 2007).[7] What, if anything, does this imply for incumbent performance?

Decline in party identifications is not a sufficient condition for stiffer electoral competition and improved public performance. For this to happen, declining party identifications need to reduce existing biases. Increased (net) change in voting support of parties is good news for performance if voter migration is due to punishment of under-performers. It is bad news for performance if it is driven by shocks in popularity that are unrelated to performance. Unfortunately, the existing literature does not allow one to make the relevant distinctions. Our paper takes a step in the direction of disentangling these effects.

Model

The model has two periods with an election in between, and its public finance structure is tailored to the polities we study.[8] The polity includes both partisan and non-partisan voters, allowing for partisan biases to create lopsided elections. Incumbents come in two types. Bad incumbents maximize expected utility over the game, while good incumbents always provide maximal effort. Voters have probabilistic beliefs about the distribution of incumbent types, but only the incumbent knows its own true type.[9] There is a persistent revenue shock to the economy in period one. The revenue shock is observed by the incumbent, while voters have probabilistic beliefs about its distribution. This permits a bad incumbent to profitably mimic a good incumbent when revenues are high and survive elections with less than full effort, even if it is not favored by a bias. Finally the polity is hit by an exogenous popularity shock at election day. The shock can throw out a hard working incumbent even in the absence of partisan biases. Agents have probabilistic beliefs about the strength of the popularity shock.

We show that there are two equilibria in this model. In the first—pooling—equilibrium bad incumbents mimic good ones, and put in some effort in good times to gain reelection. In the second—separating—equilibrium bad incumbents never provide effort. The likelihood that a pooling equilibrium exists is larger the smaller is partisan bias, and the smaller is exogenous electoral volatility (popularity shocks). Thus, inefficiencies become more likely as bias and volatility increase. In contrast to a simple environment partisan bias can have an effect even when the share of partisans in the electorate is vanishingly small. Furthermore, the model predicts a negative interaction between bias and volatility; higher partisan bias should lead to lower efficiency in service production, and more so the higher electoral volatility is.

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[7] There is, however, no firm evidence indicating that the same holds for the total number of vote switches between consecutive elections (overall volatility).

[8] See the section on institutions below for details.

[9] The model allow any probabalistic belief, so we do not need to take a stand on what motivates politicians.

Thus, we show that a version of the direct and intuitive effects of bias and volatility survive in a more complex environment. The interaction effect pinned down by the model is novel and non-intuitive.

Related literature

Empirical testing of electoral agency models is scarce. We know of no other study that relates efficiency in public production to partisan bias and electoral volatility. Early studies based on observational data relied on country-year data sets with considerable institutional heterogeneity, and used aggregate measures of performance that relates to incumbent decisions in highly indirect ways.[10] This is starting to change. Today a handful of convincing empirical tests exists.[11]

Besley et al. (2010) model the (essentially pre-electoral) trade-off between fielding a high quality governor (that promotes growth and increases the win probability), and fielding a low quality governor (that reduces the win probability but extracts growth-retarding rents to party members). Their model is tested on U.S. states from 1929 to 2000. Various performance variables are regressed on the absolute deviation of the Democratic vote from 50%, which is their measure of electoral competition.[12] The measure of competition is significantly related to the outcome variables. Institutions have a fair degree of homogeneityin this study—though even between-state arrangements in the U.S. (such as, for example, term limits and balanced budget requirements) vary quite a bit.

Svaleryd & Vlachos (2009) develop an essentially static agency model (with full commitment), and analyze the effects of party competition and media coverage using panel data on Swedish municipalities. In their model political competition is conceptualized by the density of swing voters over a policy-unrelated dimension. In their empirical application electoral competition is operationalized in two ways; as the absolute distance between the left-wing and right-wing block, and as the cut-point density on the left-right axis of politics.[13] Their response variables tap "legal rent-extraction" (party subventions and politicians wages), while ours exploits a more comprehensive measure of government performance. They find that party subventions and politicians wages respond negatively to increased competition and increased media coverage.

Fiva & Natvik (2013) set up a model in which the current incumbent can influence the action set of a successor through the allocation of public investments. In equilibrium the incentive to overinvest

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[10] See for instance Alesina, Bakir & Easterly (1999); Easterly & Levine (1997); Svensson (1997, 1999); Cheibub & Przeworski (1999). See also the comments on parts of this litterature in Persson & Tabellini (2000:73).

[11] There is also a small literature on electoral agency using controlled laboratory experiments. We do not discuss it here. See Helland & Monkerud (2013) for a discussion and references.

[12] The performance measures include real growth in personal income; total taxes; corporate taxes, and a dummy for right-to-work laws.

[13] The last measure is taken from Johansson (2003).

in the incumbents preferred program increases with declining reelection probability.[14] They test their model on a panel of Norwegian municipalities. The reelection probability is operationalized as the change in support for the incumbent between the last national election and the last local election. The assumption is that a change in this support signifies a change in the reelection probability. They find that right-wing incumbents raise the general investment level in response to declining reelection prospects, while left-wing incumbents react to declining reelection prospects by raising the investments in child care.

Sørensen (2014) test a model of political dominance and polarization on panel data covering Norwegian municipalities. His dependent is public production measured by the same index as we use in this paper. Political dominance is defined as a party block that receives 60% or more of the vote in six consecutive elections, while polarization is measured by the survey responses of elected politicians on questions tapping into their ideological preferences. He finds that polarization and political dominance tend to reduce efficiency in public production.[15]

The papers by Besley et al. (2010); Svalryd & Vlachos (2005); Fiva & Natvik (2013); and Sørensen (2014) use exogenous sources of variation in order to achieve identification.[16] Below we discuss our empirical strategy and relate it to the strategies chosen in these four papers.

Institutions

The Norwegian institutional setting is a three-tier system comprising central government, 18 county governments and 434 municipalities. Local elections to municipal and county councils are held every four years, alternating every second year with national elections (whose fixed term is also four year). Local elections take place in the context of a multi-party system with proportional representation, and each municipality is a single electoral district. Municipal revenues are largely exogenously given (see below), while a substantial discretion exists with respect to the allocation of revenues on expenditure items. Municipalities are not permitted to borrow in order to finance deficits.

The institutional structure of our electoral agency model fits the actual institutional set up well. In our model election periods are fixed; parties compete in a single district; revenues are given; and budgets are required to balance.

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[14]Provided the elasticity of substitution between capital and labor is low.

[15]Bruns & Himmler (2011) use the same dependent variable as Sørensen (2014). Their interest, however, is in the impact of local media coverage on efficiency, and political competition does not play a role.

[16]Petterson-Lidbom (2006) uses Swedish municipalities as a testing ground. He finds broad patterns consistent with electoral agency models in these (institutionally highly homogenous) data. However, he does not attempt to identify the precise mechanisms generating the observed patterns.

Empirical strategy

The core proposition (that follows from our electoral agency model) is that efficiency in public sector production is determined by the interaction of partisan bias and electoral volatility. We use the following econometric specification to investigate this relationship:

$$\log(\tfrac{Production_{it}}{Revenue_{it}}) = \beta_0 + \beta_1 \log(Revenue_{it}) + \beta_2(Partisan\ Bias_{it}) + \beta_3(Electoral\ Volatility_{it}) +$$
$$\beta_4(Partisan\ Bias_{it} \times Electoral\ Volatility_{it}) + \boldsymbol{\gamma}\mathbf{Z} + \alpha_t + \epsilon_{it}$$

were $\mathbf{Z}$ is a vector of control variables and $\boldsymbol{\gamma}$ the vector of coefficients. We run the regressions with fixed effects for years, and robust standard errors clustered on the municipality level.[17]

We have chosen a reduced form specification rather than a two stage least squares approach for two reasons. First, a two stage least square regression with interaction terms is not very transparent.[18] Second, the reduced form facilitates a straight forward interpretation of results.

Our main concern is reverse causality. Historical and expected performance may affect both the distribution of vote shares and the change in this distribution over time. Indeed, poor performance should provoke migration of non-partisans over party blocks according to our model. We now present our measures, and discuss potential endogeneity problems.

Revenue Most of municipal revenues derive from three sources of income: tax revenues, government grants and user charges. Tax revenues account for 45% of municipal revenues. Most of the tax revenues are collected as a proportional income tax. All local councils use the maximum tax rates throughout the period analyzed here. Furthermore, most of the grants are allocated as a general purpose grant based on fixed criteria. A large part of this block grant is a per capita subsidy designed to equalize revenues across municipalities ('revenue equalization'). Another component in the general purpose grant scheme compensates municipalities for external factors that influence production costs ('expenditure equalization'). Population size, age structure and settlement pattern are important criteria.

Free revenues are defined as the sum of income tax revenues and block grants, and they account for about 80% of total local government revenue. Note that the municipalities have very little influence on the level of free municipal revenue. The municipal councils can allocate the 'free municipal revenue' to different service sectors as they see fit, given that statutory obligations have been met. Local authorities are required by law to maintain a balanced budget and to run an operating surplus, first to finance investments and second as a financial buffer.

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[17] Using the proc mixed procedure in SAS.

[18] In general, instruments need to be interacted with the *exogenous* part of the interaction term to achieve identification (Bun & Harrison 2014).

Adjusted free revenue is an indicator of the municipality's purchasing power, which has been developed by the Advisory Commission on Local Government Finances (TBU). It makes modifications in free municipal revenue per capita using the same criteria (cost keys) that are included in the system of expenditure equalization described above. The index is standardized on a national average of 100.

The adjustment for cost differences does not take into account geographical variations in social security contributions. The municipalities pay a fixed rate on total wage spending as social security contributions, and the rate varies from 14.1% in urban areas to zero in the smaller municipalities located in peripheral regions. To standardize purchasing power across municipalities, we subtract the costs of to these contributions from the original index.

Production and Efficiency   Service production has been measured as a composite index that covers the major local government sectors. The index is based on data from the TBU.[19]

The index captures a wide spectrum of policy issues on which voters are likely to judge the performance of their representatives. The index is available for the period 2001–2010 (see Borge et.al. 2008; Bruns and Himmler 2011; Sørensen 2014). For the period 2001-2007, the production index covers six service sectors: child-care centers, primary and upper secondary education, primary health care, nursing services, child custody, and social welfare programs. Output in each of these sectors has been measured by a total of 17 indicators. These cover about 70% of gross operating costs in the municipality. For the period 2008-2010, the index includes the cultural sector and additional quality indicators have been developed. In this period the composite index is based on 25 indicators.

The indicators for the individual sectors have been defined by a key output indicator and a set of quality indicators. For example, the main indicator for child-care service production is number of staying hours for children in day-care institutions, measured relative to number of children aged 0–5 years. The quality indicators are defined by personnel qualifications and the area allocated for children's play and outdoor activities. The production indicator for child-care is based on both these indicators. The composite indicator has been calculated by defining service production for each sector, and subsequently aggregating sectorial output into an overall index using their annual share of aggregate spending as weights.

One concern is that the revenue index does not exactly match the services included in the production index. The production index does not cover all municipal services, and the local government can collect some additional revenues by user fees and by dividend from companies owned by the municipalities. As a robustness check, we therefore include an additional adjustment factor,

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[19]Borge et al. (2008:477-478) provide a detailed account of the indicators included in the index.

the ratio of gross current expenditures to free revenue as a control variable. The results are not sensitive to this test.[20]

Another concern is reverse causation. Rent seeking politicians may increase current spending levels to maintain levels of service production, hoping for bail-outs from the central authority. At the same time, it is vital to control for municipal revenues in the efficiency regression since it is well known that efficiency decreases in revenues (e.g., Borge et al. 2008). In line with this concern, Figure 1 shows that efficiency decreases in revenues in our data. As to be expected from theory, for a given revenue level efficiency is lower in biased, high volatility municipalities.

<Figure 1> here

Although we believe that adjusted free revenue is an exogenous revenue concept, we estimate additional regressions using municipalities' hydropower revenues as instrument variable. Following Andersen et al.(2014), we use revenues from hydropower taxation as measured by commercial property taxes per capita as instrument variable for index of adjusted free revenues. Our results turn out to be robust to this, indicating that adjusted free revenues are indeed exogenous.[21]

Partisan bias Party competition has usually been captured by the concurrent vote margin of victory or density at the cut-point (Besley et. al 2010; Svaleryd & Vlachos 2009).[22] Our concept of partisan bias deviates from this conceptualization. We assume that a party bloc is favoured by a partisan bias if it has a larger 'bedrock constituency' or 'core body of voters' than its competitor.[23]

Short-term fluctuations in the vote margin are not necessarily a valid indicator of partisan bias. We therefore measure bias in an extended time period before the relevant year. These data have been matched with the relevant election periods in the 2000s, i.e. the local elections in the 2001-2010 period. Bias has been measured using data on five previous elections to municipal councils.

For each municipality, we have identified the party blocs' minimum level of voter support over these five election periods. These minimum levels are defined for each municipality, and as a share variable. Partisan bias is defined as the difference between the incumbent and challenger minimum vote support. This implies that the partisan bias has identical values for years in the same election period, and that variations over election periods are limited.

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[20]See Supplementary materials, S3.

[21]See Supplementary materials, S5.

[22]See Besley and Case (2003) for a comprehensive survey of measures of political competition.

[23]Operating with blocks of parties seem warranted. Beginning with the local elections of 1999, political parties have increasingly choosen to enter into formal coalition agreements. At the start of the election periods in 2007 and 2011 nearly all Norwegian municipalities had formal coalition agreements in place. See Sørensen (2014).

The existing literature has used different strategies to identify exogenous variation in party competition. Besley et. al (2010) exploit the changes in the system of voter registration in the southern US states, which ended the Democratic Party's near monopoly position. Svaleryd & Vlachos (2009) use voters support for the political parties in the national elections in a period before a major consolidation of the municipality structure. They develop an instrument variable for party competition by aggregating these data to the existing municipal structure. Sørensen (2014) has employed a similar identification strategy. Finally, Fiva & Natvik (2013) use municipal level data on national election outcomes to measure the voters' ideological preferences, and also exploit variations in the support for the incumbent's party bloc in the surrounding municipalities in the county.

In line with previous studies, our indicator of partisan bias has been measured on municipality-level voting in the national elections (i.e. the elections to the national parliament, the Storting). For this to make sense local performance should not impact on bias in national elections. Little is known about the impact of local performance on national voting. In the election studies literature, the main concern seems to be the reverse, that national performance and national campaign issues determine local election results. Around 1/10 of respondents in the Local Election Surveys of 1995 and 1999 identified national issues as the most significant determinants of their voting (Bjørklund & Saglie 2000:39). A majority of respondents in the local election survey of 1999, moreover, shared the opinion that the local election was dominated by local issues (Bjørklund & Saglie 2000:73). Finally, a sizable 20% of respondents split their party vote in the municipal and county elections of 1999 (Bjørklund & Saglie 2000:53). This suggests that different considerations, or differences in party platforms, determine the vote in the two elections for at least a sizable fraction of voters. Nonetheless, the correlation between bias in local and national elections is sizable.[24]

By assumption, partisan voters (i.e. voters with strong (left or right) ideological preferences) do not split their voting at local and national elections. Partisans vote for labels. Thus, the partisan vote shares in a given municipality should be the same when measured in local and national elections. Our identifying assumption is that historical national election outcomes are related to efficiency only through their effect on the incumbency bias in the elections to the municipal councils.

Histograms for partisan bias measured by local voting in local elections (the potentially endogenous measure), and partisan bias measured by local voting in national elections (the presumably exogenous measure) are presented in Figure 2.

<Figure 2 here>

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[24]The bivariate correlation between bias measured at the local and national level is 0.78.

We appreciate that the distribution of partisan bias measured by local voting in local elections is less dense than the corresponding distribution measured by local voting in national elections.

Electoral volatility   We define volatility as variations in voter support for a bloc that are unrelated to voters' assessment of the incumbent's efficiency performance. We measure volatility using a procedure similar to that for incumbency bias. We calculate municipal-level variations in support for the party blocs over a history starting with the local election of 1983 and including all subsequent elections up to the one in question.[25] We capture this variation by the municipality-specific standard deviations of voter support for the party blocs over the relevant time periods.

To obtain our measure of electoral volatility we calculate the average standard deviations of all municipalities in a given economic region, *excluding* the municipality in question. This allows us to interpret volatility as a regional popularity shock using, presumably, exogenous sources of variation (Svaleryd & Vlachos 2009; Fiva & Natvik 2013).[26] Obtaining an exogenous source of variation is of importance, since our theoretical model only address volatility due to random—and efficiency independent—shocks in popularity. The identifying assumption here is that volatility in neighboring municipalities influences efficiency only through volatility in the relevant municipality.

Note that both bias and volatility are measured as averages over a (recent) history. We believe this help in distinguishing between, on the one hand, persistent traits—bias and volatility—of the polities analyzed, and, on the other hand, current performance—that is, efficiency in production. We recognize that the start years of our calculations are arbitrary. Although we should consider partisanship a fairly persistent trait of voters, electorates are gradually replaced by demographic forces. For this reason alone, one would expect the number of partisans to change over time. However, we see historical volatility as a proxy for volatility as it is perceived by the agents. Perceptions are subjected to the presumably limited memory of voters and candidates. Limited memory is an argument for fixing our start years in the fairly recent past.

Figure 3 show our measures of Electoral Volatility, measured in the municipality (potentially endogenous) and in the neighboring municipalities (presumably exogenous).

<p style="text-align:center;"><Figure 3 here></p>

We appreciate that the distributions of electoral volatility measured in the municipality and in neighboring municipalities does not differ radically.

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[25] Local elections were held in 1987, 1991, *1995*, 1999, 2003, 2007 and 2011. National elections in 1985, 1989, 1993, 1997, 2001, 2005 and 2009.

[26] We differ from Fiva & Natvik (2013) as they use the county level (N=19), while we use the economic regions (N=90). The latter yields more cross-sectional variation, which is useful in the current research design.

Controls   We include a vector of controls in our regressions to address potential problems of omitted variables bias. This vector include municipal population, share of children, young and elderly, a dummy for socialist majority in the municipality, and a party fragmentation measure for the local council.

Population and population shares are included to account for demand effects in the municipality that are not captured fully by the fixed criteria of the block grant system.

The political color of party blocks could impact on efficiency. Left-wing parties—particularly the Labor party—have strong ties to the trade unions, and are likely to cater to their interests. If efficiency implies fewer employees, the socialist block may be less willing to loose popularity among public union members than a non-socialist incumbent. Existing research also suggests that a socialist majority may be more likely to cause higher wage levels (Strøm 1995). For these and similar reasons we include a dummy for socialist majority in the local council.

Borge et al. (2008) suggest that efficiency is a common-pool problem. When the party structure is highly fragmented, each party group seeks to increase spending for its pet projects. Lack of centralized coordination may lead to spending increases, which are likely to reduce efficiency (cf. Figure 1). Furthermore, fragmentation within party blocks may weaken accountability, which is also likely to reduce efficiency. Several contributions in the vote-popularity literature suggest that blurred lines of responsibility dilute voters' ability to punish incumbents for poor performance (for example Dutch & Stevenson 2008). We use the complement of the Herfindahl index to control for party fragmentation.

Descriptives   We have two particular concerns with the data. The first is that the definition of the production index for 2009 differs somewhat from the index for the previous years. However, excluding data for 2009 and 2010 does not affect our estimates.[27] All results are therefore based on the entire data set. The second concern relates to people who vote for parties outside the two major blocks in local elections. These votes go to local lists and shared lists of two or more political parties. For half the municipalities, support for these lists amounts to less than 2% of the total ballot. In about 25% of the municipalities, these lists receive 13% or more of the votes. Since the model is based on the assumption that polarization is a left-right phenomenon, we ran regressions excluding municipalities with substantial vote shares going to local lists.[28] Based on these, taking account of local lists does not seem to influence results, so we decided to run regressions on the entire data set. Fortunately, the local list is a marginal phenomenon in national elections, so our

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[27] See Supplementary materials, S7.

[28] See Supplementary materials, S6a and S6b.

measure of partisan bias should be unaffected by the presences of such lists in the municipality.[29]
Descriptive statistics are provided in Table *1*.

	N	Mean	Std	Max	Min
Production	3 710	108.56	15.00	189.20	73.41
Revenues	3 515	93.51	20.65	347.02	73.90
Efficiency	3 710	1.04	0.12	1.44	0.41
Partisan bias, measured locally	4 340	0.24	0.17	0.82	0.00
Partisan bias, measured nationally	4 340	0.22	0.16	0.74	0.00
Electoral volatility, measured locally	4 340	0.06	0.04	0.36	0.00
Electoral volatility, measured regionally	4 320	0.06	0.02	0.16	0.00
Population	4 312	9 526	18 493	256 600	209
Population share $\leq$ 6 years	4 312	0.07	0.01	0.11	0.03
6 years $<$Population share $\leq$ 15 years	4 312	0.14	0.01	0.19	0.09
Population share $\geq$66 years	4 312	0.16	0.03	0.27	0.07
Party fragmentation (1-Herfindahl index)	4 051	0.76	0.08	0.89	0.39
Socialist majority (=1, otherwise 0)	4 067	0.18	0.38	1.00	0.00

Table 1: *Descriptive statistics.*

The production indicator has an average value of 109, and a standard deviation of 15 (the population weighted average is 100). As expected, about 80% of the variation is cross sectional. Average revenue is 94, ranging from a minimum of 74 to a maximum of almost 350. The extremely high maximum value is due to revenues from hydroelectric power plants in a few municipalities with very small populations. The average value is below 100 since we have subtracted social security contributions and added other revenue types as explained above. The efficiency index is calculated as the ratio of the production index to the revenue index, and it displays considerable variation as well. About 70% of the variation is between municipalities.

Norwegian municipalities differ a lot with respect to size and demographic composition. The smallest municipality is the island Utsira with 209 inhabitants, while Bergen has a population of 256 thousand.[30] Shares of children, young and elderly also vary considerably across municipalities.

Four variables characterize the political situation of each local council, party fragmentation (1-Herfindahl index), socialist majority (dummy variable), partisan bias and electoral volatility as

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[29]In the national elections of 2005, for instance, only 6 000 votes were allocated to local lists, of a total of 2.6 million.

[30]The capital—Oslo—is not included in our analysis, since it has status both as a municipality and a county.

defined above. These variables are measured as local voting in local elections in the municipality in question. Below we use these in-municipality measures for comparison. On average, we find a similar partisan bias for local voting in local and in national elections (cf. Figure 2). The incumbent block's electoral support minus the opposition block's electoral support is 0.22-0.24 on average. Partisan bias varies from almost zero to a maximum of 0.74 for local voting in national elections, and 0.82 for local voting in local elections. As explained, electoral volatility is measured as the variation over time in the incumbent's support in the neighboring municipalities of the same economic region. The average is comparable to the corresponding average when electoral volatility is measured in the municipality itself (cf. Figure 3). Nearly all variation in volatility is cross-sectional, and inter-municipal variations are obviously higher than the volatility variations between the regions.

Analysis

In our regressions the measures of electoral volatility and partisan bias are centered around their mean values to facilitate interpretation of the multiplicative terms. The main result is displayed in Table 2. The regression in Model 1 calculates electoral volatility and partisan bias using election results for the municipality in question. In Models 2 and 3 electoral volatility is measured using economic region level data while excluding the municipality in question, while partisan bias is measured using local voting in national elections. Models 1 and 2 are estimated with the vector of controls.[31] In Model 3 the vector of controls is dropped.

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[31]Supplementary materials, S1, contains Model 2 with controls displayed.

	Model 1		Model 2		Model 3	
Partisan Bias	-0.059	***	-0.088	***	-0.082	***
	(0.021)		(0.021)		(0.025)	
Electoral Volatility	0.207	**	0.812	***	0.870	***
	(0.092)		(0.130)		(0.172)	
Partisan Bias×Electoral Volatility	-0.356		-3.132	***	-3.458	***
	(0.514)		(0.725)		(0.914)	
log(Revenues)	-0.551	***	-0.584	***	-0.415	***
	(0.038)		(0.034)		(0.040)	
Constant	3.062	***	3.221	***	1.859	***
	(0.195)		(0.173)		(0.181)	
Controls included	Y		Y		N	
Number of observations used	3 514		3 494		3 495	
χ^2 model, p-value	0.000		0.000		0.000	
BIC	-7 281.7		-7 528.4		-6 356.9	

Significance levels *** 1%; ** 5%; * 10%.

Table 2: *Dependent: log(Efficiency). Fixed effects for years; robust standard errors clustered on the municipality level; Electoral Volatility and Partisan Bias centered on their mean values.*

Note first that the signs of partisan bias, electoral volatility and their interaction are consistent with our theoretical model in all three regressions. The coefficient of both partisan bias and electoral volatility is substantially weaker in Model 1 than in Models 2 and 3. Furthermore, while the cross-term in Model 1 is weak and insignificant, it becomes strong and significant in Models 2 and 3. Our interpretation is that reverse causation renders a specification based on in-municipality measures of partisan bias and electoral volatility weak and insignificant. Once these measures are replaced by measures based on out-of-municipality variation, the interaction of partisan bias and electoral volatility becomes strong and significant.[32,33]

Note that the effects of our presumably exogenous measures of partisan bias and electoral volatility remains practically unchanged (both in strength and significance) if the vector of controls is dropped (compare Models 2 and 3). This indicates that selection on unobservables is not a major issue in our specification (Altonji et al. 2005).

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[32] The bi-variate correlation between partisan bias and electoral volatility is only -0.08 / -0.09 (depending on whether they are measured in-municipality or out-of-municipality), so multicolinearity is unlikely to be a problem.

[33] The findings in Model 2 are robust to measuring partisan bias in the same way as electoral volatility (as variation in neighboring municipalities in the economic region), see Supplementary materials, S2. The findings in Model 2 are also robust to the inclusion of 160 cross-terms for county-year effects, see Supplementary materials S4.

Figure 4 depicts the marginal effect of partisan bias on the log of efficiency, conditioned on the value of electoral volatility. The diagram shows that the core proposition from our theoretical model is present in the data. The marginal effect of partisan bias on the log of efficiency in service production goes down as electoral volatility increases. For electoral volatility above its mean, the effect of bias on the log of efficiency is significantly negative at the 5% level.

The effects identified are economically important as well. An increase in partisan bias of one standard deviation (an increase in the vote-share difference of 0.16, cf Table 1) induces a reduction of efficiency in service production of nearly 1.4% when volatility is held at its mean (0.065). If volatility is held at one standard deviation above its mean (0,13), an increase in partisan bias of one standard deviation causes a reduction in efficiency of 2.4%. When volatility reaches the maximum level observed in the data (0.16), a one standard deviation increase in partisan bias reduce efficiency in service production by 5.9%. And, in the extreme case were volatility is held at its maximum and partisan bias is increased from its mean to its maximum (0.74), efficiency is reduced by a full 25%.

<Figure 4 here>

Concluding remarks

Electoral agency implies that the combination of ideological bias and pronounced swings in candidate popularity is detrimental to the efficiency of public service production. Importantly, the adverse effects of ideological bias and popularity swings should be mutually reinforcing. We test this relationship on a panel data set of Norwegian municipalities comprising more than 3 500 observations. These polities operate in an institutionally homogenous setting, but face substantial differences with respect to voter preferences. This makes them an excellent testing ground. We also employ a performance measure—efficiency in service production—which constitutes a direct quantification of voter welfare drawn from a valence issue. Using exogenous sources of variation to measure ideological bias and popularity shocks, we find strong support for our interaction hypothesis: efficiency in service production decreases when the relative partisan bias of the incumbent increases, the more so the higher the variance of the popularity shocks. The detrimental effects of failed agency are of a magnitude that is both plausible and economically significant.

Appendix A: Model

There are two candidates in the polity, the incumbent (A) and the challenger (B). Voters are either partisans or non-partisans. Partisans care only about the candidates' labels. Non-partisans care about a non-partisan issue (performance). The fractions of partisans and non partisans are ω and $(1 - \omega)$. The fraction of partisans favoring the incumbent is $\omega\left(\frac{1}{2} + \eta\right)$. There is an incumbency bias among the partisans, so $0 < \eta \leq \frac{1}{2}$.

The game has two periods $t \in \{1, 2\}$ with an election in between. Non-partisans derive periodic utility from the non-partisan issue as follows: $v_t = \alpha(1 - \tau)y + x_t$, with $0 < \alpha < 1$. Income (y) and tax rate (τ) are exogenously given, while public production (x_t) is determined by the incumbent.[34]

At the beginning of period one a revenue shock $\psi \in \{s, 1\}$, with $0 < s < 1$, hits the local economy.[35] The common prior over the shock is $\Pr(\psi = s) = q$ and $\Pr(\psi = 1) = (1 - q)$. We assume $q \geq \frac{1}{2}$.[36] The revenue shock is persistent (=lasts for two periods). The public produces according to $\psi e_t \tau y = x_t$, with $e_t \in [0, 1]$ representing the effort of the incumbent. Let $(\psi = 1)(e_t = 1)\tau y \equiv R$ (production at full effort and high revenues equal R). We assume that funds cannot be diverted for private ends.

Incumbents come in two types $i \in \{g, b\}$. g-types set $e_t = 1$ unconditionally. The payoff function of b-types is $u_b = E - c(e_1) + \beta(E - c(e_2))$. E is an "ego-rent," while $\beta < 1$ is the discount factor. $c(e_t)$ is the cost of effort function. Assume $c(0) = 0$, $c(1) > \beta E$ and $c' > 0\ \forall e_t \in [0, 1]$. The prior over types is $\Pr(i = g) = \pi$ and $\Pr(i = b) = (1 - \pi)$.

The incumbent is subject to an aggregate popularity shock $\delta \in (0, \infty)$. The cdf of this popularity shock is $H(\delta)$, with corresponding density $h(\delta)$. The density is assumed to be symmetric and unimodal. Type and productivity are drawn at the beginning of period one, and revealed to the incumbent only. The realization of the aggregate popularity shock is revealed to everyone in the election. The structure of the game (including prior distributions) is common knowledge.

Non-partisans use a cut-off rule in their voting: if the challenger and the incumbent are equally popular and the update of a g-type is at least as great as the prior, the incumbent is kept, otherwise she is ousted.

We now show that existence of a pooling equilibrium in which b-type incumbents can, to some extent, be disciplined by voters. In the pooling equilibrium, lazy politicians only exert an effort in the initial period if revenues are high and the probability of reelection is not too low. The probability of reelection is a function of incumbent behavior in the initial period, partisan bias,

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[34] Thus, we analyze a setting of partial fiscal decentralization, cfr. Brueckner (2009), in which revenues are determined by the central government while allocation on expenditures are determined by local polities.

[35] Alternatively, we may interpret the shock as an exogenous productivity shock.

[36] This assumption simplifies the analyzis, by removing a hybrid equilibrium in which players randomize over actions.

and the density of the popularity shock. In particular, we show that the support of the pooling equilibrium shrinks when the relative partisan bias of the incumbent increases, and more so the higher the variance of the popularity shock.

Proposition 1 *For $q \geq \frac{1}{2}$ and $s > \kappa \equiv \frac{(1-q)(1-\pi)}{1-\pi(1-q)}$*

a) a pooling equilibrium exists in which b-types mimic g-types when revenues are high

b) support of this pooling equilibrium is greater in the absence of partisan voters

Last period behavior is trivial: g-types choose full effort, b-types choose zero. Consider updates prior to election. Note first that full effort is dominated for b-types. Let H^0 represent reelection probability with no effort, and H^R reelection probability with full effort. The no effort condition is $E + H^0 \beta E > E - c(1) + H^R \beta E$, which can also be written $c(1) > \beta E \left(H^R - H^0 \right)$. The last condition is satisfied by the assumption that $c(1) > \beta E$, and the fact that $\left(H^R - H^0 \right) \in [-1, 1]$. Thus, no effort dominates full effort so that $\Pr(i = g | x_1 = R) = 1$.

By the definition of types $\Pr(i = g | x_1 = 0) = 0$. What about $\Pr(i = g | x_1 = sR)$? Let λ denote the probability that a b-type produces sR when $\psi = 1$. Then $\Pr(i = g | x_1 = sR) = \frac{\pi q}{\pi q + (1-\pi)(1-q)\lambda} \equiv \Pi$. We conclude that reputation is maintained or improved (i.e. $\Pi - \pi \geq 0$) if $\lambda \leq \frac{q}{1-q}$, which is true under the assumption that $q \geq \frac{1}{2}$.

Let a non-partisan voter j reelect the incumbent if $\frac{1}{2} + \delta + v_2(\psi) \Pr(i = g | x_1) \geq v_2(\psi)\pi$. Assume we are in a pooling equilibrium where b-types set $(x_1 = sR | \psi = 1)$. We need to consider three cases.

Case 1: Assume $x_1 = 0$. Then $\Pr(i = g | x_1 = 0) = 0$ and $\Pr(\psi = s | x_1 = 0) = 1$. The reelection condition of voter j reduces to $\frac{1}{2} + \delta \geq \pi sR$. Aggregating over voters, the condition for the incumbent to survive elections now becomes $\omega \left(\frac{1}{2} + \eta \right) + (1 - \omega) \left(\frac{1}{2} + \delta - \pi sR \right) > \frac{1}{2} \Rightarrow \delta < \frac{\omega \eta}{1-\omega} - \pi sR$. Write the incumbent bias as $\frac{\omega \eta}{1-\omega} \equiv \theta$. Given our distributional assumptions on the popularity shock, an incumbent that delivers $x_1 = 0$ is reelected with probability $H^0 (\theta - \pi sR)$.

Case 2: Assume $x_1 = R$. Then $\Pr(i = g | x_1 = R) = 1$ and $\Pr(\psi = 1 | x_1 = R) = 1$. The reelection condition of voter j becomes $\frac{1}{2} + \delta + R \geq \pi R$, or $\frac{1}{2} + \delta + R (1 - \pi) \geq 0$. Aggregating as in case (1), the probability of incumbency survival after observing $x_1 = R$ becomes $H^R (\theta + R (1 - \pi))$.

Case 3: Assume $x_1 = sR$. Then $\Pi \geq \pi$ and $\Pr(\psi = s | x_1 = sR) = \Pr(i = g | x_1 = sR) = \Pi$. The reelection condition of voter j then becomes $\frac{1}{2} + \delta + \Pi sR \geq \pi [\Pi sR + (1 - \Pi) R]$, or $\frac{1}{2} + \delta + R [s(1 - \pi)\Pi + (1 - \Pi)\pi] \geq 0$. The probability of the incumbent surviving after having produced $x_1 = sR$ is $H^{sR} (\theta + R [s(1 - \pi)\Pi + (1 - \Pi)\pi])$.

For the problem to be well behaved we need $H^R > H^{sR} > H^0$. We now show that this ordering requires $0 < \kappa < s < 1$. Rearranging we find that $H^R > H^{sR}$ as long as $s < 1$, which is true by

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assumption. Furthermore, $H^{sR} > H^0$ if $s > \kappa$. Note that κ falls quickly with both $q \in \left[\frac{1}{2}, 1\right)$ and $\pi \in (0,1)$, and approaches its maximum value $\kappa = \frac{1}{2}$ as $\pi \to 0$ while $q = \frac{1}{2}$. Thus, for a large range of values on π and q requiring $H^{sR} > H^0$ is undemanding. In what follows it is assumed that this requirement is met. Comparing the last expressions in cases (1) and (2), it is immediate that $H^R > H^0$ for all permissible values.

Proof. For a b-type to be willing to produce $(x_1 = sR|\psi = 1)$ the following inequality will have to be satisfied $E - c(s) + H^{sR} (\theta + R [s(1-\pi)\Pi + (1-\Pi)\pi]) \beta E \geq E + H^0 (\theta - \pi sR) \beta E$, which can be rewritten as a pooling condition (A1): $\frac{c(s)}{\beta E} \leq H^{sR} (\theta + R [s(1-\pi)\Pi + (1-\Pi)\pi]) - H^0 (\theta - \pi sR)$. In a world without ideology (only non-partisan voters) and no popularity shocks, it is readily seen that the pooling condition reduces to (A2): $\frac{c(s)}{\beta E} \leq 1$. It is evident that the right hand side of (A1) is smaller than that of (A2). ∎

Remark: Electoral uncertainty and incumbency bias clearly reduce the support of an equilibrium in which shirking can be disciplined. The derivative of the difference on the RHS of (A1) wrt θ is proportional to: $h^{sR} (\theta + R [s(1-\pi)\Pi + (1-\Pi)\pi]) - h^0(\theta - \pi sR)$. Noting that $[s(1-\pi)\Pi + (1-\Pi)\pi] > 0$, the effect of incumbency bias (θ) can be clarified. For $\theta < \theta' = \frac{1}{2}R [\Pi(\pi - s(1-\pi)) - \pi(1-s)]$, increased bias expands the support of the pooling equilibrium. For $\theta > \theta'$ increased bias contracts the support of the pooling equilibrium. Further to this, the higher the standard deviation of the $h(\delta)$ distribution (the more uncertainty there is in the voting mechanism), the less likely discipline becomes (the smaller is the support of a pooling equilibrium) for given values of θ.

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