Voting When the Stakes are High*

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Abstract

Rational choice theories of electoral participation stress that an individual's decision to vote depends on her expected net benefit from voting. If this instrumental motive is relevant, then turnout should be higher in elections where more is at stake. We test this prediction, by studying how turnout is affected by exogenous variation in governments' financial flexibility to provide pork. Utilizing simultaneous elections for different offices, we identify a positive effect of election stakes on turnout.

Keywords: Voter Motivation; Elections; Turnout

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1 Introduction

In its simplest form, the rational choice theory of voting suggests that individuals are motivated to vote because they can affect the election outcome. It follows that turnout is expected to be higher in elections where more is at stake and where voters are more likely to cast a decisive vote (Downs (1957), Riker and Ordeshook (1968)). While several studies have investigated how the expected probability of being pivotal matters (see Blais (2000)), little attention has been directed to how the stakes of the election affect political participation. In this paper we explore if turnout rates vary with the benefits of being pivotal: Do more people vote when the stakes are high?

The stakes of an election depend on how strongly the winning candidate can influence outcomes that voters care about. A key determinant here is the budgetary constraints that politicians face in office, which in general cannot be taken as exogenous. Our approach to handle endogeneity of electoral stakes is to utilize variation in local government revenue in Norway from hydro power production, which is largely determined by geography. More revenue from hydro power production equips elected officials with more funds to distribute, and thus affects the stakes of the local election.[1]

Our identification strategy exploits that elections for the local and regional governments are held simultaneously, with identical sets of eligible voters. By focusing on the *difference* in turnout in the two elections—the turnout difference hereafter—our estimates are unlikely to be biased by (unobserved) population characteristics.

Our main finding is that revenues from taxation of hydropower production increases turnout in the local relative to the regional election. This finding is remarkably robust. It is visible in the raw data, and it does not disappear as we gradually control for an extensive list of local characteristics known from the literature to affect turnout. Furthermore, while these observables do explain turnout *levels*, they have a small impact on turnout *differences*. Hence, in order for our qualitative finding to be driven by unobservables,

[1] Hægeland, Raaum, and Salvanes (2008) use the same source of variation to identify effects of school resources on pupil achievement.

these must both be correlated with power income, and influence the turnout difference far stronger than observables do. We argue that this is not likely to be the case.

Quantitatively, we find that if hydropower tax revenue increases from zero to its maximum level, the turnout difference responds with about 6 percentage points. The estimates imply that it takes around 1500 dollars per capita (9,000 Norwegian kroner) to increase participation by 1 percentage point in the local relative to the regional election. Because the observed variables do not influence this point estimate by much, a primary concern is not that this number is biased by omitted variables. However, if hydro power taxation triggers people to vote at the local election, this is also likely to reduce the cost of voting at the regional election, since voting for both elections takes place within the same voting booth. Consequently, we consider our estimates as lower bounds of the causal effect of interest.

In the elections we study, voters may cast preferential votes for specific candidates. As a robustness check, we therefore investigate whether hydropower income also motivates voters to alter the party lists. The evidence suggests that it does.

In terms of the Downsian "calculus of voting" model, our results only make sense if hydropower revenue *increases* the incentive to vote at the local relative to the regional elections. In theory this need of course not be the case. As resource wealth feeds into greater provision of public goods by the local government, the marginal utility of these goods is likely to decline, reducing how strongly voters' prefer one candidate's prioritization over public goods relative to another's. On the other hand, if extra revenues instead are used for purposes targeted at particular recipients, or pork, it becomes more important to vote at the local election.[2] We therefore inspect how income from hydropower relates to spending priorities. The data reveals that the two core welfare services that local governments must provide (schooling and elderly care) are down-prioritized relative to non-core components such as local roads, cultural activities and industry support. Thus, the spending pattern appears consistent with the hypothesis that hydropower income

[2]A related argument is made by Schwartz (1987).

raises the instrumental incentive to vote at the local election.

A broad distinction in the literature on voter motivation goes between theories that focus on the instrumental motive to vote and theories where the act of voting in itself generates utility (Dhillon and Peralta (2002)). It is well understood that the "calculus of voting" framework cannot explain observed turnout *levels* in large-scale elections (e.g. Schachar and Nalebuff (1999)). Our analysis fits into this literature, by showing that the instrumental motive to vote may still matter on the *margin* (as suggested by Blais (2000), Dowding (2005) and Geys (2006b)).

The paper is organized as follows. In section 2 we assess how revenues from hydropower income taxes are spent. Section 3 uses a simple version of the pivotal voter model to obtain an empirical strategy for estimating the effect of hydropower income on turnout. The data and our empirical specification are presented in section 4. Section 5 gives the results for turnout, while we in section 6 conduct a brief analysis of preferential votes. Section 7 explores the robustness of our main result and Section 8 discusses potential endogeneity issues. Section 9 concludes.

2 Fiscal Effects of Hydro Power

The central question we explore in this paper is how hydropower income affects turnout. A priori, it is not obvious whether hydropower income will increase or reduce the instrumental motive to vote. On the one hand, if power rich governments simply use their extra revenues to produce more of the same welfare services as poorer local governments provide, and voters' utility over these services is concave, higher income will reduce the importance of the election to voters. On the other hand, if hydropower income triggers pork barrel spending that is targeted at specific recipients in the electorate, this income source will stimulate the instrumental incentive to vote.[3] Hence, before we analyze how hydropower income affects turnout, it is important to know how this extra income is spent.

[3]A formalized version of this argument is provided in the appendix.

In this section we therefore describe how spending varies with hydropower income.

2.1 Hydro Power and Local Government Revenues

Hydro power accounts for 98-99 percent of total electricity production in Norway (Statistics Norway). Large hydro power plants are typically found in mountainous areas with substantial precipitation, often with a glacier nearby. Most of the major hydro power stations operating today started up production several decades ago.[4]

A topography that is favorable to production of hydropower translates into large revenues for local governments due to the commercial property taxation that the local governments can choose to levy on power producers.

In 2007, 65 percent of the local governments levied commercial property taxation. The tax rate is chosen by the local government, but cannot exceed 0.7 percent. Almost all local governments choose to tax at the maximum rate (Hægeland, Raaum, and Salvanes (2008)).[5]

For most local governments the revenues from commercial property taxation are small. About two thirds of all local governments receive less than four percent of their total revenues from this source. However, for some local governments, revenues from commercial property taxation constitute an important source of income. In 2007, 37 local governments received more than 10 percent of their total income from commercial property taxation. In per capita terms, the average revenue from this tax source is about NOK $2,000$ (USD 345). The maximum is about NOK $52,000$ (approximately USD $9,000$) per capita. As revenues from commercial property taxation predominantly stem from taxation of hydro power plants, we refer to this as hydro power income.[6]

[4]As of January 1, 2008, there are 331 power stations with a capacity above 10 MW. The median start-up year for these power stations is 1968 (data provided by the Norwegian Water Resources and Energy Directorate).

[5]Local governments also have the possibility to levy property taxation on housing, studied in Fiva and Rattsø (2007).

[6]Out of the 37 local government with more than 10 percent of their income from commercial property taxation, 30 have major power stations (capacity above 10MW). Three local government have only minor hydro power stations (capacity below 10MW) and four do not have any hydro power. In these cases the property tax revenues stems mainly from fish, and from the oil industry.

2.2 Fiscal Flexibility and Spending Priorities

There are three layers of government in Norway, the central government, regional governments (counties) and local governments (municipalities). The main entities of interest in this paper are the 431 local governments, which play an important role within the Norwegian welfare state.

In 2007 local governments spent on average NOK 67,000 per capita (USD 11,500). About 57 percent is spent on the major welfare services that Norwegian local governments have responsibility for, namely child care, schooling and elderly care. About 6 percent is spent on traditional local public goods (fire protection and infrastructure). The remainder is spent on central administration, social assistance, primary health care, culture, industry support, planning and local roads. See Table 1 and 2 for details.

The local governments have substantial flexibility concerning the composition of government spending, subject to a set of minimum standards set by the central government. On the revenue side they are more restricted. Most local governments receive the bulk of their revenues from highly regulated local tax sharing and grants (based on tax and spending equalization) from the central government. On average, this source of revenue accounts for about 80 percent of the total local government revenues. One area in which the local governments do have some flexibility are user charges. However, these are limited to cover costs only. Importantly for the present study, property tax revenues, and therefore hydro power income, are not part of the grant system, and are thus not redistributed across local governments.

In Table 3 we present results from simple regressions where we relate spending per capita to hydropower income for twelve different expenditure categories, holding the number of inhabitants in the municipality and the settlement pattern fixed. We find that hydro power rich local governments spend more per capita on every category of the local budget. This is not surprising, and says little about how hydro power income affects priorities. We therefore continue by focusing on each expenditure component as share of total spending, and explore how these spending shares vary with hydro power income.

Results for spending shares are presented in Table 4. We see a systematic negative association between the fraction spent on the two major welfare services (schooling and elderly care) and hydro power income (again holding population size and settlement pattern fixed). On the other hand, hydropower income is positively related to the shares spent on culture, industry support, planning and local roads, respectively. All these associations are statistically significant at the one percent level. In addition we find a positive relation between hydro power income and central administration, but this association is statistically significant only at the ten percent level.

This pattern is likely to reflect that most local governments without hydropower revenues must spend most of their funds just to achieve the minimum standards set by the central government concerning the major welfare services (e.g. maximum class size at primary schools). Rich local governments, on the other hand, have the financial flexibility to pursue interests beyond their primary tasks.

The expenditure components that gain priority as hydropower income increases have the common feature that they may be targeted at well-defined interest groups. For instance, a larger administration is particularly beneficial for those who gain employment from this. Higher spending on culture matters most for those who produce cultural services and have an appreciation for the culture services provided. While industry support may be useful for the local community as a whole, it is particularly useful for the recipient companies. Furthermore, although roads are generally considered as public goods in economics, the roads provided by local governments in Norway are small and are not the main routes for transportation within the municipalities. Instead they are typically utilized only by the residents of the neighborhood where they are located, as main roads are provided by the central or regional governments. Finally, planning is a logical need as these types of projects expand.

A natural interpretation of the pattern in Table 4 is that hydropower income allows politicians to allocate resources to new purposes beyond the primary welfare services that poorer municipalities must focus on, and that these new purposes benefit specific groups

of voters. Hence, of the two opposing effects of hydropower income on the instrumental incentive to vote mentioned above, the spending patterns indicate that the positive effect is likely to dominate the negative effect.

3 Theory and Empirical Strategy

3.1 The Model

Consider the following formulation of the conventional "calculus of voting" model.

An eligible voter i in local voting district l votes if her expected benefit from voting exceeds her cost:

$$p_{l,i}^{L} B_{l,i}^{L} + D_{l,i}^{L} \geq C_{l,i}^{L}, \tag{1}$$

where $p_{l,i}^{L}$ is citizen i's probability of casting a decisive vote (indexed by L) and $B_{l,i}^{L}$ is her subjective value of influencing the election outcome, the "party differential" in the terminology of Downs (1957). Hence, the product, $p_{l,i}^{L} B_{l,i}^{L}$, is the total instrumental incentive to vote. $D_{l,i}^{L}$ denotes i's direct benefit from voting at the local election, termed the "consumption benefit" of voting by Riker and Ordeshook (1968), and $C_{l,i}^{L}$ is i's cost of voting.[7]

The probability of being pivotal can be interpreted in the traditional way, where voters may be pivotal in terms of altering political representation. Alternatively, voters may

[7]Even though $D_{l,i}^{L}$ was initially introduced as the "consumption benefits from voting" by Riker and Ordeshook (1968), it can be assigned the more general interpretation of a "catch-all" variable. In the literature, the catch-all term has been associated with a range of factors that may give individuals utility of voting per se, for instance: demographic variables such as age (Strate, Parrish, Elder, and Ford (1989)), gender (Schlozman, Burns, Verba, and Donahue (1995)), marital status (Stoker and Jennings (1995)), education (Leighley and Nagler (1992a)), income (Leighley and Nagler (1992b)); attitudinal and behavioral factors such as general political knowledge (Galston (2001)), strength of partisanship (Huckfeldt and Sprague (1992)), feelings of civic duty (Blais and Young (1999)), political trust (Hetherington (1999)), church attendance (Cassel (1999)); social variables such as social pressure (Funk (forthcoming)), group consciousness (Miller, Gurin, and Gurin (1981)), political disagreement (Mutz (2002)), and social capital (Lake and Huckfeldt (1998)); and institutional variables such as closeness of the election (Schachar and Nalebuff (1999)), party loyalty (Schuessler (2000)), contact from political organizations (Wielhouwer and Lockerbie (1994)), campaigns (Ansolabehere, Lyengar, Simon, and Valentino (1994)), and barriers to registration (Rosenstone and Wolfinger (1978)); and, finally, genes (Fowler and Dawes (2008)). See Geys (2006a) and Degan and Merlo (forthcoming) for more comprehensive reviews of the literature. For our purposes the exact interpretation of D is not important.

be pivotal by influencing which group(s) within the community that receive patronage rewards or local public benefits (Schwartz (1987); Smith and Bueno de Mesquita (2010)). When pork barrel politics dominate the political agenda this interpretation of $p_{l,i}^L$ may be particularly relevant.

The terms $C_{l,i}^L$ and $D_{l,i}^L$ may differ across individuals. Hence, the net cost of voting, $C_{l,i}^L - D_{l,i}^L$, is distributed within the population of local government l, with a cumulative distribution function $F\left(e_l^L; \mathbf{Y}_l\right)$ representing the fraction of eligible voters with $C_{l,i}^L - D_{l,i}^L \leq e_l^L$. $\mathbf{Y}_l$ is a vector of local government specific characteristics that influence the distribution of net voting costs.

For expositional convenience, we assume that the instrumental incentive does not differ across individuals in l, $p_{l,i}^L B_{l,i}^L = p_l^L B_l^L$. The share of l's potential voters who turn out for the local election, "local turnout" hereafter, is then $F\left(p_l^L B_l^L; \mathbf{Y}_l\right)$.[8]

Consider now the decision to vote at the regional government election (indexed by R). Completely analogously to (1), the citizen will choose to vote if

$$p_{l,i}^R B_{l,i}^R + D_{l,i}^R \geq C_{l,i}^R \tag{2}$$

As for the local election, assume that the net cost of voting at the regional election, $C_{l,i}^R - D_{l,i}^R$, differs across the inhabitants in l, with a cumulative distribution function $G\left(e_l^R; \mathbf{Y}_l\right)$. Assume also that the instrumental motive to vote at the regional election is identical for all voters in l, $p_{l,i}^R B_{l,i}^R = p_l^R B_l^R$. The share of voters in l who vote at the regional election, "regional turnout" hereafter, is then $G\left(p_l^R B_l^R; \mathbf{Y}_l\right)$.

[8]Rather than assuming that individuals have the same $p_l^L B_l^L$, we could let them be heterogenous in this respect too. In this case turnout could be represented by $H\left(0, Y_l\right)$ denoting the mass of voters with $C_{l,i}^L - D_{l,i}^L - p_{l,i}^L B_{l,i}^L < 0$. However, because this formulation allows a less transparent representation of how local income affects local turnout we simplify by assuming that individuals have the same $p_l^L B_l^L$.

3.2 The Effect of Local Government Income on the Turnout Difference

Within the model laid out above, local government income, I_l, affects turnout in the local election in l as follows:

$$\frac{dF\left(p_l^L B_l^L; \mathbf{Y}_l\right)}{dI_l} = f\left(p_l^L B_l^L; \mathbf{Y}_l\right)\left[p_l^L \partial B_l^L/\partial I_l + B_l^L \partial p_l^L/\partial I_l\right] + \tag{3}$$
$$d\mathbf{Y}_l/dI_l\left[f\left(p_l^L B_l^L; \mathbf{Y}_l\right)\left(p_l^L \nabla \overline{B_{\mathbf{Y}}^L} + B_l^L \nabla p_{\mathbf{Y}}^L\right) + \nabla F_{\mathbf{Y}}\left(p_l^L B_l^L; \mathbf{Y}_l\right)\right],$$

where $\nabla \overline{B_{\mathbf{Y}_l}^L}$, $\nabla \overline{p_{\mathbf{Y}_l}^L}$ and $\nabla F_{\mathbf{Y}_l}\left(p_l^L B_l^L; \mathbf{Y}_l\right)$ are the gradients of B_l^L, p_l^L and $F\left(p_l^L B_l^L; \mathbf{Y}_l\right)$ with respect to $\mathbf{Y}_l$, and $d\mathbf{Y}_l/dI_l$ is a vector of how each characteristic is affected by I_l.[9] $f\left(p_l^L B_l^L; \mathbf{Y}^l\right) \equiv F_1\left(p_l^L B_l^L; \mathbf{Y}_l\right)$ is the mass of eligible voters who are "on the margin" in the sense that they are indifferent between turning out and abstaining. In the first term of the expression, this mass is multiplied with the effect of income on the instrumental incentive to vote, which is the expression inside brackets. The total product thus captures how strongly a marginal increase in income affects turnout via the instrumental incentive to vote.

The second term in (3) captures how I_l may influence turnout through an association with local characteristics, hereafter referred to as the "selection effect". This effect depends on how strongly income relates to each characteristic in $\mathbf{Y}_l$, $\frac{d\mathbf{Y}_l}{dI_l}$, and how strongly each characteristic in $\mathbf{Y}_l$ relates to the benefit and the probability of being pivotal ($\nabla B_{\mathbf{Y}_l}^L$ and $\nabla p_{\mathbf{Y}_l}^L$) and the distribution of net voting costs in local community l ($\nabla F_{\mathbf{Y}_l}$). An intuitive example of this effect would be that local governments with high I_l attract citizens with a strong conviction that voting per se is important, and who therefore have low values of e_l^L and e_l^R.

A similar expression to (3) applies for the effect of local income on the local turnout in the regional election. Hence, income will affect the difference between the local turnout

[9] Hence, e.g. $\nabla F_{\mathbf{Y}}\left(p_l^L B_l^L; \mathbf{Y}_l\right)$ is a vector of the derivatives of F with respect to each component of $\mathbf{Y}_l$.

in the local and regional elections, the "turnout difference" hereafter, in the following way:

$$\begin{aligned}\frac{d\left[F_l - G_l\right]}{dI_l} &= f_l\left(p_l^L \partial B_l^L/\partial I_l + B_l^L \partial p_l^L/\partial I_l\right) - g_l\left(p_l^R \partial B_l^R/\partial I_l + B_l^R \partial p_l^R/\partial I_l\right) \\ &\quad + \frac{d\mathbf{Y}_l}{dI_l}\Delta s_l^Y, \end{aligned} \tag{4}$$

where

$$\Delta s_l^Y = f_l\left(p_l^L \nabla \overline{B_{\mathbf{Y}_l}^L} + B^L \nabla p_{\mathbf{Y}_l}^L\right) + \nabla F_{\mathbf{Y}_l} - g_l\left(p_l^R \nabla \overline{B_{\mathbf{Y}_l}^R} + B^R \nabla p_{\mathbf{Y}_l}^R\right) - \nabla G_{\mathbf{Y}_l}.$$

Here we have used the compressed notation $F_l \equiv F\left(p_l^L B_l^L; \mathbf{Y}_l\right)$, $f_l \equiv f\left(p_l^L B_l^L; \mathbf{Y}_l\right)$, etc., while $g_l \equiv g\left(p_l^R B_l^R; \mathbf{Y}_l\right)$ is the mass of voters l who are on the margin at the regional election, and $\nabla G_{\mathbf{Y}_l}$ is the gradient containing all the derivatives of G with respect to $\mathbf{Y}_l$.

As in the expression for turnout in the local election (3), we see two channels through which income potentially affects the turnout difference. First, local income may affect the instrumental incentive to vote at the local and regional elections differently. This is likely to be the case since higher income at the local level raises the financial flexibility under which the local government operates, but does not affect the financial situation of the regional government.

Next, there is the selection effect, in which the same relationship between income and characteristics, $d\mathbf{Y}_l/dI_l$, now is multiplied by $\mathbf{\Delta s}_l^Y$, hereafter referred to as the "selection difference". This term will be quantitatively smaller than the selection effect in (3) if the effects of characteristics $\mathbf{Y}_l$ on the consumption benefits of voting, the probability of being influential, and the distributions of net costs of voting go in the same direction at the two elections. Importantly, equation (4) illustrates that a selection effect can affect the turnout difference only if income is related to local characteristics and these characteristics influence individuals' propensity to vote at the regional election differently from their propensity to vote at the local election.

3.3 Local Government Income and the Instrumental Incentive to Vote

The spending patterns documented in Section 2 suggested that hydropower income is predominantly used to provide goods and services that benefit more narrowly defined groups than the primary tasks of local governments do. Hence, we expect that a voter's benefit of being pivotal, $B^L_{l,i}$, increases with hydropower income.[10] On the other hand, if income stimulates political participation through this channel, equilibrium turnout will increase, and the probability of being pivotal will decline with income, $\partial p^L_l/\partial I_l < 0$. However, this second order effect can only dampen, not overturn, the total impact of income on the instrumental incentive to vote at the local government election, and $p^L_l \partial B^L_l/\partial I_l + B^L \partial p^L_l/\partial I_l > 0$ if $\partial B^L_{l,i}/\partial I_l > 0$.

3.4 Empirical Strategy

Our aim is to identify how income affects turnout via the instrumental motive to vote. From (3) we know that in a simple regression of local turnout, T^L_l, on local income, I_l,

$$T^L_l = \mu^L + \beta^L I_l + \varepsilon^L_l, \tag{5}$$

the coefficient β^L captures the selection effect of income in addition to the instrumental effect we are interested in. To handle this, we therefore consider the difference between turnout in the local and the regional elections in each l, and estimate an equation of the type

$$T^L_l - T^R_l = \mu^{LR} + \beta^{LR} I_l + \varepsilon^{LR}_l. \tag{6}$$

where the superscript LR denotes that we are studying the difference between local and regional elections. From (4) and the ensuing discussion, it follows that specification (6) will identify how hydro power income affects the instrumental motive to vote if the

[10] This argument, and in particular the conditions for $\partial B^L_{l,i}/\partial I_l > 0$ to hold, is more formally addressed in the appendix.

selection difference is (on average) zero (in the model, if $\mathbf{\Delta s}_l^Y = 0$).

On the other hand, if the selection difference is non-zero, we may suffer from the selection problem even with specification (6). We would therefore like to infer the severity of this potential problem. To do this we partition the vector $\mathbf{Y}_l$ into observables, $\mathbf{X}_l$, and unobservables, $\mathbf{Z}_l$. The selection effect in (4) will then consist of two parts:

$$\mathbf{\Delta s}_l^Y \frac{d\mathbf{Y}_l}{dI_l} = \frac{d\mathbf{X}_l}{dI_l}\mathbf{\Delta s}_l^X + \frac{d\mathbf{Z}_l}{dI_l}\mathbf{\Delta s}_l^Z,$$

where $\mathbf{\Delta s}_l^X$ and $\mathbf{\Delta s}_l^Z$ are the selection differences for $\mathbf{X}_l$ and $\mathbf{Z}_l$, respectively. Hence, when we run the following regression of the turnout difference where we include the observables $\mathbf{X}_l$,

$$T_l^L - T_l^R = \mu + \beta^{LR} I_l + \mathbf{X}_l\alpha + \varepsilon_l^{LR}, \tag{7}$$

our estimate of β^{LR} will be contaminated by a selection effect only through $\mathbf{\Delta s}_l^Z$. A comparison of estimates of β^{LR} from specifications 6 and 7 then allows us to assess the importance of selection on unobservables. If we include variables which we a priori expect to be important for voter behavior, and find that this leaves β^{LR} basically unaltered, then it is unlikely that unobservables bias β^{LR}. A more formal argument along these lines is given in Altonji, Elder, and Taber (2005).

4 Political Environment, Data and Econometric Specification

4.1 The Political System

Both the local and the regional governments are headed by councils elected through open list proportional representation. Voters choose a party list, but also have the possibility to cast preferential votes for *any* candidate running for a seat in the council. The preferential votes primarily affects the allocation of seats within parties, but can also impact the

distribution of seats across parties.[11] The distribution of seats in the local council is determined according to the modified Saint-Lagüe method.

Elections for both the local and the regional governments take place every fourth year. Local governments choose whether elections last for one or two days. The election outcomes we analyze are based on elections held September 9-10, 2007. The regional governments ($n = 19$) are, like the local governments, multi-purpose authorities, but with more limited tasks. Their primary responsibilities are upper secondary education, roads and transportation.

At the local and regional level of government there are 7 main political parties. In addition there are some independent lists (i.e., local lists that are independent of the traditional parties) that receive substantial support in some of the local elections in our sample. Independent lists are more issue oriented than traditional party lists and are frequently based on geographical divides within the geographical boundaries of the local government (Aars and Ringkjøb (2005)).

The key player in the local government is the mayor. In about 90 percent of the local governments, the mayor is elected by the members of the local government at the beginning of the election term. The remaining 10 percent hold direct elections for mayor together with the ordinary local elections. The mayor cannot be removed within an election term.

The main political divide in Norwegian politics goes between the social democratic left bloc and the conservative right bloc. In the 2007-2011 election period, 44 percent of the mayors are from the left wing bloc, 50 percent are from the right wing bloc, and 6 percent are from independent lists.

[11] At the local government level parties have the option to give some candidates an increased share of the poll (maximum 25 percent of the total number of votes received by the party's list). Together with preferential votes, this is the basis for seat distribution within parties. At the regional level the parties cannot give candidates an increased share of the poll, and preferential votes cannot be given to candidates from other lists. The voters may however affect the ordering of candidates at different lists, but for this to overrule the ordering proposed by the party prior to the election, a candidate must receive a preferential vote from at least 8 percent of the party's electors.

4.2 Data

The data set applied in this analysis is a cross section of Norwegian local governments in 2007. The total number of local governments was 431 that year, but we lose five observations for various reasons.[12] Table 5 shows descriptive statistics for all variables used in the analysis.

4.3 Econometric Specification

We follow the empirical strategy explained in section 3, and base our inference on the difference between turnout in the local and regional elections using specifications of equation (7). In the vector of controls, $\mathbf{X}_l$, we include the richest set we have available of the characteristics suggested as important determinants of voter turnout by the literature (see footnote 7).

First, we include in the vector of controls various measures capturing population characteristics. In particular, we include the size and age distribution of the electorate, as well as the distribution of educational and marital status within the population. We also include variables capturing local government settlement pattern and recent immigration (measured as the number of people moving into the local government in 2006 relative to the size of the population). Furthermore, we include the average wage level (measured in NOK 100,000) for men and women, respectively. Finally in this category of controls we include two measures that proxy for social capital, namely donations per capita (NOK) at the annual, country-wide TV charity show, and the number of church services attended per capita.

Second, we include controls for various institutional characteristics of each local government: whether elections were held at one or two days (dummy), whether there are direct local elections for the mayor or not (dummy), party fragmentation of the local government based on the previous local election and whether there exists an independent list

[12] Two local governments (Kristiansund and Frei) merge January 1st 2008, two local governments have implemented parliamentary systems (Oslo and Bergen) and we lack data on property taxation for one local government (Torsken).

at the local election (dummy). These political institutional characteristics are potentially endogenous to voter turnout and are not included in all specifications.[13]

Finally, we include region fixed effects, implying that all inference comes from within region variation in our explanatory variables. Our econometric specification is therefore

$$T_l^L - T_l^R = \mu_R + \beta^{LR} I_l + \mathbf{X}_l \alpha + \varepsilon_l^{LR}, \tag{8}$$

where μ_R is the region fixed effect and ε_l^{LR} is an error term.

5 Results

5.1 Descriptive Statistics on Voting Behavior

The average turnout in the local election is 64 percent, while average turnout in the regional election is 58 percent. In fact, the turnout in the regional election is lower than turnout in the local government election throughout the sample. The maximum deviation between the two is 20 percentage points.

As mentioned above, voting for a party list is not the only way to influence the composition of the local government. An alternative is to cast preferential votes to favored candidates (or delete unfavored candidates from the party list). The option to alter the party list is utilized by 51 percent of the voters in the local election and by 29 percent of voters at the regional election (as captured by the variables PreferentialVotesLocal and PreferentialVotesRegional). See Table 5).

5.2 Simple Correlations

As a simple first investigation, we plot the association between voter turnout and hydro power income and accompanying regression lines in Figure 1. We see that turnout in both the local and the regional election correlate positively with hydro power income (upper

[13]For a detailed description of all variables included in the analysis, see Table 14 in the Appendix.

and middle panel, respectively). The association is strongest for the local election. The slope of the regression lines based on the local and regional elections are 0.23 and 0.09 (both statistically significant at the one percent level).

In the bottom panel of Figure 1 we plot the association between our main outcome variable, the difference in turnout for the two elections (Dturnout), and hydro power income. The slope of the regression line is 0.14 and statistically significant at the one percent level.

5.3 Contrasting Turnout in the Two Coinciding Elections

In Table 6 we present results where we explain the difference between turnout in the two elections, using Ordinary Least Squares (OLS) to estimate variants of equation (8), that differ by which variables we include in our set of controls.

We start out with specification (1) where we do not include any control variables, equivalent to the regression line displayed in the lower panel of Figure 1. We then add control variables in four steps: Specification (2) includes region dummies, specification (3) includes a control variable for the size of the electorate, specification (4) includes the full battery of the population characteristics we have available. Finally, specification (5) is augmented with political institutional variables.

All specifications give a positive and statistically highly significant estimate for the effect of hydro power tax income. In the richest specification the point estimate is 0.11, statistically significant at the one percent level. Quantitatively, this implies that if revenues from hydro power taxes increase by USD $1,000$ per capita, the turnout difference rises with about 0.7 percentage points. Alternatively, when hydro power tax revenues raise from the minimum (NOK 0) to the maximum (NOK $52,000$, USD $9,000$) observed level, the turnout difference increases with about 6 percentage points. Assuming a baseline turnout rate at 65 percent, this implies that about 1 out of 7 citizens who otherwise would have abstained are motivated to participate in the election.

From the "calculus of voting" model we would expect the size of the electorate to be

negatively associated with turnout, as the probability of an individual vote being pivotal in the election is reduced when the size of the electorate increases. We find this effect in our data. The estimates in column (3) suggest that together with regional dummies and hydro power income, electorate size explains about 42 percent of the variation in turnout difference.

We have experimented with a functional form where we allow the impact of hydro power income on turnout to depend on the number of voters. The interaction term was not statistically significant at conventional levels.[14] This may imply that "prize pivotalness" (Schwartz (1987); Smith and Bueno de Mesquita (2010)) is empirically more relevant than "outcome pivotalness" (Downs (1957)) in the context we study. The idea in Schwartz (1987) and Smith and Bueno de Mesquita (2010) is that parties depend on the continuing support of particular groups to stay in power and therefore have incentives to cater the same groups by offering local public benefits. When a party allocates rewards contingent upon group-level voting results it motivates group members to coordinate on supporting the party even if individuals cannot influence who will win the election.

Local characteristics have limited explanatory power, as seen in column (4) of Table 6. While several population characteristics are associated with the local government turnout levels (see Table (13) in the appendix), few are statistically significant for the turnout difference.[15] Hence, turnout in the regional election seems to capture how observable characteristics affect citizens' general motive to vote, independently of what is at stake in the elections.

Our interest in point estimates for population characteristics follows from the discussion in Section 2.4. When we find that observables have negligible effect on the turnout difference, the possibility that omitted variables are driving our results becomes less of a

[14]Results are available upon request. That the benefits from voting and the probability of casting a decisive vote, in the traditional sense, matters independently, but not multiplicatively is in line with survey evidence provided by Blais, Young, and Lapp (2000).

[15]Local governments with a large number of recent immigrants tend to have a lower turnout difference. This effect is statistically significant at the five percent level in specification (4). Most likely, this captures that newcomers are less rooted in their community and consequently are less likely to vote at the local election (Geys (2006a); Gentzkow, Shapiro, and Sinkinson (2009)).

concern: The relevant omitted variable must both be appropriately correlated with hydropower income, and affect turnout far stronger than our observables. Furthermore, by comparing point estimates of hydropower tax income in specification (1) and (4) of Table 6 we learn that omitted variables must reduce this point estimate by almost six times as much as our full list of controls, including population size and region fixed effects, to make it disappear. This seems unlikely.

Although omitted variables are unlikely to be driving our main result, there is one factor that could impact our estimates: The cost of voting. Once an individual is inside the voting booth, part of the voting cost (in our model, C) is sunk. It is therefore reasonable to expect that if hydropower income motivates individuals to participate in the local election, some of these people will drop a vote in the regional election too. The upward sloping relationship between hydropower income and regional turnout in Figure 1 is consistent with this taking place. Hence, our point estimates may be interpreted as a *lower bound* of how hydropower income affects turnout via the instrumental incentive to vote.

5.4 Independent Lists: Special Interests and Cognitive Costs of Voting

The broad hypothesis behind our study is that when hydropower equips local governments with more funds to distribute, individuals are motivated to seek political influence through voting. An alternative means for influencing politics is to create a local list, independent of the nationwide political parties. Indeed, the conventional understanding of independent lists in Norway is that these are founded when there are particular issues of controversy beyond the conventional partisan divide (Aars and Ringkjøb (2005)), and our evidence in Section 2 indicates that the room for special interest politics is particularly large when hydropower income is high. Furthermore, one might hypothesize that when the party structure for the local election differs from the regional election, the cognitive cost of

deciding who to vote for at the regional election increases. If this is the case, a mechanism behind our findings may be that hydropower stimulates the turnout difference through the emergence of independent lists.

To assess this possibility, we have controlled for whether the set of parties participating in the local and regional elections differed. The dummy PartyIndepLists equals 1 if independent lists participated, zero otherwise.[16] We see from Table 6 that the estimated coefficient is positive, as expected. Importantly, however, the impact of hydropower income is basically unaltered when this control variable is included (compare specification (4) and (5)). Hence, the reason hydropower income stimulates the turnout difference is not that it makes independent lists emerge.

However, the existence of independent lists may still be relevant for the interpretation of our results. If hydropower income triggers people to vote at the local election, they automatically sink the cost of attending the polling booth for the regional election, but not the cognitive cost of choosing which party to support at that election. Consequently, hydropower income may to a larger extent trigger individuals to vote for just the local, rather than both elections, when the set of available party lists is different at the two elections (i.e. in local elections where coattail voting is expected to be less prominent). To address this hypothesis, we introduce an interaction term between PartyIndepLists and hydro power income. The results are given in Table 7. The interaction term is positive and statistically significant at the five percent level. In fact, if we compare to the baseline results reported in Table 6, we see that the estimates from that specification are strongly driven by local electoral districts where the party lists available are not the same for the two elections. This result is confirmed when we split the sample according to the presence of independent lists.[17]

We interpret the interaction effect as a confirmation that by focusing on the turnout difference, we estimate a lower bound of how hydropower income affects the incentive to

[16] We only consider local party lists that got votes sufficient to gain at least one seat in the local council (41 percent of the local governments fulfilled this criteria). The results are similar if we consider local lists that got at least one vote (53 percent of the local governments).

[17] Details are available upon request.

vote because part of the voting cost for the regional election is sunk. When the cognitive cost of voting at the regional election is high this issue is less important. Hence, the sum of the direct effect and the interaction effect in Table 7 is likely to be a better representation of how hydro power income impacts turnout. This effect is then 0.16 rather than 0.11 as in the baseline specification.

6 Preferential Votes

As an extension of our main analysis we consider a different dimension of political participation and its connection to hydropower income: The use of preferential votes. As explained in Section 4.1, voters may in local elections cast "side votes" for a specific candidate on *any* party list. A similar, but not identical, feature exists for the regional election. Clearly, this constitutes an alternative way for voters to affect election outcomes.

We follow the empirical approach laid out in Section 4, but we now use the share of votes that have been corrected (in percentage points) as the dependent variable. In Table 8 we contrast vote correcting behavior at the local level to vote correcting behavior at the regional level (i.e. estimates on Equation (8) with the difference in corrected vote shares as the dependent variable).

This exercise yields a positive effect of hydro power income, which is statistically significant at the five percent level. The point estimate is 0.17, indicating that if hydro power tax revenues were to increase from 0 to NOK $52,000$, the share of votes that are corrected would increase with about 9 percentage points.

In contrast to the cost of voting, an individual's cognitive cost of casting a preferential vote at the regional election should not be affected by the existence of independent lists. Hence, if the effects of independent lists in section 2.4 really are due to cognitive costs of voting, they should *not* turn up for preferential votes. We therefore test whether an interaction term between PartyIndepLists and hydropower income does affect the number of preferential votes. The interaction effect is not statistically different from zero

(see Table 9).

7 Sensitivity Checks

Areas with substantial hydro power income are typically sparsely populated. To ensure that our results are not driven by some omitted population size variable we have experimented with a more homogenous sample, where we only include local governments with less than 10,000 inhabitants. In Table 10 we provide results from this exercise for the specifications where all covariates are included and voter turnout is the dependent variable.

For ease of comparison we reproduce our baseline results in specification (1) in Table 10. As is evident from the tables, our results do not change much when excluding local governments with population size above 10,000 (specification (2)). We have also investigated to what extent our results are driven by outliers by applying a robust regressions method, which we report in specification 3.[18] We also report results from robust regressions on the more homogenous sample (specification 4). The point estimate is smaller in specification (3) relative to our baseline estimate from specification (1). However, in all specifications, we find that the impact of hydro power revenues is statistically significant at the one percent level.

8 Endogeneity

A challenge when assessing a causal effect of election stakes, is that these stakes generally are not exogenous, but will depend on the policies chosen by politicians in response to fiscal needs, personal popularity and so on.[19] To circumvent this problem, we have used a research design where such policy endogeneity is unlikely to be a concern since hydro power income is largely determined by geographical factors. However, as noted in Section

[18]The robust regression iteratively reweights observations to reduce the importance of outliers. We implement it with STATA's rreg command.

[19]Besley and Case (2000) offer a general discussion of bias due to policy endogeneity.

2.1., local governments do have the choice whether to levy commercial property taxation or not, they can choose to set the tax rate below the maximum rate (even though few do), and there are also some local governments receiving commercial property tax revenue from non-hydro power sources (such as oil and fish).

To investigate whether endogeneity poses a threat to our identification strategy we rely on instrumental variable techniques where we employ measures of topographic variation as instruments for hydro power income. More specifically, we use five variables capturing variation in altitude across local governments.

As documented in our first stage regression, reported in Table 11, there is a positive relationship between altitude and hydro power income. The F-test of the excluded instruments indicate that the instruments are relevant (with an F statistic of about 10). Furthermore, the second stage results, reported in Table 12, lend support to our main finding: Local revenues do seem to stimulate political participation. The estimated effects are stronger than what we reported in our baseline specification, and they are statistically significantly different from zero at the one percent level.[20]

9 Conclusion

We have found that in communities where windfall gains equip the local government with extra funds to distribute, more people vote at the local rather than at the regional election. It is reasonable to view this effect as causal, both because the eligible voting populations are the same at the two elections and because the estimated effect hardly changes as we include a rich set of observable variables.

Our interpretation of the effect is that when more wealth is controlled by the local government, the elected officials have more flexibility to pursue targeted spending and individuals thus have a stronger incentive to participate in the political process so as to influence the direction of the spending. Consequently, some individuals who otherwise

[20]For our most elaborate specification, a Wu-Hausman test fails to reject the assumption of exogeneity of Hydro Power Income ($p = 0.064$).

would have stayed at home are motivated to turn out at the election. Viewed through the lens of the basic framework of voter turnout, the "calculus of voting" model due to Downs (1957), this is evidence that the instrumental incentive to vote indeed matters for turnout rates.

Because our empirical strategy is constructed to establish causality rather than to distinguish between competing models, other mechanisms than those in the plain Downsian model of turnout may also be valid. To us, a particularly plausible alternative explanation is that public sector wealth increase the rents from holding office and thus stimulates candidates' efforts to mobilize voters in the race for office (as in Schachar and Nalebuff (1999)). The instrumental incentive is thus moved up one link in the explanatory chain, from individual voters to parties. In order to reveal and identify the exact mechanism from windfall gains to voter turnout, however, detailed micro-level data is required. We plan to pursue this question in future research.

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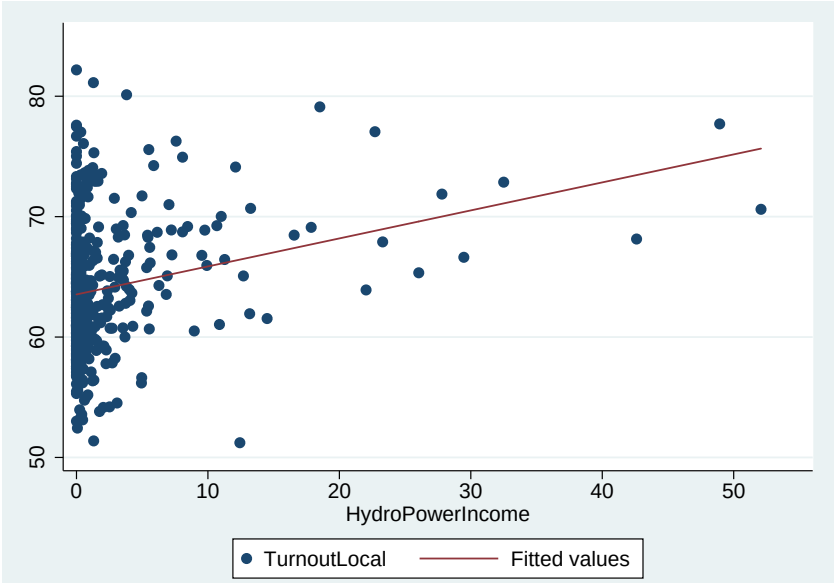
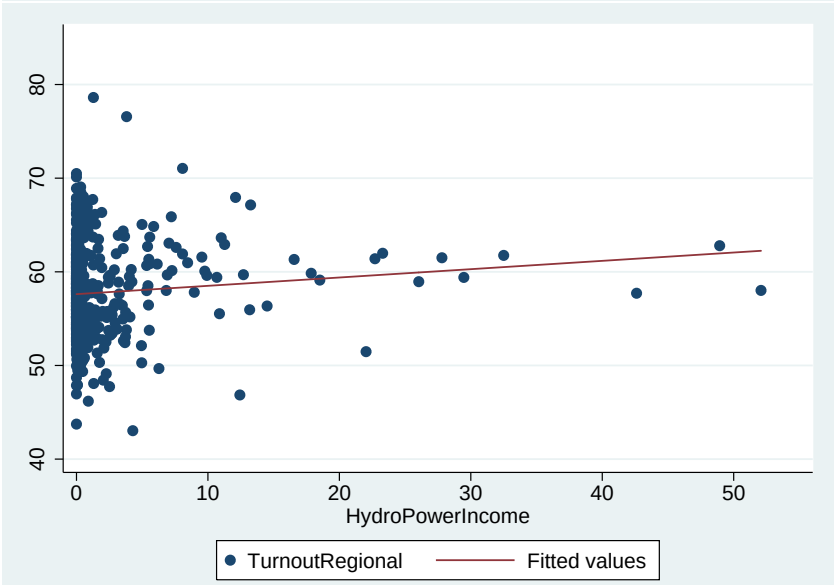
Figure 1: The relation between voter turnout and hydropower income (per capita) at elections held September 9-10, 2007.





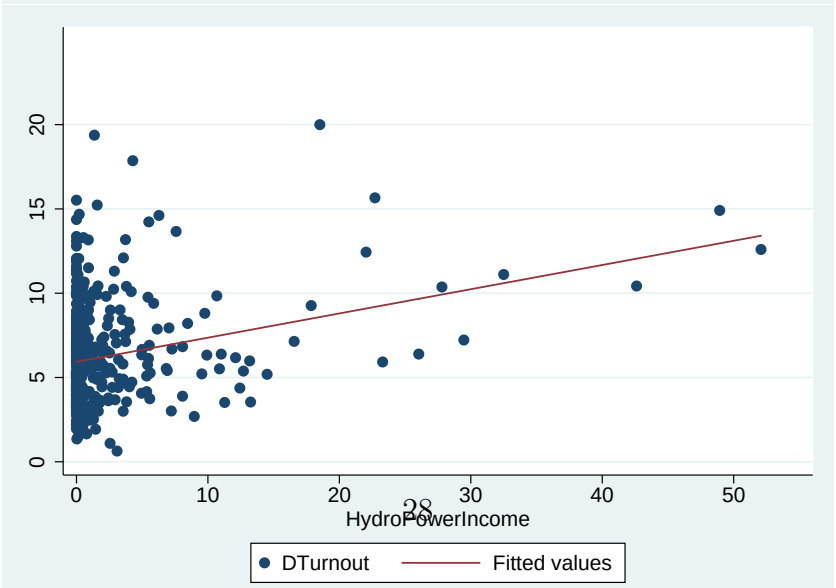


Table 1: Descriptive Statistics, Spending Per Capita

Variable	Mean	Std. Dev.	Min.	Max.
PerCapita_ChildCare	5.523	2.662	2.743	44.848
PerCapita_Schooling	14.961	4.077	9.347	42.926
PerCapita_ElderlyCare	17.212	5.26	8.061	50.306
PerCapita_Fire	0.894	0.654	0.073	7.538
PerCapita_Infrastructure	3.569	1.984	0	13.459
PerCapita_Administration	5.963	3.443	1.703	30.776
PerCapita_SocialAssistance	4.665	2.328	1.393	29.439
PerCapita_Health	2.809	1.442	1.156	11.801
PerCapita_Culture	3.482	4.222	0.925	49.666
PerCapita_IndustrySupport	1.885	2.568	0.015	30.098
PerCapita_Planning	1.141	1.004	0.046	10.976
PerCapita_Roads	1.984	1.866	0.329	17.928
N		426		

Table 2: Descriptive Statistics, Shares of Spending

Variable	Mean	Std. Dev.	Min.	Max.
Share_ChildCare	8.540	2.864	3.77	20.095
Share_Schooling	22.819	4.566	11.079	45.949
Share_ElderlyCare	25.853	4.794	9.65	46.039
Share_Fire	1.32	0.76	0.096	10.549
Share_Infrastructure	5.342	2.35	0	16.731
Share_Administration	8.487	2.758	3.243	22.686
Share_SocialAssistance	7.046	2.538	1.492	25.19
Share_Health	4.077	1.381	1.887	13.502
Share_Culture	4.784	3.293	1.652	31.396
Share_IndustrySupport	2.443	2.164	0.029	15.352
Share_Planning	1.65	0.945	0.086	7.576
Share_Roads	2.787	1.746	0.418	17.913
N		426		

Table 3: The relation between public spending (per capita) and hydro power income

	(1) Child b/se	(2) School b/se	(3) Elderly b/se	(4) Fire b/se	(5) Infra b/se	(6) Admin b/se	(7) Social b/se	(8) Health b/se	(9) Culture b/se	(10) Industry b/se	(11) Planning b/se	(12) Roads b/se
HydroPowerIncome	0.28***	0.19***	0.27***	0.03***	0.13***	0.26***	0.17***	0.09***	0.37***	0.28***	0.11***	0.17***
	(0.10)	(0.03)	(0.05)	(0.01)	(0.03)	(0.03)	(0.05)	(0.01)	(0.11)	(0.08)	(0.02)	(0.04)
Population	0.02***	-0.03**	-0.04**	-0.00**	-0.01**	-0.03**	0.01**	-0.02**	-0.01	-0.01**	0.00*	-0.01**
	(0.01)	(0.01)	(0.02)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
ShareInRuralAreas	-0.24	2.86***	6.30***	0.17	-0.37	3.85***	0.36	1.42***	-0.34	1.08**	0.57***	0.00
	(0.43)	(0.89)	(0.97)	(0.13)	(0.40)	(0.78)	(0.46)	(0.31)	(0.78)	(0.49)	(0.20)	(0.43)
_cons	4.82***	13.36***	13.92***	0.79***	3.55***	3.80***	4.00***	2.04***	2.93***	0.85***	0.58***	1.73***
	(0.34)	(0.53)	(0.65)	(0.08)	(0.25)	(0.45)	(0.24)	(0.20)	(0.58)	(0.27)	(0.10)	(0.27)
N	426	426	426	426	426	426	426	426	426	426	426	426
adj. R^2	0.346	0.159	0.297	0.078	0.148	0.410	0.166	0.331	0.252	0.458	0.439	0.289

Robust standard errors in parentheses. HydroPowerIncome is measured in NOK 1000 per capita. Population is the number of inhabitants in 1000s.

Table 4: The relation between shares of total public spending (percent) and hydro power income

	(1) Child b/se	(2) School b/se	(3) Elderly b/se	(4) Fire b/se	(5) Infra b/se	(6) Admin b/se	(7) Social b/se	(8) Health b/se	(9) Culture b/se	(10) Industry b/se	(11) Planning b/se	(12) Roads b/se
HydroPowerIncome	0.02	-0.23***	-0.24***	0.00	0.02	0.03*	0.01	-0.00	0.15***	0.15***	0.04***	0.07***
	(0.05)	(0.03)	(0.03)	(0.01)	(0.02)	(0.02)	(0.03)	(0.01)	(0.05)	(0.04)	(0.01)	(0.02)
Population	0.05***	0.00	-0.02	-0.00	-0.00	-0.04***	0.04***	-0.01***	-0.00	-0.01**	0.01**	-0.01*
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
ShareInRuralAreas	-3.04***	-2.36**	2.72***	-0.02	-1.79***	3.32***	-1.25***	1.23***	-1.15*	1.67***	0.54**	-0.24
	(0.55)	(0.93)	(0.94)	(0.13)	(0.41)	(0.64)	(0.47)	(0.31)	(0.63)	(0.39)	(0.22)	(0.41)
_cons	9.57***	24.46***	25.20***	1.35***	6.20***	7.12***	7.31***	3.62***	5.01***	1.40***	1.21***	2.85***
	(0.38)	(0.61)	(0.61)	(0.08)	(0.27)	(0.40)	(0.27)	(0.18)	(0.43)	(0.25)	(0.12)	(0.27)
N	426	426	426	426	426	426	426	426	426	426	426	426
adj. R^2	0.209	0.121	0.089	-0.005	0.033	0.230	0.093	0.117	0.065	0.268	0.082	0.052

Robust standard errors in parentheses. HydroPowerIncome is measured in NOK 1000 per capita. Population is scaled by 1000, inhabitants in 1000s.

Table 5: Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
TurnoutLocal	64.051	5.488	51.224	82.189	426
TurnoutRegional	57.81	5.019	43.036	78.616	426
DTurnout	6.241	3.059	0.638	20	426
PreferentialVotesLocal	51.405	13.076	23.093	91.473	426
PreferentialVotesRegional	28.925	8.83	14.033	64.012	426
DPreferentialVotes	22.48	10.093	-8.236	62.92	426
HydroPowerIncome	2.197	5.761	0	52.079	426
lnVotingPopulation	8.199	1.093	5.088	11.755	426
VotingPopulation	7025.803	11642.053	162	127338	426
ShareLivingInRuralAreas	0.493	0.274	0.007	1	426
RecentImmigrants	0.045	0.016	0.014	0.093	426
ShareVotersAged18to37	0.297	0.035	0.185	0.398	426
ShareVotersAged38to57	0.354	0.022	0.284	0.423	426
ShareVotersAged58to77	0.252	0.03	0.159	0.361	426
ShareVotersAged77plus	0.097	0.024	0.041	0.171	426
ShareWomen	0.497	0.01	0.449	0.52	426
ShareUnMarried	0.488	0.031	0.384	0.642	426
ShareWidow	0.067	0.016	0.03	0.115	426
ShareDivorced	0.075	0.018	0.032	0.122	426
ShareLowerSecondaryEducation	0.348	0.066	0.173	0.592	426
ShareUpperSecondaryEducation	0.445	0.045	0.243	0.552	426
CharityDonations	47.338	15.237	23.9	159.33	426
ChurchServiceAttendance	1.838	0.676	0.539	4.521	422
GrossWageMen	3.216	0.444	2.016	5.306	426
GrossWageWomen	2.056	0.183	1.702	2.944	426
DirectElectionMayor	0.117	0.322	0	1	426
TwoVotingDays	0.481	0.5	0	1	426
PartyFragmentation	0.747	0.098	0	0.859	424
PartyIndepLists	0.406	0.492	0	1	426
Altitude0to299	0.531	0.353	0	1	424
Altitude300to599	0.227	0.189	0	0.951	424
Altitude600to899	0.127	0.161	0	0.815	424
Altitude900to1199	0.075	0.134	0	0.593	424
Altitude1200	0.04	0.119	0	0.785	424

Table 6: Voter turnout. The relation between hydro power income and voter turnout, local relative to regional election results.

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
HydroPowerIncome	0.14***	0.15***	0.09***	0.12***	0.11***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
lnVotingPopulation			-1.33***	-1.36***	-1.58***
			(0.14)	(0.26)	(0.27)
ShareLivingInRuralAreas				-0.10	-0.51
				(0.79)	(0.82)
RecentImmigrants				-26.94**	-25.12*
				(13.44)	(12.82)
ShareVotersAged18to37				-4.35	-4.54
				(14.84)	(14.86)
ShareVotersAged38to57				-26.36*	-29.14**
				(14.66)	(14.31)
ShareVotersAged58to77				-2.02	-1.12
				(14.25)	(14.58)
ShareWomen				-12.18	-13.84
				(18.39)	(17.72)
ShareUnMarried				12.66	12.79
				(8.65)	(8.55)
ShareWidow				-4.80	-9.79
				(20.71)	(20.86)
ShareDivorced				3.10	1.43
				(14.80)	(14.40)
ShareLowerSecondaryEducation				0.84	2.95
				(3.71)	(3.43)
ShareUpperSecondaryEducation				-4.54	-0.42
				(4.79)	(4.53)
CharityDonations				-0.03*	-0.03*
				(0.02)	(0.02)
ChurchServiceAttendance				-0.21	-0.27
				(0.27)	(0.27)
GrossWageMen				0.44	0.33
				(0.56)	(0.55)
GrossWageWomen				-2.10	-1.46
				(1.37)	(1.32)
DirectElectionMayor					-0.14
					(0.30)
TwoVotingDays					-0.01
					(0.26)
PartyFragmentation					2.72*
					(1.57)
PartyIndepLists					0.98***
					(0.27)
N	426	426	426	422	420
adj. R^2	0.073	0.244	0.424	0.458	0.480
Regional Fixed Effects	No	Yes	Yes	Yes	Yes

Robust standard errors in parentheses.

Table 7: Voter turnout. The relation between hydro power income and voter turnout, local relative to regional election results. Interaction term between same party lists and hydro power income included.

	(1)	(2)	(3)	(4)
	b/se	b/se	b/se	b/se
HydroPowerIncome	0.02	0.05	0.06	0.05
	(0.04)	(0.03)	(0.04)	(0.04)
HydroXPartyIndepLists	0.08*	0.05	0.09*	0.11**
	(0.05)	(0.04)	(0.05)	(0.04)
PartyIndepLists	1.01***	0.81***	0.77***	0.77***
	(0.29)	(0.28)	(0.27)	(0.27)
lnVotingPopulation	-1.41***	-1.40***	-1.39***	-1.52***
	(0.13)	(0.15)	(0.27)	(0.28)
ShareLivingInRuralAreas			-0.23	-0.43
			(0.79)	(0.81)
N	426	426	422	420
adj. R^2	0.323	0.444	0.483	0.487
Regional Fixed Effects	No	Yes	Yes	Yes
Population Characteristics	No	No	Yes	Yes
Institutional Characteristics	No	No	No	Yes

Robust standard errors in parentheses.

Table 8: Preferential Votes. The relation between hydro power income and vote correcting behavior, local relative to regional election results.

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
HydroPowerIncome	0.55***	0.46***	0.17**	0.19**	0.17**
	(0.10)	(0.09)	(0.08)	(0.08)	(0.08)
lnVotingPopulation			-5.82***	-4.92***	-5.35***
			(0.35)	(0.74)	(0.81)
ShareLivingInRuralAreas				8.12***	7.15***
				(2.22)	(2.26)
RecentImmigrants				-80.34**	-73.91**
				(36.70)	(36.00)
ShareVotersAged18to37				52.26	42.36
				(46.58)	(44.45)
ShareVotersAged38to57				-43.73	-63.44
				(42.79)	(41.74)
ShareVotersAged58to77				3.35	-9.83
				(42.17)	(39.51)
ShareWomen				16.78	17.48
				(46.83)	(46.64)
ShareUnMarried				-13.86	-20.96
				(24.26)	(23.75)
ShareWidow				-11.93	-49.17
				(72.30)	(70.20)
ShareDivorced				25.55	25.01
				(36.20)	(36.14)
ShareLowerSecondaryEducation				-8.19	-5.58
				(10.36)	(10.42)
ShareUpperSecondaryEducation				-35.69***	-29.31**
				(12.46)	(12.39)
CharityDonations				0.01	0.00
				(0.04)	(0.03)
ChurchServiceAttendance				0.48	0.35
				(0.78)	(0.79)
GrossWageMen				1.49	1.30
				(1.58)	(1.56)
GrossWageWomen				-5.72	-5.13
				(4.15)	(4.05)
DirectElectionMayor					-4.45***
					(1.11)
TwoVotingDays					-0.21
					(0.88)
PartyFragmentation					0.93
					(6.32)
PartyIndepLists					1.84***
					(0.69)
N	426	426	426	422	420
adj. R^2	0.096	0.246	0.562	0.597	0.620
Regional Fixed Effects	No	Yes	Yes	Yes	Yes

Robust standard errors in parentheses.

Table 9: Preferential Votes. The relation between hydro power income and vote correcting behavior, local relative to regional election results. Interaction term between same party lists and hydro power income included.

	(1)	(2)	(3)	(4)
	b/se	b/se	b/se	b/se
HydroPowerIncome	0.31***	0.18	0.15	0.12
	(0.12)	(0.11)	(0.12)	(0.13)
HydroXPartyIndepLists	-0.10	-0.03	0.04	0.08
	(0.16)	(0.15)	(0.14)	(0.15)
PartyIndepLists	1.69**	2.15***	1.61**	1.68**
	(0.77)	(0.73)	(0.72)	(0.71)
lnVotingPopulation	-5.96***	-5.99***	-5.06***	-5.30***
	(0.35)	(0.37)	(0.74)	(0.80)
ShareLivingInRuralAreas			7.75***	7.21***
			(2.24)	(2.26)
N	426	426	422	420
adj. R^2	0.473	0.570	0.601	0.620
Regional Fixed Effects	No	Yes	Yes	Yes
Population Characteristics	No	No	Yes	Yes
Institutional Characteristics	No	No	No	Yes

Robust standard errors in parentheses.

Table 10: Sensitivity checks: The relation between hydro power income and voter turnout, local relative to regional election results.

	(1)	(2)	(3)	(4)
	b/se	b/se	b/se	b/se
HydroPowerIncome	0.11***	0.12***	0.06***	0.11***
	(0.03)	(0.03)	(0.02)	(0.02)
ShareLivingInRuralAreas	-0.51	-1.03	-1.17**	-1.35*
	(0.82)	(0.88)	(0.58)	(0.72)
lnVotingPopulation	-1.58***	-1.62***	-1.23***	-1.34***
	(0.27)	(0.41)	(0.21)	(0.34)
N	420	320	420	320
adj. R^2	0.480	0.379	0.551	0.395
Regional Fixed Effects	Yes	Yes	Yes	Yes
Population Characteristics	Yes	Yes	Yes	Yes
Institutional Characteristics	Yes	Yes	Yes	Yes
ExcludedObservations	None	Pop$> 10,000$	None	Pop$> 10,000$
EstimationMethod	OLS	OLS	Robust reg.	Robust reg.

Standard errors in parentheses.

Table 11: First stage estimates: Local government altitude as instrument for Hydro Power Income

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
Altitude300to599	-1.36	2.31	2.03	4.53***	4.81***
	(0.95)	(1.61)	(1.57)	(1.65)	(1.74)
Altitude600to899	7.05**	7.02**	5.96**	6.94***	6.47***
	(3.41)	(2.88)	(2.74)	(2.27)	(2.39)
Altitude900to1199	4.65	10.67**	9.84*	12.25***	13.37***
	(5.67)	(5.16)	(5.01)	(3.42)	(3.77)
Altitude1200	10.20*	11.77**	10.96**	12.35***	11.95***
	(5.75)	(5.22)	(5.15)	(3.74)	(3.80)
lnVotingPopulation			-0.85***	-0.14	0.07
			(0.31)	(0.96)	(0.60)
ShareLivingInRuralAreas				4.23*	4.55*
				(2.17)	(2.44)
N	424	424	424	420	420
Regional Fixed Effects	No	Yes	Yes	Yes	Yes
Population Characteristics	No	No	No	Yes	Yes
Institutional Characteristics	No	No	No	No	Yes

Robust standard errors in parentheses.

Table 12: Second stage estimates: The relation between hydro power income and voter turnout, local relative to regional election results.

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
HydroPowerIncome	0.30***	0.32***	0.20***	0.22***	0.21***
	(0.08)	(0.06)	(0.06)	(0.06)	(0.05)
lnVotingPopulation			-1.17***	-1.30***	-1.53***
			(0.15)	(0.29)	(0.27)
ShareLivingInRuralAreas				-0.27	-0.69
				(0.76)	(0.79)
N	424	424	424	420	420
Regional Fixed Effects	No	Yes	Yes	Yes	Yes
Population Characteristics	No	No	No	Yes	Yes
Institutional Characteristics	No	No	No	No	Yes
F-statistic from 1st.	8.288	9.744	10.07	11.18	11.25

Robust standard errors in parentheses.

10 Appendix

10.1 The Effect of Income on Election Stakes

We here give a simple formalization of how municipality income may affect the instrumental incentive to vote.

We assume that a local government may use its income I to provide core welfare services to its citizens and to finance targeted spending ("pork"). Candidates differ by which composition of core services they will provide, and which composition of targeted spending they will choose, if elected. Denote by $G_{j,i}$ the basket of core services provided by candidate j, normalized by the preferences of voter i. Hence, if voter i prefers the composition of general goods provided by candidate j over the composition provided by candidate k, and both candidates spend equally much on core public goods, then $G_{j,i} > G_{k,i}$. Denote by $T_{j,i}$ the targeted spending provided by candidate j to voter i. Voters' preferences over spending are given by $U(G_{j,i}, T_{j,i})$, which is separable, increasing and concave in each argument: $U_1 > 0$, $U_{11} < 0, U_2 > 0$, $U_{22} < 0$, $U_{12} = 0$. We assume that candidate j will target spending at individual i, whereas other candidates will not. Hence, $T_{j,i} > 0$ and $T_{-j,i} = 0$. Finally, we assume that that the candidate who targets individual i with pork also is the candidate who offers the basket of core services that i prefers the most: $G_{j,i} > G_{-j,i}$.

Denote by B_i individual i's utility from having his most preferred candidate, j, in office rather than someone else. We may express this benefit as

$$B_i = U(G_{j,i}, T_{j,i}) - U(G_{-j,i}, T_{-j,i}).$$

Differentiating with respect to income, I, we obtain

$$\frac{dB_i}{dI} = \frac{\partial U}{\partial T_{j,i}} \frac{\partial T_{j,i}}{\partial I} + \frac{\partial U}{\partial G_{j,i}} \frac{\partial G_{j,i}}{\partial I} - \frac{\partial U}{\partial G_{-j,i}} \frac{\partial G_{-j,i}}{\partial I}.$$

From this expression we see that higher income is likely to have two opposing effects

on the instrumental incentive to vote (B_i). First, if $\frac{\partial T_{j,i}}{\partial I} > 0$ higher income raises the instrumental incentive to vote by facilitating more non-core spending. On the other hand, if both $\frac{\partial G_{j,i}}{\partial I} > 0$ and $\frac{\partial G_{-j,i}}{\partial I} > 0$, then income may reduce B_i, since concavity of U implies that $\frac{\partial U}{\partial G_{j,i}} < \frac{\partial U}{\partial G_{-j,i}}$. It follows that higher income is more likely to raise the instrumental incentive to vote, the more strongly higher income tends to be spent on pork rather than core welfare services.

The argument above relates to the traditional way of viewing pivotalness (i.e., "outcome pivotalness"). An alternative type of pivotalness that has been forwarded in the literature is "prize pivotalness" (Smith and Bueno de Mesquita (2010)). If parties are able to observe group level voting, they can make targeted spending contingent on the voting pattern and thus motivate voters to turn out even when they are highly unlikely to affect who wins the election. Note that both of these two types of pivotalness requires spending to be targeted, in the sense that it benefits some voters, but not others. Furthermore, in our discussion we have implicitly assumed that voters are certain about what candidates will do once in office. Schwartz (1987) discusses the role of targeted spending versus "global public benefits" when credibility of campaign promises is an issue, and argues that targeted spending will stimulate the instrumental incentive to vote more strongly than non-targeted spending.

Table 13: Simple cross sectional estimates: The relation between hydro power income and voter turnout at the local election.

	(1)	(2)	(3)	(4)	(5)
	b/se	b/se	b/se	b/se	b/se
HydroPowerIncome	0.23***	0.17***	0.01	-0.01	-0.01
	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)
lnVotingPopulation			-3.35***	-2.82***	-2.86***
			(0.23)	(0.42)	(0.45)
ShareLivingInRuralAreas				3.01**	2.85**
				(1.38)	(1.36)
RecentImmigrants				-44.84**	-42.85**
				(21.17)	(21.09)
ShareVotersAged18to37				-6.70	-7.66
				(23.70)	(24.06)
ShareVotersAged38to57				-9.28	-13.23
				(23.78)	(24.08)
ShareVotersAged58to77				-10.30	-9.20
				(23.42)	(24.02)
ShareWomen				-42.59*	-45.60*
				(24.14)	(24.21)
ShareUnMarried				-45.60***	-44.19***
				(14.93)	(15.15)
ShareWidow				11.39	8.74
				(37.55)	(39.18)
ShareDivorced				-27.99	-29.91
				(25.77)	(25.51)
ShareLowerSecondaryEducation				-26.44***	-25.23***
				(7.03)	(6.82)
ShareUpperSecondaryEducation				-22.26***	-18.72**
				(7.58)	(7.34)
CharityDonations				0.02	0.02
				(0.04)	(0.03)
ChurchServiceAttendance				0.76*	0.73
				(0.45)	(0.45)
GrossWageMen				-0.26	-0.33
				(0.94)	(0.94)
GrossWageWomen				7.34***	7.59***
				(2.60)	(2.56)
DirectElectionMayor					-1.27**
					(0.51)
TwoVotingDays					-0.66
					(0.44)
PartyFragmentation					1.42
					(2.56)
PartyIndepLists					0.60
					(0.39)
N	426	426	426	422	420
adj. R^2	0.057	0.120	0.475	0.578	0.587
Regional Fixed Effects	No	Yes	Yes	Yes	Yes

Robust standard errors in parentheses.

Table 14: Variable Description

TurnoutLocal	Casted votes relative to the total number of eligible voters at the local (municipal) election, percentage points.
TurnoutRegional	Casted votes relative to the total number of eligible voters at the regional (county) election, percentage points.
DTurnout	TurnoutLocal - TurnoutRegional
PreferentialVotesLocal	Share of votes that have been corrected at the local (municipal) election.
PreferentialVotesRegional	Share of votes that have been corrected at the regional (county) election.
DPreferentialVotes	PreferentialVotesLocal - PreferentialVotesRegional
HydroPowerIncome	Revenues from commercial property taxation, NOK 1000 per capita
VotingPopulation	The number of eligible voters (January 1, 2007)
ShareLivingInRuralAreas	Fraction of the population living in rural areas (January 1, 2007)
RecentImmigrants	Fraction of population that migrated to the municipality during 2006
ShareVotersAgedXXtoYY	Fraction of eligible voters aged XX to YY (January 1, 2007)
ShareWomen	Fraction of women in the population (January 1st, 2007)
ShareUnMarried	Fraction of population that are unmarried (January 1, 2007)
ShareWidow	Fraction of population that are widowed (January 1, 2007)
ShareDivorced	Fraction of population that are divorced (January 1st, 2007)
ShareLowerSecondaryEducation	Fraction of population aged 16 above with lower secondary education as highest education (October 1, 2007)
ShareUpperSecondaryEducation	Fraction of population aged 16 above with upper secondary education as highest education (October 1, 2007)
CharityDonations	Donations per capita (NOK) at annual TV charity show, Oct. 22, 2006. (donations went to *Doctors Without Borders*)
ChurchServiceAttendance	Number of church services attended, per capita, 2007.
GrossWageMen	Average gross wage for men 17 years and older, 2006.
GrossWageWomen	Average gross wage for women 17 years and older, 2006.
DirectElectionMayor	Dummy=1 if the municipality hold direct elections for the mayor
TwoVotingDays	Dummy=1 if the municipality have two voting days
PartyFragmentation	1 - (Herfindahl index of party fragmentation in the local council at the 2003 election) The Herfindahl-index is generally given by 1/P , when the representatives are equally divided among P parties.
PartyIndepLists	Dummy=1 if the municipality had at least one party independent list, that obtained at least one seat in the local council
Altitude0to299	Fraction of local government area 0 to 299 meters above sea level.
Altitude300to599	Fraction of local government area 300 to 599 meters above sea level.
Altitude600to899	Fraction of local government area 600 to 899 meters above sea level.
Altitude900to1199	Fraction of local government area 900 to 1199 meters above sea level.
Altitude1200	Fraction of local government area 1200 meters or more above sea level.

Election variables are from September 2007, unless otherwise noted.
The data are provided by Norwegian Social Science Data Services and Statistics Norway.
Neither of these institutions are responsible for the analyzes conducted or for the conclusions drawn.