Revenue scarcity and government outsourcing: Causal evidence from Norwegian local governments[*]

Benny Geys and Rune J. Sørensen

Norwegian Business School (BI)

0484 Oslo, Norway

Abstract (102 words)

It is often said that "*necessity is the mother of invention*". In this article, we assess whether this applies also to the design of public authorities' service provision. Particularly, we evaluate whether revenue scarcity – as an indicator of fiscal stress – induces government outsourcing. In contrast to previous studies, we exploit arguably exogenous variation in local government revenue across time and space to estimate *causal* effects of revenue scarcity on outsourcing. Using data from Norwegian local governments covering the period 1995-2012, our main results indicate that an exogenous decrease in local government revenues indeed causes more outsourcing of both infrastructure and support services.

Key words: Fiscal stress, Outsourcing, Public good provision, Local government, Contracting, Privatization.

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Introduction

An enduring debate in public administration concerns the institutional design of (local) government service provision. In principle, several options are available to public authorities – ranging from in-house provision, over contracting-out to public- or private-sector providers (i.e. outsourcing) to full-scale privatization. This range of alternatives raises two important questions. First, which form of service provision provides the 'best' outcomes in terms of, for instance, cost or production-technical efficiency, service effectiveness and service quality (for an early review, see Domberger and Jensen, 1997)? Second, what determines who chooses which form of service provision (for an early review, see Boyne, 1998)? Our study concentrates on the latter question, and thus aims to help elucidate why certain jurisdictions turn to outsourcing, while others do not.

More specifically, we concentrate on the potential role of revenue scarcity – or fiscal stress – for the decision to outsource service provision. Early observers often view fiscal stress as a key driver behind outsourcing and privatization decisions (Moore, 1987; Miranda, 1992; Boyne, 1998). It is currently gaining increased attention again due to the ongoing fiscal crisis in many Western countries, which "intensifies the need for local governments to rethink service delivery in order to increase the efficiency of locally provided services" (Bel and Warner, 2015: 52; see also Lamothe and Lamothe, 2015). Several theoretical arguments have been brought forward for such a potential revenue-outsourcing relation. A first line of argument focuses on a simple production cost argument: affluent governments can offer more and better in-house service provision compared to low-revenue authorities, and thus are less likely to rely – or, possibly, forced to rely – on alternative provision systems (Moore, 1987). Reversely, governments suffering "financial strains due to softening revenues" may be particularly likely to "feel pressure to cut back and possibly jettison noncore functions as a way to deal with the problem" (Lamothe and Lamothe, 2015: 3). As a result, fiscal stress is likely to stimulate higher levels of outsourcing.

Another line of argument focuses on potential political costs and benefits, and highlights that outsourcing might offer increased governance flexibility by acting as a "budgetary buffer" (Pallesen, 2006: 39). When service provision is contracted out, the political and administrative costs of adjusting service levels are smaller. In line with such reasoning, recent evidence suggests that local governments are more likely to shed services that have been outsourced to external

suppliers in the recent past (Lamothe and Lamothe, 2015). Finally, a third line of argument builds on a transaction cost perspective (Williamson, 1981, 1996), which maintains that public service providers will choose governance structures minimizing the transaction costs (e.g., costs of negotiating and contracting) involved in obtaining a desired service level. In such a framework, cost pressures are thought to induce "variation in the degree to which (…) cost savings will be valued" (Klaas et al., 1999: 120; see also Williamson, 1996). Particularly, the more severe cost pressures become, the more likely it is that the value assigned to a reduction in short-term costs via outsourcing will outweigh concerns about any contracting costs linked to outsourcing (Williamson, 1996; Klaas et al., 1999). Overall, therefore, financial difficulties faced by local governments may increase the appeal of outsourcing and privatization options (Gonzalez-Gomez *et al*., 2011).

Yet, while indicators of fiscal stress constitute among the most frequently considered variables in outsourcing or privatization studies (Ferris, 1986; Warner and Hebdon, 2001; Bakker, 2002; Pallesen, 2004; Brudney *et al*., 2005; Bhatti *et al*., 2009; Zullo, 2009; Gonzalez-Gomez *et al*., 2011; Rho, 2013), empirical results in this literature have thus far remained inconclusive at best (for reviews, see Boyne, 1998; Bel and Fageda, 2007, 2009). Moreover, foregoing studies on the relation between fiscal stress and outsourcing have been severely criticized for failing to account for the "reciprocal relationships between contracting out and the explanatory variables" (Boyne, 1998: 150) and the "dynamic nature" of the outsourcing/privatization decision (Bel and Fageda, 2007: 517). As such, inferences drawn from existing empirical studies remain exceedingly fragile (Boyne, 1998; Sundell and Lapuente, 2012) and generally at best reflect a (possibly spurious) correlation between fiscal stress and outsourcing rather than a true *causal* connection.

Our main contributions lay in tackling these two central empirical deficiencies in the foregoing literature. First, we have access to unique panel data, which cover six surveys on the institutional design of local public authorities' service provision collected in consistent four-year intervals among Norwegian municipalities over the period 1996-2012 (with an additional initial survey fielded in 1995). Hence, we can study changes over time and space in revenue scarcity and outsourcing to more accurately capture the move from public to private. It should be noted here that several recent studies have likewise made use of panel data (Pallesen, 2004; Bhatti *et al*. 2009; Zullo, 2009; Gonzalez-Gomez *et al*., 2011; Hefetz and Warner, 2012; Gonzalez-Gomez *et al*.,

2011; Sundell and Lapuente, 2012; Rho, 2013). Nonetheless, these often still rely on pooled OLS regressions that effectively exploit only the cross-sectional variation in the data, and thus ignore the information provided by any existing temporal variation (e.g., Pallesen, 2004; Bhatti *et al*. 2009; Sundell and Lapuente, 2012).

Second, and crucially, our analysis can exploit arguably exogenous variation in local government revenue scarcity to provide a more credible identification of the true (*causal*) revenue-outsourcing relation. This is important because a recent review of the privatization literature maintains that "no published study has managed to make use of plausibly exogenous variation" in government revenues (Andersson and Jordahl, 2011: 17). The underlying problem is that, as mentioned, any decision to engage in outsourcing naturally also affects the level of government expenditures and, therefore, revenue requirements (Boyne, 1998). Ignoring this joint determination of revenues and outsourcing by using endogenous sources of revenue in the analysis generates spurious results in the sense that the estimated correlation between both variables is likely to be inconsistent (i.e. it will not reflect the true population parameter). In contrast, and following Hægeland *et al*. (2012), Andersen *et al*. (2014) and Borge *et al*. (2015), our approach builds on the fact that many Norwegian municipalities derive significant revenue streams from the presence of hydropower plants within their boundaries. These revenues – which can amount to a substantial share of the local budget – are exogenous to local government decision-making since all hydropower stations were constructed in the period 1950-1990 (i.e. prior to the period analyzed here), their location depends on the presence of mountainous terrain (which is beyond municipal control), and municipalities in practice never adjust the commercial property tax rate levied on hydropower plants (i.e. all set the maximum rate allowed by the national government) (more details below). This source of exogenous revenue shocks facilitates the estimation of causal revenue effects on outsourcing decisions.[1]

[1] As mentioned, we are not the first to use an identification strategy based on hydropower revenues for causal inference. Hægeland *et al*. (2012) use the same exogenous variation in Norwegian local government revenues to identify effects of school resources on pupil achievement. Andersen *et al*. (2014) employ it to illustrate that voter turnout increases with the financial stakes of the election (in line with rational voter models; Geys, 2006a,b). Finally, Borge *et al*. (2015) use it to show that reduced fiscal stress causes lower levels of cost efficiency in local service production, which suggests that local governments in Norway face an important political agency problem.

The remainder of the article is structured as follows: The next section provides information on the institutional setup of Norwegian local governments, focusing on the system of revenue generation and how municipalities collect revenues from hydropower facilities. This section also describes the panel dataset on the institutional design of Norwegian public authorities' service provision, from which we derive our central dependent variable. We then proceed by outlining the research design, presenting baseline regression results, and discussing a number of robustness checks. The final section provides a concluding discussion and highlights some important avenues for further research.

Institutional setting and data

Norway has a three-tier governance system comprising a central government, 19 county governments and 434 municipalities. The current study uses data on the municipalities, which we will also refer to as 'local' governments. Local government revenue in Norway amounts to about 18 percent of GDP, with employment in the local government sector accounting for about 20 percent of total employment.

Norwegian municipalities face a number of statutory obligations, including entitlement legislation for welfare services and legal requirements for the delivery of infrastructure services. As such, the large local government sector delivers welfare services including child care, primary and lower secondary education, primary health care and care for the elderly, and is responsible for various infrastructure services including water supply, sewage, garbage collection and disposal, and electricity distribution. Crucially, however, Norwegian municipalities face few regulations on the *type* of service delivery. They are therefore free to deliver services via traditional in-house provision, municipal agencies or companies owned by local government, via outsourcing or via private companies or non-profit organizations. This creates substantial variation in the institutional design of Norwegian public authorities' service provision, which provides an ideal situation to assess the role of fiscal stress on such service delivery choices (more details below).

Municipal revenues

Municipal revenues in Norway comprise income from three main sources: tax revenue, government grants and user charges. Most tax revenues derive from a proportional income tax, for which the

rate is capped by the central government. All municipalities employ the maximum allowed rate in the period analyzed here. The main grant received by Norwegian local authorities is a general-purpose block grant based on fixed criteria (including population size, age structure and settlement pattern). Part of this block grant is a per capita subsidy designed to equalize revenues across municipalities ('revenue equalization'), while another component compensates municipalities for external factors that influence production costs ('expenditure equalization'). The central government also allocates a number of earmarked grants, which account for about 13 percent of total revenues. For example, municipalities receive such grants to cover the costs of resettlement of refugees and asylum seekers. Finally, user charges are important in kindergartens, nursing homes and for infrastructure services (e.g., water supply, sewage, garbage collection and disposal, electricity distribution). They account for about 12 percent of total revenues.

The sum of income tax revenues and block grants is commonly denoted as 'free revenues'. They account for about 70 percent of total local government revenue, and constitute our central revenue variable in the empirical analysis. We thus explicitly exclude earmarked grants and user charges from our operationalization of total municipal revenues. The reason is that municipalities can obviously set the levels of user charges fully independently (subject to fee revenue not being larger than production costs), whereas revenues from earmarked grants depend at least in part on decisions made by the local government (e.g. the number of asylum seekers it receives). As such, both revenue sources are directly determined by local fiscal decisions, and thus subject to the joint-determination problem raised in the introduction (Boyne, 1998). To avoid spurious inferences arising from such endogenous revenue sources, they are excluded from the analysis.

Hydropower revenues

Many Norwegian municipalities receive a substantial share of their revenues from hydroelectric power plants and related facilities. Following Hægeland *et al*. (2012), Andersen *et al*. (2014) and Borge *et al*. (2015), we argue that revenues from hydropower plants represent an important exogenous source of revenue variation for local governments – and can therefore serve as a credible basis for strengthening the causal nature of the inferences in the analysis below. This proposition rests on the observation that hydropower revenues consist of two main parts, neither of which are under the (direct or indirect) control of local governments.

A first part of hydropower revenues derives from a tax on commercial property, for which local governments are allowed to set a tax rate between 0.2% and 0.7% of the asset value. In practice, however, *all* municipalities with a hydropower plant levy the maximum tax rate of 0.7%, and they cannot affect the taxed asset values. That is, the central government uses the net present values of future revenues and costs to estimate the taxable asset value, and also determines the distribution of asset values between the neighboring municipalities whenever the water reservoirs of the hydropower plants cover areas in several municipalities. Consequently, the actual revenues derived in any given year from this tax are *de facto* independent of local governments' decision-making.

The remainder of municipalities' hydropower revenues largely derives from the sale of electricity.[2] Municipalities with large hydropower plants (i.e. over 4,000 natural horsepower) are entitled to use up to 10 per cent of the generated electric power at production costs. Since these production costs are calculated by the Ministry of Petroleum and Energy as an average across hydropower facilities and are substantially below the market price, municipalities generally put the entire licensed production up for sale. As neither the produced quantity (determined by the facilities' owners)[3], nor the production costs (set by the Ministry), nor the sales price (set by the market for electricity) can be influenced by the municipalities, sales revenues in any given year are *de facto* independent of local governments' decision-making. They will in effect be largely driven by variations in the level of precipitation and market prices (Borge *et al*., 2015), which are very hard to anticipate for municipalities prior to their actual realization. Note also that these sales revenues are not included the redistribution of municipal revenues through the block grant scheme, so municipalities have no strategic reason to under-utilize this revenue source.

Finally, it should also be observed that hydropower revenues are only available were proximity to mountains and waterfalls have facilitated the construction of water reservoirs, which are crucial for the continuous and efficient functioning of hydropower plants. Municipalities thus cannot influence the de facto location of hydropower plants, or make sure that they are constructed within their

[2] Municipalities can also receive license fees, whose revenues are included in our concept of hydroelectric revenues.

[3] Central government, urban municipalities, county governments and private companies own most power plants. The municipalities where the power plants are located very rarely own the facilities. Consequently, these municipalities have little direct influence over these facilities' production decisions.

jurisdiction. Moreover, since nearly all major hydropower stations were constructed in the period from 1950-1990, they were operational before the period analyzed here.[4]

Table 1 provides summary statistics for municipalities' total and hydropower revenues (measured per capita, in current prices; Panel I) and also illustrates the substantial variation over time and space in hydropower revenues (Panel II). Panel I indicates that hydropower revenues on average constitute approximately 3-5% of total local government revenues, and that the predominant share of these revenues derives from commercial property tax revenues. Still, importantly, panel II highlights that there is substantial variation in the reliance on hydropower revenues across Norwegian municipalities and over time within municipalities. Substantial variation over time is illustrated by the fact that inter-temporal changes in the importance of hydropower revenues *within* municipalities range from -21% to +38% (see bottom row of panel II). The 'between' row of panel II specifies that while some municipalities on average have no hydropower revenues over the period 1995-2012, others on average obtain about 50% of their total revenues from this source. This cross-sectional variation is also illustrated in the map provided in figure B4 in appendix B. Confirming the importance of mountainous terrain for obtaining hydropower revenues, this figure also shows that municipalities with large hydropower revenues tend to be concentrated in the mountainous areas in the center of southern Norway and central Norway.

TABLE 1 ABOUT HERE

Public authorities' service provision

Data on the institutional design of Norwegian public authorities' service provision – and thus the level of outsourcing among local governments – derive from a series of surveys collected by the Norwegian Institute for Urban and Regional Research (NIBR) on behalf of the Ministry of Local Government and Modernization. The survey data include information on organizational patterns, and comparable data have been collected in 1995, 1996, 2000, 2004, 2008 and 2012. The response rates to these surveys were consistently very high (1995: 75%; 1996: 85%; 2000: 86%; 2004: 80%; 2008: 79%; 2012: 82%), which gives high validity to our dataset and allows us to generalize the

[4] For further documentation on institutional framework and production capacity of the Norwegian hydropower system, see "Facts 2013, Energy and water resources in Norway" (Norwegian Ministry of Petroleum and Energy; https://www.regjeringen.no/globalassets/upload/oed/faktaheftet/facts_energy_water.pdf).

findings to the entire population of Norwegian municipalities. The datasets and additional documentation are available through the Ministry's homepage (in Norwegian) on https://www.regjeringen.no/nb/tema/valg-og-demokrati/lokaldemokrati/kommunal-organisasjonsdatabase/id2344586/.

Information on the level of outsourcing in any given municipality derives from a question on organizational choices. The 2008 and 2012 waves of the survey thereby applied the following formulation: "How does the local government currently provide its services? The municipality can perform its responsibilities singlehandedly, it can cooperate with other municipalities, or it can purchase the services from outside providers. The same service can be provided in multiple ways. Please state how the municipality manage its responsibilities in the following sectors." The respondents were then asked to indicate the extent to which service provision occurred along a number of possible organizational forms (i.e. in-house, provision via a government-owned corporation, provision via a private corporation, and so on) on a scale from 0% to 100%. As the first waves of the survey collected less detailed responses,[5] we apply a consistent recoding of the original survey data throughout the analysis.

In effect, we experimented with a number of different operationalizations, which is important to allow assessing the robustness of our results to the exact choices made at this point. In a first approach, we code in-house provision as 0, provision via a government-owned corporation as 0.5, and provision via a private corporation as 1, for each service sector available in the original survey data. The 0.5 coding of government-owned corporations thereby reflects that this constitutes an intermediate stage where the local government retains significant direct influence over actual service provision decisions. However, since such a 0 – 0.5 – 1 scale arguably imposes a very specific relation between the three outsourcing options, a second approach simply separates in-house provision from any form of outsourcing (i.e. a 0 – 1 dichotomy). What matters most under

[5] The 2004 formulation is largely equivalent to that employed in 2008 and 2012, but includes an additional initial question about the existence of inter-municipal cooperation in the provision of a given service. The question formulation in the 1995, 1996 and 2000 surveys is less detailed, and simply asks: "How does the local government currently provide the majority of its service provision in the following sectors". Answers are recorded via a set of indicator variables equal to 1 if the majority of the service is provided in-house, via a government-owned corporation, via a private corporation, and so on.

this alternative operationalization is that some degree of outsourcing takes place, whereas the exact form this outsourcing takes becomes irrelevant.

For both operationalizations of the outsourcing decision discussed above, our analysis concentrates on eight services that have been included in most of the surveys on municipalities' organizational choices between 1995 and 2012. These services cover garbage collection, sewage, water supply, firefighting, road maintenance, laundry, cleaning and catering. Again, we take two approaches to analyse these various services. On the one hand, we evaluate outsourcing decisions for each service area independently. On the other hand, we also experimented with calculating the share of services that is outsourced across the five 'infrastructure' services (i.e. garbage collection, sewage, water supply, firefighting and road maintenance) and the three 'support' services (i.e. laundry, cleaning and catering) per municipality and per survey year. This results in an outsourcing score between 0 and 1, where higher numbers indicate of more extensive employment of outsourcing within a given service area. In Table A1 in Appendix A, we present descriptive statistics for the outsourcing indicators, thereby including information on all eight services independently as well as the constructed index.

Our distinction between the various services and the individual-level analysis of each service type reflects the idea that "the type of service conditions local government decision-making" (Gonzalez-Gomez *et al*., 2011: 475; Hefetz and Warner, 2012). The underlying argument is that public services differ in the "type and magnitude of their contractibility problems" (Andersson and Jordahl, 2011: 1), which directly affects the level of transaction costs involved in the outsourcing decision (Hefetz and Warner, 2012). That is, services with larger contractability issues – such as concerns over moral hazard, verifiability of service quality, contract enforcement and monitoring, and so on – may not only be less likely candidates for outsourcing as such, but the decision to engage in outsourcing with respect to such services may also be affected by different determinants. This line of reasoning closely resembles the importance awarded to transaction costs in the theory of the firm in industrial organization (Coase, 1937; Williamson, 1981, 1996). Moreover, the requirements for "specific physical infrastructure or technical expertise" may differ across service areas (Hefetz and Warner, 2012: 292), which might again affect the make-or-buy decision.

Empirical analysis

Estimation model and methodological issues

The estimation model used to analyze the revenue-outsourcing relation takes the following basic form (with subscripts *i* and *t* referring to municipalities and years, respectively):

$$Y_{i,t} = \beta Revenue_{i,t} + Controls_{i,t} + \alpha_i + \delta_t + e_{i,t} \quad (1)$$

In equation (1), $Y_{i,t}$ represents a set of dependent variables representing the level of outsourcing in municipality *i* at time *t* (using the different operationalizations discussed in the previous section). Our key independent variable – $Revenue_{i,t}$ – is operationalized as the natural logarithm of total municipal revenues in year *t* (defined as income and property tax revenues plus block grants per capita). Clearly, local governments are better off when experiencing higher revenues, and can be expected to suffer "financial strains due to softening revenues" (Lamothe and Lamothe, 2015: 3). As such, we expect $\beta<0$. We should note that our approach here is close in spirit to Rho's (2013) use of 'revenue shocks' as a determinant of the outsourcing decision in Texas school districts. Still, there are two important differences between our respective approaches. First, Rho (2013) only accounts for negative revenue shocks, which induces an (untested) asymmetry with respect to the potential influence of positive revenue shocks. Second, the revenue shocks in Rho (2013) are operationalized via changes in local revenue exceeding a certain threshold, and do not exclude 'shocks' deriving at least in part from local decision-making. Hence, by introducing revenue shocks and outsourcing in the same year, Rho (2013) does not address the potential simultaneity of revenues and outsourcing (Boyne, 1998). In contrast, we treat positive and negative revenue variations symmetrically, and deal directly with the simultaneity issue by relying on arguably exogenous revenue sources via an instrumental variables approach (more details below).

Our set of control variables are referred to as $Controls_{i,t}$ in equation (1). They include measures for population size, settlement pattern (measured as the share of population residing in sparsely populated areas), age structure (operationalized as the share of inhabitants between 0 and 5 years, 6-15 years, and over 67 years), the local unemployment rate and the ideological leaning of the local government (operationalized as the vote share of right-wing political parties in the most recent municipal election). The demographic statistics derive from the Norwegian Social Science Data

Services, and are organized by Fiva et al. (2012). Population size is included as a control variable since it was established as an important determinant of privatization decisions by, among others, Gonzalez-Gomez *et al*. (2011). Similarly, ideological factors have attracted much attention in the privatization and outsourcing literatures (Ferris, 1986; Boyne, 1998; Warner and Hebdon, 2001; Sundell and Lapuente, 2012; Lamothe and Lamothe, 2015). We include the ideological composition of the local council here as well to assess whether outsourcing has "entered a new, less ideological phase" also in Norwegian local government (Brudney *et al*., 2005: 393).[6] We present descriptive statistics for the control variables in Table A2 in Appendix A.

Two methodological issues are important when estimating equation (1). First, we exploit panel data covering six survey waves (1995, 1996, 2000, 2004, 2008 and 2012), which means that the same municipality has been observed at repeated points in time. Since total revenue levels (though not hydropower revenues; see table 1 above) are relatively stable over time, our baseline model specification estimates models with random effects for municipalities. This approach allows exploiting variation within and across municipalities. Moreover, we estimate the regression models with cluster- and heteroscedasticity-robust standard errors. Second, a central concern regarding our key independent variable – $Revenue_{i,t}$ – is that it may be endogenous. While we focus on 'free revenues' that are largely beyond the influence of local authorities (see above), we still cannot exclude that any decision to engage in outsourcing naturally also affects the level of municipal expenditures (and, therefore, revenue requirements) (Boyne, 1998). To accommodate this endogeneity concern and achieve a stronger identification of *causal* effects, we rely on an instrumental variables technique. The revenue variable in our model will thereby be instrumented with exogenous hydropower-related municipal revenues (i.e. revenues obtained from the commercial property tax and the sale of electricity; see above).[7]

[6] As the ideological composition of the local government might be deemed endogenous to the municipality's financial situation – e.g., because voters may take information on fiscal variables into account on Election Day (Geys and Vermeir, 2008a,b) – we also replicated the analysis without this variable to assess whether our results are affected by any resulting endogeneity bias. All results reported below are unaffected, and we report the results including ideology to acknowledge the importance it has been given in previous work. Furthermore, we also experimented with extensions of the baseline model including region fixed effects. Such specification essentially compares the outsourcing decisions of neighboring authorities facing different revenue levels, and thus directly accounts for possible local 'trends' in outsourcing decisions. Inclusion of such region fixed effects leaves all inferences drawn below unaffected (details upon request).

[7] One could argue that hydropower-related revenues are themselves endogenous since municipalities have the right to set the commercial property tax rate. However, as argued above, all municipalities set the maximum rate of 0.7% and no adjustments occur in our time period. Furthermore, revenues from electricity sales are likewise exogenous

Main results

Our baseline regression results using the aggregated outsourcing score across five 'infrastructure' services (i.e. garbage collection, sewage, water supply, firefighting and road maintenance) and three 'support' services (i.e. laundry, cleaning and catering) are summarized in table 2. Equivalent results for each of the eight individual services are provided in figure 1.[8] In both cases, we provide two main sets of results, which are distinguished by our treatment of the central independent variable ($Revenue_{i,t}$). That is, in panel I of table 2 and the left-hand panel of figure 1, we ignore its potential endogeneity and estimate a set of standard linear panel regression models (referred to as 'OLS estimates'). In panel II of table 2 and the right-hand panel of figure 1, however, we accommodate its potential endogeneity via an Instrumental Variables approach using hydropower revenues as an exogenous instrument (referred to as 'IV estimates'). Columns I and III in table 2 present a model without control variables and municipality-specific random effects, while these are included in columns II and IV (as indicated in the bottom row of table 2). To preserve space, figure 1 only reports results when including control variables and municipality-specific random effects. The key variable of interest throughout all models is *Revenues*, which estimates the relation between municipal revenues and outsourcing in infrastructure and supporting services. Note, however, that panel II in table 2 also presents the estimated relation between municipal revenues and hydropower revenues (i.e. *First stage estimates*) used to generate the predicted values of *Revenues* in the Instrumental Variables model.

TABLE 2 ABOUT HERE

FIGURE 1 ABOUT HERE

The results in panel I of table 2 indicate that municipal revenues and outsourcing are negatively correlated – in line with theoretical arguments suggesting that fiscal stress increases the appeal of outsourcing options (Ferris, 1986; Boyne, 1998; Brudney *et al*., 2005; Bhatti *et al*., 2009; Zullo,

since municipalities have no influence on the market price for electricity. Hence, any changes in hydropower revenues are de facto exogenous to municipal policies, and constitute a valid instrument for our purposes.

[8] The results in table 1 and figure 1 employ the 0 – 1 dichotomy separating in-house provision from any form of outsourcing. Nonetheless, similar results are obtained when using a 0 – 0.5 – 1 scale to operationalize the three outsourcing options (detail upon request).

2009; Gonzalez-Gomez *et al*., 2011). Though the OLS regressions yield negative estimates in all specifications, they are not statistically significant at conventional levels. Panel II of table 2 presents IV-estimates using hydropower revenues as the exogenous instrument. The first stage results suggest that hydropower revenues are indeed an important source of (total) revenue variation, which underlines their validity as instruments in our analysis (see Figure B2 in Appendix B for further details). The small standard errors in the first stage regression lead to relatively high F-test statistics (well above 10), which shows that weak instruments are not a concern.

The key estimates in Panel II indicate considerably larger negative effects of revenues on the outsourcing decision. The negative revenue-outsourcing relation is always statistically significantly different from 0 at the 95% confidence level or better. This finding arises both for infrastructure and support services. In terms of effect size, a one standard deviation in total revenues (0.43 measured on the logarithmic scale) implies that 0.18 infrastructure services will no longer be outsourced. A similar effects size is obtained also for support services. A shift from the 5th percentile in the revenue distribution (on average: 16.020 NOK per capita) to the 95th percentile (on average: 58.274 NOK per capita) causes the level of outsourcing in both the infrastructure and support area to drop by about 0.58 services. Consequently, if we consider the combined impact on infrastructure and support services, we would expect such as revenue increase to cause one additional service to be provided in-house.

In close analogue to the results reported in table 2, figure 1 indicates that the large majority of coefficient estimates for the eight individual services are negative. The OLS-estimates are again relatively small and mostly insignificant. However, once we account for the endogeneity of municipal revenues, all coefficient estimates are negative and statistically significant at conventional levels for all services except road maintenance, firefighting and (though only marginally) laundry services. Overall, table 2 and figure 1 thus provide clear evidence that revenue shocks indeed *cause* changes in the level of outsourcing of Norwegian local governments.

Robustness checks

We subjected the results presented in table 2 to several robustness checks. First, all models have been re-estimated excluding seven municipalities with a total population size below 400 inhabitants

or above 90.000 inhabitants. These seven municipalities are obvious outliers in terms of population size in the Norwegian landscape. Their exclusion does not affect the qualitative findings on the revenue-outsourcing relation reported above (details upon request), such that our results are not driven by the few extremely small or large Norwegian municipalities. Second, not all surveys include the exact same set of public services. Specifically, information for all infrastructure services included in our infrastructure index is only available for the 2004-2012 period, while the information for all support services included in our support index is complete for the 1995-2004 period. We have therefore re-estimated models I through VIII for the time periods allowing us to construct the outsourcing indices using a balanced set of public services. The estimates from these more restricted time periods are comparable to those presented in table 2 (details upon request).

Finally, to illustrate that our results are not merely an artefact of the empirical approach employed, we also estimated a series of 'reduced-form' regression models that include the exogenous hydropower revenues directly as the central explanatory variable in equation (1). The detailed results are illustrated in figure B3 in appendix B, which has the same format as figure 1 for ease of interpretation. The results strongly corroborate the negative revenue-outsourcing relation even when using the random effects panel models. Although hydropower revenues are exogenous, we nonetheless experimented with an instrumental variables approach where terrain characteristics act as instrument variables for hydropower revenues (share of area above 600-899 meters, 900-1199 meters and 1200 meters of higher)[9]. Such terrain characteristics are valid instruments since hydropower revenues are strongly positively related to the presence of mountainous areas within the municipality (see Figure B2 in Appendix B for details). The results again largely confirm the negative revenue-outsourcing relation. Still, as terrain characteristics clearly do not change over time, we lose some cross-temporal information in these estimates, which might explain the somewhat weaker results for support services in these models.

Conclusion

In this paper, we evaluated whether revenue scarcity – as an indicator of fiscal stress – induces government outsourcing. While indicators of fiscal stress have been frequently considered in foregoing outsourcing or privatization studies, such studies have generally failed to establish a

[9] We employ the same geographical indicators as Andersen et al. (2014) (table 4).

causal connection between fiscal stress and outsourcing/privatization decisions (Boyne, 1998; Bel and Fageda, 2007; Andersson and Jordahl, 2011; Sundell and Lapuente, 2012). In contrast, we exploit arguably exogenous variation in local government revenues across both time and space deriving from the presence of hydropower plants within municipal boundaries, which facilitates the estimation of causal revenue effects on outsourcing decisions (for a similar approach in different settings, see Hægeland *et al*., 2012; Andersen *et al*., 2014; Borge *et al*., 2015).

Our main findings indicate that financial strains due to an exogenous *decrease* in local government revenues indeed causes *more* outsourcing (and vice versa). Municipalities collecting substantial revenues from hydropower facilities access this natural resource to maintain in-house service provision. There is only weak evidence that this finding differs across different types of services (i.e. infrastructure and support services). These findings not only provide an important contribution to the literature on local-level outsourcing decisions, but gain additional relevance from recent findings linking government outsourcing decisions to the subsequent shedding of public services (Lamothe and Lamothe, 2015). Although these authors fail to find a direct effect of indicators of fiscal stress on the decision to stop service provision, our results suggest there may well be an important indirect effect. That is, to the extent that fiscal stress causes increased outsourcing, it may well increase the likelihood that the service is shed completely in the future (Lamothe and Lamothe, 2015). To improve our understanding of the *processes* driving who chooses which form of service provision (and why), the potential existence of such gradual, dynamic developments in the institutional framework of public authorities' service provision in our view presents an important avenue for future research.

Finally, it is interesting to observe that revenue shocks have likewise been found to affect governance decisions in corporate governance. Schoar and Washington (2011), for instance, discuss the impact of abnormally good or bad company performance (i.e. the extent to which the firm's earnings exceed or falls short of analysts' expectations) on governance decisions. They find that positive earnings and profit surprises increase the likelihood that managers introduce bad management practices in subsequent special shareholder meetings (while negative earnings surprises have little bearing). As in the literature on the institutional design on public service provision, however, the exact mechanisms driving these policy changes remain poorly understood.

One important avenue for future research in this direction should look into possible changes in the *implementation* process of public and private governance structures following episodes of revenue scarcity (or abundance).

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Table 1: Municipal hydropower revenues

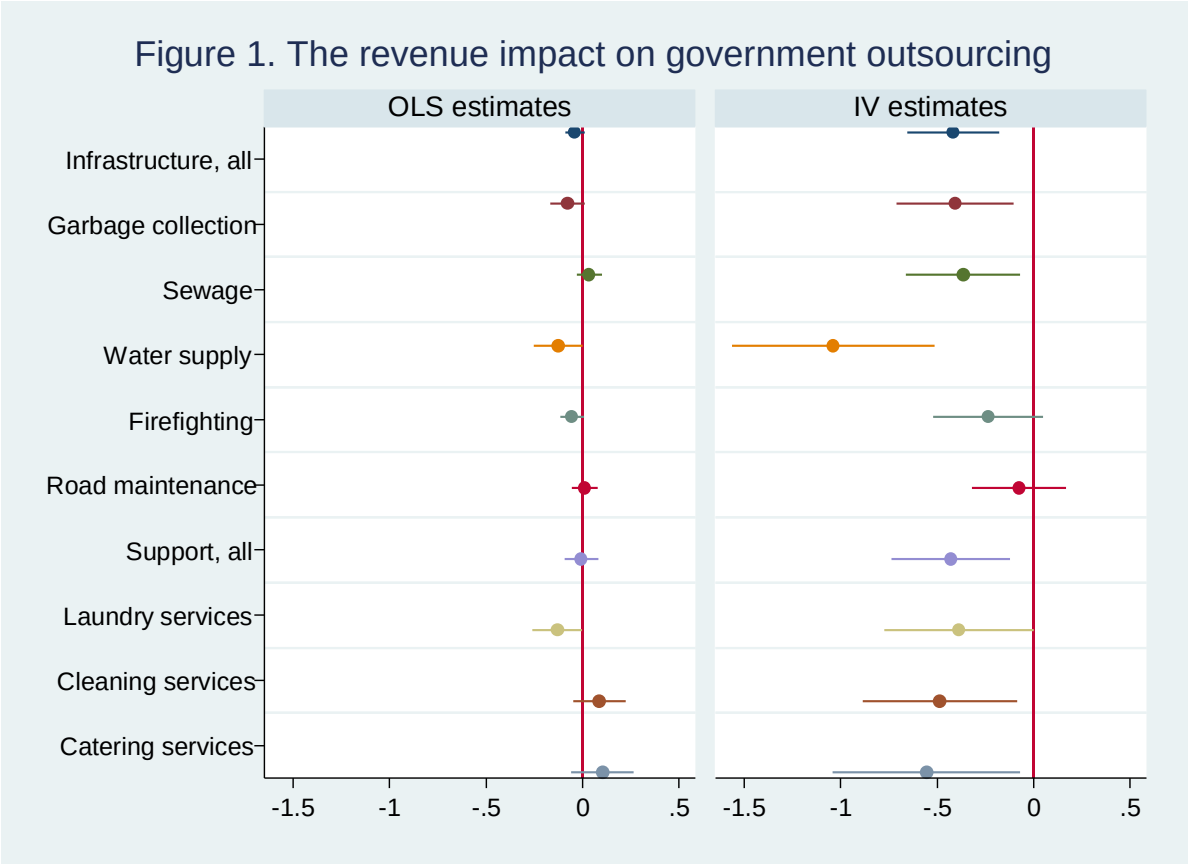
Panel I: Hydropower revenues					
Year	Total revenues	Hydropower revenues	Property taxes	Revenues from hydropower sales	(N)
	(1)	(2)	(3)	(4)	
1995	19.73	1.024	1.007	0.0167	(422)
1996	20.02	1.035	1.017	0.0183	(428)
2000	25.57	1.165	1.142	0.0226	(429)
2004	31.04	1.069	1.040	0.0296	(428)
2008	37.19	2.346	2.282	0.0585	(424)
2012	52.31	2.691	2.624	0.0657	(419)
Panel II: Hydropower revenue share					
	Mean	St.dev.	Min	Max	(N)
Overall	3.71	7.88	0	76.16	2502
Between		7.51	0	49.43	426
Within		2.45	-21.11	37.66	5.87

Note: Panel I present four revenue indicators per capita in current prices. Total revenues (1) comprises income tax revenues, property tax revenues, central government block grants and hydropower revenues. Hydropower revenues (2) is the sum of commercial property taxes (3) and revenues from sales of licensed hydropower production (4). Data on total property tax revenues (i.e. the sum of residential and commercial taxes) are available for the entire period, while data for commercial property tax revenues are available only from 2007 onwards (see Fiva *et al*., 2012). We therefore estimate the ratio of commercial property taxes in total property taxes based on data for 2010, and assume that the municipality-specific property tax ratio is constant over time (which allows us to estimate commercial property taxes for the entire period). Note that this assumption holds trivially for municipalities without (residential) property taxes, but appears credible also for municipalities with both types of property taxes since only few municipalities change the tax *rates* over time. Panel II illustrates the overall variation in the share of hydropower revenues in total revenues for all municipalities and years ('overall'), and also decomposes the standard deviation into between and within components.

Table 2: Baseline regression results

	Infrastructure index		Supporting services index	
	Panel I: OLS estimates			
	I	II	III	IV
Revenues (log)	-0.074*** (0.020)	-0.040 (0.026)	-0.036 (0.027)	-0.0053 (0.044)
N (obs)	1777	1775	1701	1699
N (municipalities)	433	433	431	431
R-Squared:				
- Within	0.257	0.257	0.284	0.287
- Between	0.123	0.157	0.081	0.095
- Overall	0.206	0.217	0.199	0.209
	Panel II: IV estimates			
	V	VI	VII	VIII
Revenues (log)	-0.312*** (0.075)	-0.416*** (0.121)	-0.244*** (0.092	-0.428*** (0.157)
First stage estimates [hydropower revenues (log)]	0.0256*** (0.0036)	0.0156*** (0.0024)	0.0259*** (0.0036)	0.0160*** (0.0024)
N (obs)	1743	1741	1671	1669
N (municipalities)	433	433	422	422
R-Squared:				
- Within	0.245	0.231	0.282	0.277
- Between	0.067	0.077	0.044	0.029
- Overall	0.158	0.159	0.172	0.159
F-test statistic for weak instruments	50.83	40.83	50.69	41.34
Covariates	No	Yes	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Mun. random effects	No	Yes	No	Yes

Note: The table displays estimates for (log) municipal revenue on outsourcing in infrastructure and supporting services. The response variables are measured as average scores of the relevant sub-indexes that capture outsourcing in each service sector (see main text). The regression models include the following covariates: population size (log), settlement pattern, the age structure of the municipal population and share of electorate voting for the right-wing political parties. Panel I contains OLS estimates, whereas panel II displays IV estimates that employ hydropower revenues (per capita, log-scale) as instrument variable. The models include municipality random effects, and the standard errors are also clustered at the municipality level. *** statistically significant at 0.1%, ** at 1% and * at 5% (two-tailed tests).



Note: Coefficient estimates derive from the baseline regression model (1), and are presented with 95% confidence levels.

Appendix A: Descriptive statistics

Table A1. Descriptive statistics for local government outsourcing (Averages)

Panel I: Infrastructure services							
Year	Infrastructure services	Garbage collection	Sewage	Water supply	Fire-fighting	Road maintenance	(N)
1995	0.715	0.535	1	0.360	1	1	(333)
1996	0.745	0.652	1	0.281	1	1	(363)
2000	0.739	0.940	1	0.326	1	0.648	(361)
2004	0.568	0.956	0.516	0.558	0.588	0.831	(310)
2008	0.547	0.984	0.397	0.462	0.608	0.870	(320)
2012	0.512	0.986	0.766	0.783	0.867	0.909	(121)
Total	0.657	0.842	0.780	0.461	0.844	0.876	(1808)

Panel II: Supporting services					
Year	Supporting services	Laundry services	Cleaning services	Catering services	(N)
1995	0.286	0.488	0.272	0.621	(325)
1996	0.282	0.477	0.187	0.525	(365)
2000	0.171	0.391	0.200	0.356	(359)
2004	0.325	0.692	0.500	0.678	(241)
2008	0.504	1	0.378	0.517	(320)
2012	0.501	1	0.764	0.813	(121)
Total	0.322	0.674	0.383	0.585	(1731)

Note: Each of the services has been coded 0 if it is provided in-house, and 1 if it is outsourced (which includes a company owned by the municipality, an inter-municipal company or a privately owned company). The aggregate infrastructure and supporting services indicators are operationalized as the share of services outsourced. If all services within a service type are missing, the aggregate indicator is coded missing. Otherwise, missing is coded 0 (in house provision). Note that the number of observations in 2012 is considerably lower (N=121) despite a relatively high response rate to the survey in that year (82%). This is due to the fact that many municipalities failed to fill out the relevant question on organizational choices. For further documentation, see "Kommunal Organisering 2012" (table 5.2), available in Norwegian at http://www.nibr.no/filer/2012-21.pdf

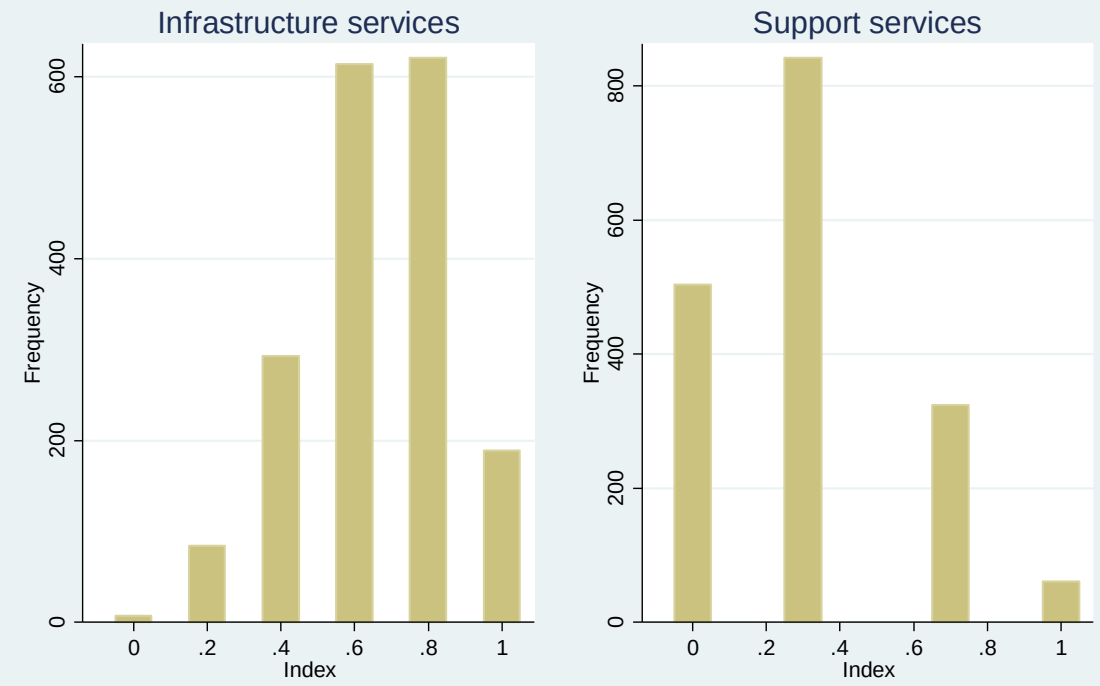
Table A2. Descriptive statistics for explanatory variables (averages)

Year	Population size	Settlement pattern	Share of children	Share of young	Share of elderly	Unemployment rate	Vote share right-wing parties	(N)
1995	9927	53.20	0.0931	0.117	0.169	0.0371	0.519	(422)
1996	9927	54.17	0.0937	0.116	0.168	0.0344	0.520	(428)
2000	10227	48.34	0.0783	0.134	0.166	0.0202	0.550	(429)
2004	10547	48.86	0.0743	0.139	0.160	0.0293	0.554	(428)
2008	10837	48.93	0.0683	0.138	0.162	0.0141	0.538	(424)
2012	11293	48.24	0.0670	0.129	0.167	0.0195	0.568	(419)
Total	10457	50.29	0.0791	0.129	0.166	0.0258	0.542	(2550)

Note: The demographic statistics come from the Norwegian Social Science Data Services, and are organized by Fiva et al. (2012). Settlement pattern refers to the share of population living in sparsely populated areas as defined by Statistics Norway. A densely populated (urban) area is defined as follows: "A hub of buildings is registered as an urban settlement if it is inhabited by at least 200 persons. The distance between the buildings must not exceed 50 meters. Exceptions are allowed for areas that cannot/are not to be occupied, for example parks, sport facilities, industrial areas or natural barriers such as rivers or arable land". Further details can be obtained from Statistics Norway at https://www.ssb.no/en/befolkning/statistikker/beftett/aar/2015-04-09?fane=om#content

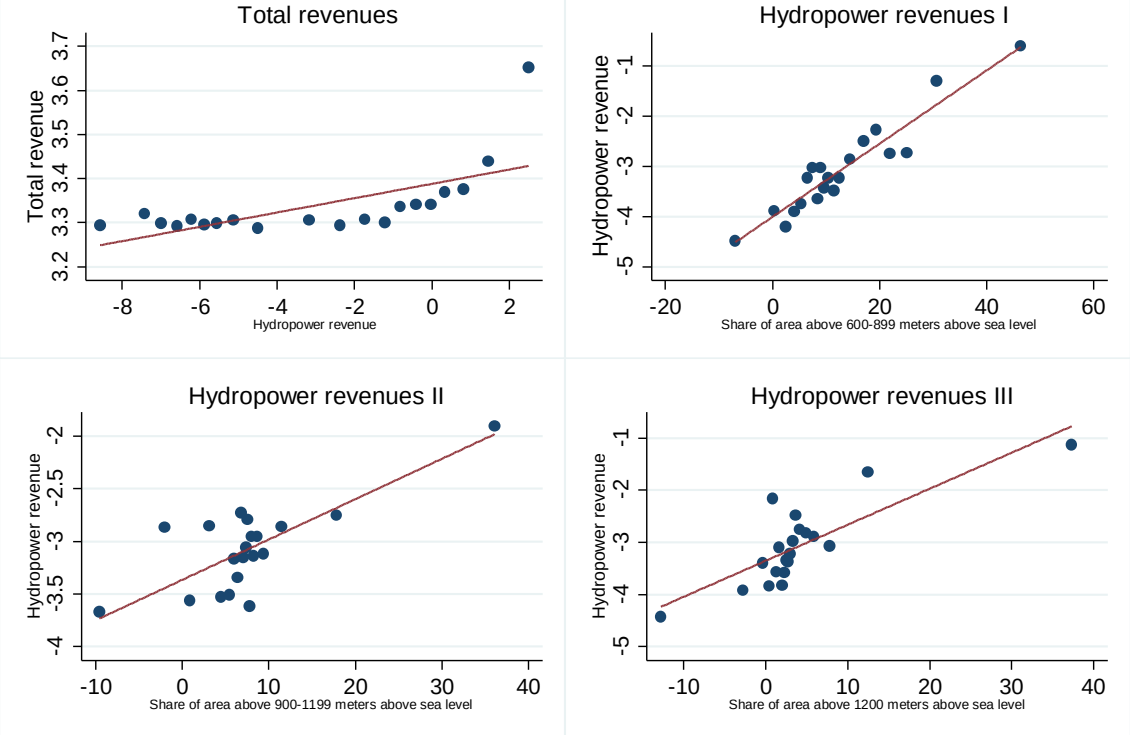
Appendix B: Additional figures

Figure B1. Frequency distribution of response variables



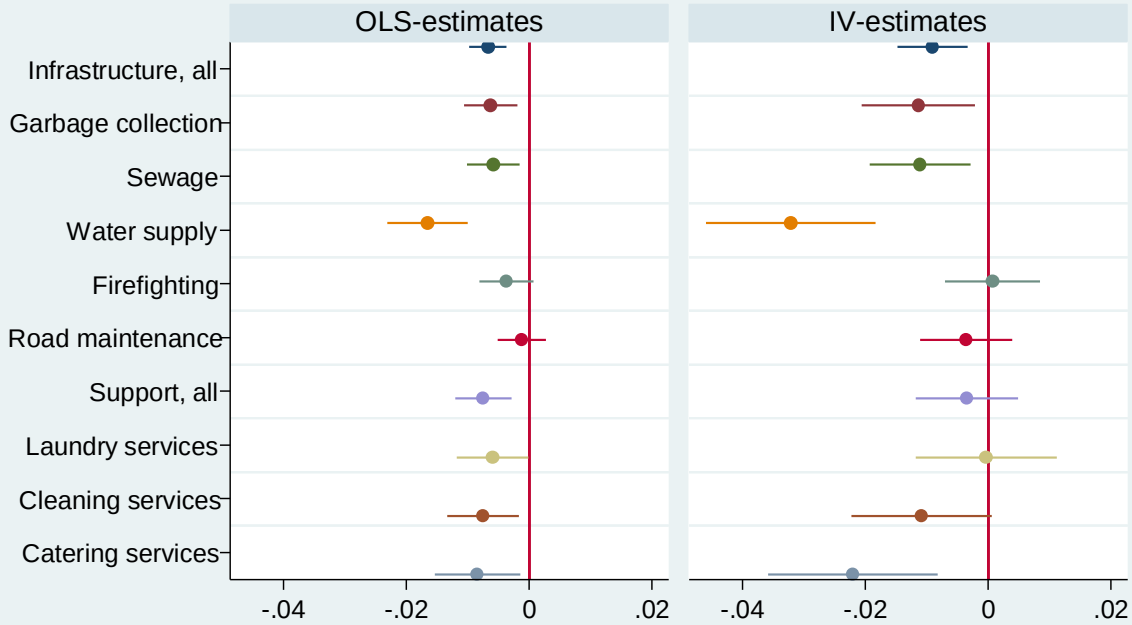
See main text for description of index definitions

Figure B2. Instrument variables



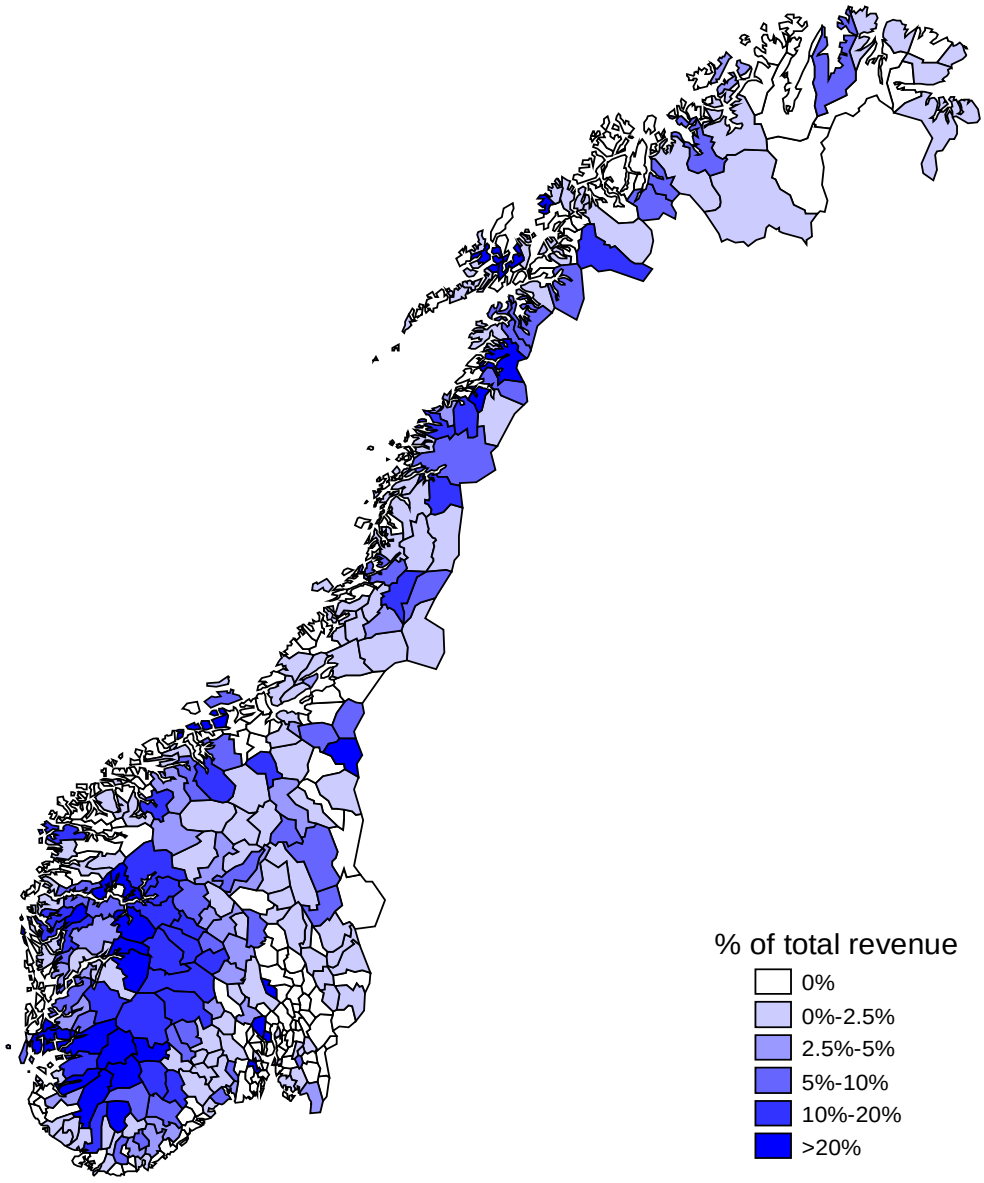
Note: The top left panel evaluates the correlation between hydropower revenues and total municipal revenues, which is required for the validity of hydropower revenues as an important source of revenue variation. The remaining three panels assess the validity of geographical variables as instruments for hydropower revenues, and illustrate that geography is indeed a strong driver of hydropower revenues. All panels present binned scatterplots covering all municipality-years, and a linear trend-line. Controls for year fixed effects, population size, settlement pattern, demographic and ideological variables, and the unemployment rate are included throughout. Total revenues are defined as the sum of municipal income and asset taxes, block grants and hydropower revenues. Hydropower revenues are defined as the sum of commercial property taxes and revenues for licensed sale of hydropower electricity production (denoted revenues from "konsesjonskraft").

Figure B3. The impact of hydropower revenues on government outsourcing



The estimates derive from regression models with the same number of controls variables. The IV-estimates are based on geographical characteristics, i.e. share of area 600-899 meters above sea level, 900-1199 meters a.s.l., and 1200 meters or more a. s. l.

Figure B4. Hydropower revenues



Local government revenues from hydropower are defined as the sum of commercial property taxes and sales of hydropower electricity