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A Structural Approach for Measuring Fiscal Disparities

Abstract:

Fiscal disparities arise from differences in costs and capacity to produce a standard package of public services. This paper proposes to use a structural modelling approach as basis for measuring fiscal disparities across municipalities. This approach differs from the widely used reduced-form approach, in the sense that identification of minimum required costs or expenditure need is made by reference to a structural model of the fiscal and spending behavior of local governments. The empirical analysis, which is based on data for Norwegian municipalities, relies on various alternative measures of fiscal capacity. One of these measures is defined by the local tax-bases, whilst another also includes grants-in-aid from the central government. This facilitates identification of the equalizing effect from grants. By comparing the effects of the current grant system with the effects of a policy designed to reduce fiscal disparities it is demonstrated that the goal of locational neutrality is far from being fulfilled. Moreover, it is shown that differences in local priorities only give a minor contribution to the observed differences in service levels.

Keywords: Local public finance, expenditure need, fiscal disparities, fiscal equalization

JEL classification: H71, H72

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1. Introduction

Central governments commonly refer to equity goals to justify the distributional profiles of the grants to local governments. The main purpose of intergovernmental transfers is to enable local authorities to provide a standard package of public services at an equal local tax rate or tax effort. Such policies are termed *fiscal equalization*. Although fiscal equalization is widely supported, the normative foundations of this policy are disputed. Oakland (1995) claims that equalization as a means of adressing inequities is poorly targeted and often seems based on a dubious primacy of public goods and services. Provided that communities are heterogenous with respect to income, the benefits of equalization grants accrue to poor as well as to rich residents of recipient communities. The effect on overall income inequality is, however, not clear.

Alternatively, fiscal equalization may be justified on the grounds of the principle of *locational neutrality*, which means that citizens should not be given incentives to migrate across localities in order to obtain lower taxes or higher levels of public services. When locational neutrality is imposed by the central government for specific functions the scope for local government priorities will be reduced. National regulations of local government service provision may undermine the principal economic motivation for local self-government, which is to utilize efficiency gains from decentralized decision-making. In order to preserve a certain degree of local autonomy, one have to accept that service levels and/or service quality differ across municipalities. Consequently, fiscal equalization is generally aimed at equalizing the economic choice opportunities for local public service production, while local governments enjoy wide discretion to make their own priorities over different services. To facilitate accountability the ambition is restricted to compensate for cost factors that are largely or entirely beyond the control of local authorities. Equalization grants are only allowed to affect local government priorities in a lump-sum manner that expands the available economic resources. The unconditional nature of the equalization transfers permits local governments to carry out their own objectives in a truly decentralized fashion. While such a policy instrument is insufficient to assure locational neutrality for specific services, it may provide local authorities with equal opportunities to attain a specified set of service standards. Thus, fiscal equalization may be seen as an effort by central governments towards locational neutrality, which is constrained by local self-government and variation in local tastes.

Another justification for fiscal equalization is the request for *procedural equity*, which is related to equity between local governments as organizations, rather than equity between individuals. For example, it may be seen as unfair that the central government requires local authorities to fulfil certain minimum standards without taking responsibility for the financial issues. However, procedural equity arguments are probably derived from and thus subordinate to equity goals for individuals, since otherwise it would not be meaningful to impose minimum standards in the first place.

Fiscal disparities are those differences that equalization is supposed to remove, and arise from differences in costs and capacity to produce a standard package of public services. Thus, fiscal disparity is defined by the capacity-need gap, which is the difference between fiscal capacity and expenditure need.[1] Fiscal capacity is the taxes collected from a standard tax rate or tax effort. Ladd and Yinger (1989) propose to measure tax effort by the tax burden, which is defined as the proportion

[1] Ladd (1994) and others define fiscal disparity by the need-capacity gap, which is the negative of the capacity-need gap. Alternative approaches for measuring fiscal disparities are given by Thurow (1970), Le Grand (1975), Downes and Pogue (1992) and Ladd and Yinger (1995).

of local taxes to private disposable income. This approach is founded on the objective to reduce overall income inequality, but will not fulfil locational neutrality, since a given level of the average income burden may be produced by quite different tax rate structures. The tax burden of individuals is neither equalized across nor within communities unless each community is homogeneous. Thus, the alternative tax rate approach appears to be more closely related to locational neutrality.

Capacity-need gaps are used either to describe patterns of fiscal disparities, or to prescribe equalizing grant programs that may reduce or remove fiscal disparities. Although the basic information on fiscal disparities is provided by the distribution of capacity-need gaps across municipalities, it may be helpful to summarize the dispersion of the distribution by measures of spread. To this end we use the conventional standard deviation and the absolute Gini coefficient.

The paper is organized as follows. Section 2 defines the capacity-need gap and demonstrates why and how a structural model of the fiscal and expenditure behavior of local governments can be used as basis for deriving measures of expenditure need. The structural approach is contrasted to the widely used reduced form approach. Section 3 provides an empirical analysis based on Norwegian data where fiscal capacity is defined either to exclude or include intergovernmental grants. The effects of a policy reform aimed at fiscal equalization are discussed in Section 4.

2. Needs and capacity for local public service production

Consider a local government that provides a per capita output level q_i on service sector i (i=1,2,...,s) and has the discretion to impose taxes on an exogenously given per capita tax base b. Then fiscal disparities may arise either from costs of producing a given package of public services or/and from capacity to finance the expenses. Thus, the difference between capacity and costs, the *capacity-need gap*, forms the basis for measuring fiscal disparities. The capacity-need gap is defined by

$$x = r^* b - \sum_{i=1}^{s} p_i q_i^* \qquad (2.1)$$

where r^* is the standard tax rate, p_i is unit costs and q_i^* is the quantities required for the standard package of services. Expenditure need for sector i is defined by $p_i q_i^*$, total expenditure need is the sum of the sectorspecific expenditure needs, and fiscal capacity equals $r^* b$.[2] Provided that the tax base and prices are exogenous, the need-capacity gap is a measure of fiscal disparities that accounts for differences in expenditure need as well as revenue-raising capacity, and is considered to reflect forces outside the control of local authorities.

Development of appropriate standards of needs and capacity is crucial for the measurement of fiscal disparities. Many national transfer systems rely on standards derived from national averages of service provision and tax rates.[3] An alternative approach derives standards from formal constraints, like minimum requirements, service standards and upper tax rate limits imposed as national regulations. However, the economic significance of formal constraints can in general not be identified

[2] It is straightforward to generalize the analysis of fiscal disparities to the case in which local authorities exploit several tax bases, see Ladd (1994). However, in quite a few countries the local discretion to tax is restricted to only one tax base. The most usual tax base is property taxes.

[3] For an international comparison of intergovernmental grants, see Ahmad (1997).

directly from a set of regulations. Minimum standards are commonly expressed in terms of quantity or quality of outputs or inputs, and not in terms of costs. Moreover, minimum required service levels may also originate from informal standards, social norms or moral pressures that are present in the society. Thus, it appears hard to find objective standards of expenditure needs and fiscal capacity that are universally supported.

2.1. Cost functions of local public services

The definition of output and unit costs in public service provision is a major challenge for the measurement of expenditure needs. Spatial variations in unit costs may arise from variation in input costs, or environmental costs, or both. *Input costs* are costs attached to the purchase of factor inputs. In some analyses of local public finance these costs are measured by an input price index. Yet, the majority of national equalization systems do not compensate for differences in input prices. Since local authorities may have opportunities to influence input prices, a compensating scheme could impair the principle of local accountability. Moreover, proper measurement of wage costs is impeded by unobserved labor heterogeneity. To the extent that workers with different skills and professional qualifications are employed in public service provision, it should be recognized that wage cost differentials may reflect variations in labor productivity. However, input price variations may be captured indirectly through the effects of environmental cost variables. As Bradbury et al. (1984) we use the environmental cost variable approach as basis for identifying price effects.

Environmental costs derive from local environments that are more or less favorable for providing the population with local public services. Environmental costs depend on the sociodemographic composition of the population for which the local government has service responsibilities, as well as on other characteristics of the local community. The paper by Bradford et al. (1969) is pioneering in clarifying the role played by sosioeconomic variables in the production of public services. While services directly produced by the public sector (D-output) use the standard types of inputs, the production of “things of primary interest to the citizen-consumer” (C-output) depends both on these directly produced services and on environmental variables. For example, the purpose of public education is to develop certain skills on the part of pupils. It is reasonable to assume that test scores and other measures of skills do not depend exclusively on the direct output of education services, like lessons, prescribed texts, teacher skills and class size, but also on family background and other characteristics of the pupils' environment.

From the discussion above it follows that cost functions for producing a given amount of C-output depend on the environmental cost factors. For this reason the presumption that environmental cost variations can be identified by means of multiple regression models has gained wide support. Local public expenditures are regressed on a set of environmental cost factors and variables that capture local governmental priorities. It is assumed that the regression coefficients of the environmental cost factors capture the effects of variations in local production technology.

However, local officials may not accept the full responsibility for C-outputs, since C-outputs are affected by the clients’ own efforts. Moreover, in many cases it has proved difficult to measure and monitor C-outputs. This may explain why national minimum standards are frequently established for input factors or D-outputs, but rarely for C-outputs. Service standards for C-outputs may run into problems that become evident in analyses of efficency in education services, showing that direct output levels are insignificant for explaining student performance, while environmental factors are significant. In this case the costs of equalizing student performance would be almost infinite. For instance, the mentally retarded cannot be expected to yield test scores just as high as other pupils.

Even for a group of pupils with equal capability and socioeconomic background, there is no widespread view that public policy should aim at equalizing test scores. The common view is rather that pupils in the same situation should be given equal opportunities by receiving similar (direct) education services and that compensatory education should be provided for disabled children. These arguments justify the inclusion of environmental factors in the cost functions of local public services, conditional on D-output. Given the production opportunities for outputs, it appears reasonable to assume that national regulations and legal minimum standards along with informal norms and habits determine a set of minimum required (direct) output levels $\tilde{q}_i$. We assume that minimum standards are either imposed directly for D-outputs, or that such standards are derived from minimum standards for factor inputs and the production functions for D-outputs.

It is quite common that standards imposed as national regulations vary according to client groups and other community characteristics. Thus, minimum required costs to fulfil minimum standards will vary as a function of environmental variables. For example, most people agree that the mentally retarded require special attention and care, so that high costs are brought upon their community of residence. Similarly, a national norm of maximum travelling distance to school increases education expenditures in sparsely populated areas. Minimum standards limit the scope for local priorities, and the costs to meet such standards vary according to the status of the local environment. This line of argument suggests a concept of need which is distinct from wants and which involves a normative judgement about a minimum desirable end state.

To summarize there are at least three mechanisms that justify the inclusion of environmental factors in the cost functions of local public services: First, environmental factors may affect the technology required for producing C-outputs. Second, input prices may depend on the environment. The third mechanism, which is the one that is emphasized in this paper, is based on formal and informal service standards that are made contingent on sociodemographic and other environmental factors. These norms and regulations are assumed to make up constraints that reduce the scope for local priorities.

2.2. A structural approach for measuring expenditure need

As pointed out above, knowledge of national regulations may not be sufficient to determine accurately the costs that are necessary to fulfil societys requirements towards local public services. Even though D-outputs are definable and measurable at the interface between service agency and consumer, we may face difficulties in identifying the impact of informal standards and regulations that are vaguely stated. Moreover, available data for outputs provided by multi-product public services, is usually incomplete. To circumvent these information deficiencies, this paper utilizes a structural model for local governments spending and fiscal behavior. The basic idea is that the economic significance of norms and regulations can be identified within a model of local government behavior. Local governments are treated as utility maximizing agents when they determine the levels of expenditures on various services as well as the level of local taxes. A particularly suitable framework for modelling the impact of minimum requirements is the linear expenditure system (LES). Since local governments in most nations have discretion to impose taxes on a local tax base, we follow Johnson (1979) by treating local taxes as an endogenous variable. By the assumption of a balanced budget requirement,[4] the budget constraint of the local government is given by

[4] The model is extended to account for budget deficits in Section 3. The discussion in Section 2 is simplified by assuming away budget deficits, but our conclusions are also valid without this assumption.

(2.2) $$y + v = \sum_{i=1}^{s} u_i$$

where y is exogenous per capita income including equalization grants, v is endogenous per capita income from local taxation, and u_i is per capita expenditure on service sector i. Like Johnson (1979), we extend the LES by treating local taxes as a negative good. Since wage rates in the public sector in many European countries are set in a centralized system of bargaining, it seems plausible to assume that wage rates do not vary across municipalities. The more conventional assumption of constant prices on material inputs may derive from competition within a national factor market. Thus, in the case of many European countries it appears likely that variation in unit costs across municipalities largely is due to variation in local production opportunities which can be captured by relevant community characteristics. For constant prices the LES is given by

(2.3) $$\begin{aligned} u_i &= \alpha_i + \beta_i (y + \kappa - \alpha), \quad i = 1,2,...,s \\ v &= \kappa - \theta(y + \kappa - \alpha) \end{aligned}$$

where

(2.4) $$\theta + \sum_{i=1}^{s} \beta_i = 1$$

and $\alpha = \sum_{i=1}^{s} \alpha_i$. The α_i-parameters are conventionally interpreted as subsistence expenditures or minimum acceptable expenditure on each of the local public services, and α is total subsistence expenditure. Similarly as Johnson (1979) we interpret κ as the maximum acceptable level of local taxes. Moreover, $y + \kappa - \alpha$ represents discretionary income which is distributed between the private and the local public sectors in line with the marginal shared parameter θ. The local public share $(1-\theta)$ of the discretionary income is distributed among the local public services in proportion to the parameters $\beta_i/(1-\theta), i = 1,2,...,s.$ Note that $\sum_{i=1}^{s} [\beta_i/(1-\theta)] = 1.$

The variables affecting the allocation of local public expenditures across service sectors can be divided into three groups: fiscal capacity, environmental cost factors, and variables that account for differences in tastes. Fiscal capacity depends on the local tax base (b) and exogenous incomes (y), and is further discussed in Section 2.4. Taste variables are factors that influence local priorities beyond imposed commitment levels such as standards and minimum requirements. For instance, the party composition in local politics may account for differences in tastes. Taste and environmental cost variables are assumed to capture essential features of heterogeneity in the structural parameters of the model defined by (2.3).

The α_i-parameters of the LES defined by (2.3) are commonly interpreted as minimum required costs. This interpretation is, however, most relevant when the subsistence parameters are allowed to depend on variables that account for variation in the costs to reach minimum service standards. We postulate a linear functional form

(2.5) $$\alpha_i = \alpha_{i0} + \sum_{j=1}^{k} \alpha_{ij} z_j, \ i = 1,2,\ldots,s$$

where $z_1, z_2, \ldots, z_k$ are k variables that are assumed to affect the sectorspecific subsistence expenditures. These are the environmental cost factors discussed above, and may include variables that form the basis for the distributional profile of the central system of equalization grants. For a characteristic to be included as a cost factor, it must be theoretically plausible and moreover exert a statistically observable impact on spending. When the model has been properly specified, it makes sense to assume that expenditure need in sector i equals α_i, and total expenditure need is given by the sum of sectorspecific expenditure needs $\alpha = \sum_{i=1}^{s} \alpha_i$.

Expenditure allocations that fall short of subsistence expenditures do not conform with the underlying assumptions of the LES model. Within this framework the minimum requirements have to be regarded as binding commitments that local governments must fulfil. The scope for local priorities corresponding to local tastes is thus restricted to what is called discretionary income, or remaining fiscal resources after deduction of minimum required costs. This reasoning may justify the assumption that taste variables solely affect marginal budget shares, or preferences for allocating discretionary income. Let $t_1, t_2, \ldots, t_m$ be m variables that are assumed to capture variation in preferences for allocating discretionary income across service sectors in the following way

(2.6)
$$\beta_i = \beta_{i0} + \sum_{j=1}^{m} \beta_{ij} t_j, \ i = 1,2,\ldots,s$$
$$\theta = \theta_0 + \sum_{j=1}^{m} \theta_j t_j.$$

Furthermore, by imposing the following restrictions on the parameters in (2.6)

(2.7)
$$\theta_j + \sum_{i=1}^{s} \beta_{ij} = 0, \ j = 1,2,\ldots,m$$
$$\theta_0 + \sum_{i=1}^{s} \beta_{i0} = 1,$$

the adding-up constraint (2.4) is fulfilled. Similarly as the standard LES the system (2.3) is not fully identified when price information is not available. However, the assumption that taste variables affect marginal budget shares, but not subsistence expenditures enables us to identify the complete demand system. Note that this assumption is essential for maintaining the interpretation of the α_i-parameters as minimum required costs.

2.3. Reduced form approaches for measuring expenditure need

The conventional reduced form approach for identifying expenditure needs relies on similar assumptions as those used for the interpretation of the LES parameters. The essential difference is that the expenditure needs are derived from reduced form equations for local government expenditures. To

be consistent with utility maximization and thus represent the preferences of the local decision-making unit, the linear reduced form equations can be considered as reduced form versions of the LES model. Assuming that κ is a linear function of the local tax base b, the reduced form of (2.3) is given by

$$u_i = \varphi_i + \beta_i y + \xi_i b, \quad i = 1,2,\ldots,s. \tag{2.8}$$

It follows from (2.3) and (2.5) that

$$\varphi_i = \varphi_{i0} + \sum_{j=1}^{k} \varphi_{ij} z_j, \quad i = 1,2,\ldots,s, \tag{2.9}$$

where $\varphi_{ij}\,(j > 0)$ is given by

$$\varphi_{ij} = \alpha_{ij} - \beta_i \sum_{h=1}^{s} \alpha_{hj}. \tag{2.10}$$

As can be seen from (2.10) the reduced form parameters will differ from the structural parameters in cases where the marginal budget share parameters are positive. Thus, when one of the cost factors affects costs positively in several service sectors, the effect captured by the reduced form parameters will be biased downwards. Note also that $\sum_{i=1}^{s} \varphi_{ij} = 0$ and $\sum_{i=1}^{s} \varphi_i = 0$ in the case of no local discretion to tax ($\kappa = \theta = 0$), which shows that the sum of reduced form parameters for environmental cost factors across service sectors cannot be used as basis for assessing total expenditure need.

Measures of expenditure need have been derived from linear reduced form models despite the problems alluded to above. In some cases the constant terms of the models are also assumed to vary with taste variables as well as with environmental cost factors, i.e. the models are on the following form

$$u_i = \varphi^*_{i0} + \sum_{j=1}^{k} \varphi^*_{ij} z_j + \sum_{j=1}^{m} \eta_{ij} t_j + \beta^*_i y + \xi^*_i b. \tag{2.11}$$

The asterisks indicate that parameters may differ from the reduced form parameters in (2.8) and (2.9), since the reduced form specification which includes taste variables does not necessarily coincide with the specification (2.6). Auten (1974), Bradbury et. al. (1984), Ladd (1994) and Shah (1996) use the reduced form model (2.11) as motivation for the following definition of sectorspecific expenditure need

$$\tilde{u}^*_i = \varphi^*_{i0} + \sum_{j=1}^{k} \varphi^*_{ij} z_j + \sum_{j=1}^{m} \eta_{ij} \bar{t}_j + \beta^*_i \bar{y} + \xi^*_i \bar{b}, \quad i = 1,2,\ldots,s \tag{2.12}$$

where $\bar{y}$, $\bar{b}$ and $\bar{t}_j$ are national averages of exogenous incomes, tax base and taste variables, respectively, while the z-variables are allowed to vary across municipalities. Auten (1974) suggests that this measure of expenditure need reflects “standardized tastes” for public services. Thus,

expenditure need is what each community would have spent if it had average resources and average values of taste variables, but retained its own values for the cost variables. Since taste variables may be essential for capturing variation in preferences for allocating discretionary income, the above discussion points out that one should make a clear distinction between local taste variables and environmental cost factors irrespective of whether expenditure needs are defined by subsistence expenditures or by "standardized tastes".

An interesting question is whether the "standardized taste" approach can be given a meaningful interpretation within the context of the structural model (2.3)-(2.7). In this case the expenditure need in sector i is defined by

$$(2.13) \qquad \tilde{u}_i = \alpha_i + \bar{\beta}_i(\bar{y} + \bar{\kappa} - \alpha), \quad i = 1,2,\ldots,s$$

where $\bar{\beta}_i$ is the average marginal budget share and $\bar{\kappa}$ is the average per capita maximum acceptable tax income. Thus, total expenditure need is given by

$$(2.14) \qquad \sum_{i=1}^{s} \tilde{u}_i = \bar{\theta}\alpha + (1-\bar{\theta})(\bar{y} + \bar{\kappa})$$

where $\bar{\theta}$ is the average marginal share that is distributed to the private sector through tax reductions. Note that total subsistence expenditure (α) is allowed to vary across municipalities. It follows from (2.14) that expenditure needs defined by "standardized tastes" coincide with subsistence expenditures if and only if all local authorities allocate the discretionary income exclusively to the private sector $(\theta = 1)$. Note that this condition requires that $v = \alpha - y$, which means that the sum of exogeneous income and income from local taxation exactly covers expenses for minimum required services. Such a case is, however, not very likely to occur. By contrast, when local authorities have no discretion to impose taxes it follows that $\bar{\kappa} = \bar{\theta} = 0$ and $\sum_{i=1}^{s} \tilde{u}_i = \bar{y}$, which means that total expenditure need is determined by average fiscal resources and is not affected by environmental cost factors.

In order to compare conventional reduced form estimates of expenditure needs with subsistence parameter estimates, structural and reduced form models of local government spending on eight service sectors have been estimated on the basis of data for 426 Norwegian municipalities. Expenditure needs were derived from the subsistence parameter estimates of the structural model, as well as from the reduced form approach based on the "standardized tastes" as specified by equation (2.12). The resulting spread (standard deviations) of estimated expenditure needs across municipalities is reported in Table 2.1. The spread of expenditure needs as measured by "standardized tastes" is smaller than the spread as measured in the structural approach in all except one service sector. The relative deviation between the two approaches in total spread is 68 per cent. This shows that the "standardized tastes" approach tends to underestimate the variation in expenditure needs, as would be expected by closer inspection of equation (2.14).

Table 2.1. Standard deviations of estimated expenditure needs across municipalities derived from structural and reduced form models by service sector, NOK per capita 1994

Service sector	1	2	3	4	5	6	7	8	Total
Structural model	578	693	224	245	332	1 568	183	551	2 867
Reduced form models	466	535	221	173	351	1 331	143	192	1 706

Sector 1: Administration
Sector 2: Education
Sector 3: Child care
Sector 4: Health care
Sector 5: Social services
Sector 6: Care for the elderly and disabled
Sector 7: Culture
Sector 8: Infrastructure

2.4. Measurement of fiscal capacity

In equation (2.1) the fiscal capacity is defined exclusive of intergovernmental grants. By adding grants-in-aid from the central government to the fiscal capacity we may use this extended measure of the capacity-need gap as basis for evaluating the equalizing effect of grants.

Both local tax incomes and intergovernmental grants are subdivided into fiscal capacities based on incomes that are exogeneous or endogenous from the point of view of local authorities. In some cases the local tax base as well as the tax rate is exclusively determined by the central government, which means that the tax is not really a local tax, since local authorities have no opportunity to affect the collected taxes. Thus, these taxes should be regarded as an integrated part of the centralized system of financing.

Equalization grants are usually unconditional grants or block grants distributed according to criteria that local authorities cannot control, so they are by purpose exogenous. Unconditional grants are frequently supplemented by conditional or categorical grants, which can either be exogenous or endogenous. Matching grants are proportional to output or expenditure in a specific service function, and are thus of the endogenous type. The model (2.3)-(2.7) can be extended to account for matching grants (see Johnson (1979)). Matching grants expands the fiscal capacity by increasing the spending level on specific services. However, since this paper focuses on evaluation of fiscal disparities, we simplify the analysis by assuming that all grants are exogenous.[5] Consequently, we consider three main sources of income: Exogenous grants, exogenous tax incomes and endogenous tax incomes.

For exogenous income components one obvious measure of fiscal capacity is defined by observed local public income. For endogenous tax incomes the common approach is to use the average observed tax rates of the local jurisdictions as the standard tax rate. We complement this approach by introducing some alternative definitions of fiscal capacity.

Section 2.2 provided arguments for interpreting subsistence parameters as minimum required costs. Similar arguments can be provided for interpreting the parameter κ as the maximum acceptable level of local taxes, or capacity to impose taxes on the local tax base. Thus, we may use a structural model for fiscal and spending behavior of local governments as basis for determining an upper limit for

[5] Moreover, the empirical analysis in Section 3 is based on data from Norway, where matching grants only constitute a minor part of total intergovernmental grants.

fiscal capacity defined by κ plus exogeneous incomes. Like Johnson (1979), we assume that κ is a linear function of the per capita tax base.[6]

A measure of fiscal capacity that does not include grants refers to a hypothetical situation where it may be controversial to assume that tax rates and tax bases remain unchanged. Alternatively, the loss of grants can be compensated by increasing the tax rates. In this paper we use two different compensating schemes.

As an alternative to the average tax rate, we may use a standard tax rate that is determined such that total taxes is equal to the sum of aggregate tax income and intergovernmental grants. This tax rate is revenue neutral in the sense that aggregate local public income including grants is constant, but the distribution across municipalities is changed since grants are replaced by increased taxation. This means that fiscal capacity exclusive of grants are comparable to the level of total observed income, but where grants are assumed to be redistributed in proportion to each jurisdiction's share of the tax base.

On a lower level of aggregate income it is possible to determine fiscal capacity exclusive of grants from the constraint that aggregate tax incomes should be equal to aggregate expenditure needs. The standard tax rate is thus given by the proportion between aggregate expenditure need and the aggregate tax base. However, since expenditure needs are exactly financed at the aggregate level, redistribution would normally be required to finance expenditure needs at the local level. If the standard tax rate is just sufficient to finance aggregate expenditure needs, fiscal disparities imply that both positive and negative values for the capacity-need gap will occur.

2.5. Measuring the spread of the capacity-need gaps

The standard method for summarizing the dispersion or spread of a distribution is to use the variance or the standard deviation. However, since the variance is rather sensitive to outliers in the data it is important to complement the information given by the variance by using a measure of spread which is not so influenced by outliers. The following measure of spread,

$$\Delta = \int F(x)\left(1 - F(x)\right)dx \tag{2.15}$$

where F is the distribution of the capacity-need gap (X) meets this requirement. Note that Δ is known as Gini's mean difference (Gini, 1912) which means that Δ divided by the mean (μ) of F defines the Gini coefficient.[7]

Given the spread in the distribution F measured by the standard deviation (variance) or Δ the next step would be to identify the sources that make substantial contributions to the spread in the capacity-need gap. Assume that the fiscal disparity variable X is a sum of s different components,

[6] The notion of a maximum acceptable level of local taxes derived from the preferences of local governments is particularly relevant in institutional settings where central regulations are aimed at restricting local tax rates or tax income which is the case in Norway.

[7] Gini's mean difference was already used by von Andrae (1872) and Helmert (1876) as a measure of spread.

(2.16) $$X = \sum_{i=1}^{s} X_i .$$

As is well known the standard deviation (variance) for the distribution of X does not offer a convenient decomposition in terms of contributions from the s subcomponents. A convenient decomposition of Δ is, however, easily derived from the following alternative expression for Δ

(2.17) $$\Delta = 2\int_0^1 u\left(\mu - E\left(X \middle| X \le F^{-1}(u)\right)\right)du,$$

where $E\left(X \middle| X \le F^{-1}(u)\right)$ is the conditional mean of X given that X takes values lower or equal to the u-fractile of F. Expression (2.17) shows that Δ can be interpreted as a weighted sum of the deviations between the overall mean and the partial means formed by the fractiles of F.

Let $\mu_i = E\, X_i$. By inserting $\mu = \sum \mu_i$ and (2.16) in (2.17) we find that Δ permits the following decomposition

(2.18) $$\Delta = \sum_{i=1}^{s} \Delta_i ,$$

where Δ_i is defined by

(2.19) $$\Delta_i = 2\int_0^1 u\left(\mu_i - E\left(X_i \middle| X \le F^{-1}(u)\right)\right)du .$$

Note that $E\left(X_i \middle| X \le F^{-1}(u)\right)$ can be considered as a function that shows whether X_i and X covariate positively or negatively. When X_i takes the same value (μ_i) for all units the conditional mean function coincides with the mean μ_i which signifies that $\Delta_i = 0$. In situations where X_i takes large values for small X-values and small values for large X-values, the conditional mean function will dominate the corresponding subcomponent mean μ_i and Δ_i will take a negative value. By contrast, Δ_i will be positive when X_i and X covariate positively.

3. Fiscal disparities in Norway

Since the capacity-need gap forms the basis for analysing fiscal disparities a major task is to define and measure standards of needs and fiscal capacity. The modelling approach described in Section 2.2 appears appropriate for identifying the expenditure needs that arise from national norms and standards, not least in the Scandinavian welfare states where local governments face a range of national regulations and standards introduced by the central government. Applied on Norwegian data the model accounts for local government spending on eight service sectors, as well as endogenous user fees and budget deficits. Budget deficits are accounted for by applying a modified version of ELES; the extended linear expenditure system (Lluch (1974)). Total expenditure need is given by the sum of sectorspecific subsistence expenditures. The subsistence parameters for each of the eight

service sectors are allowed to vary with environmental cost factors. The environmental cost factors are derived from knowledge of national norms and regulations and the choice environment of local governments in Norway. Taste variables are included to capture heterogeneity in marginal budget shares, as discussed in Section 2.2. The estimates of the parameters, based on data for 426 Norwegian municipalities, are reported in the Appendix. Most of the estimated parameters are found to be significant and of the expected signs. Moreover, results from out-of-sample predictions show that the model predicts local government behavior rather well. For further discussion of the model and the empirical results we refer to Aaberge and Langørgen (1997).

User fees is the major local tax instrument in Norway. Local governments also take advantage of income taxes and property taxes, but in this case the tax bases as well as the tax rates are determined by the central government. For this reason income and property taxes are treated as exogenous in our model. Moreover, intergovernmental grants are treated as exogenous, since the major part of grants is unconditional equalization grants and unconditional categorical grants. Exogenous incomes are made up by two components

$$y = y_1 + y_2 \tag{3.1}$$

where y_1 is exogenous tax income and y_2 is intergovernmental grants.[8] Thus, $y_1 + y_2$ is the contribution to exogenous fiscal capacity from local taxes and grants-in-aid. It is, however, less clear how the contribution from endogenous user fees to fiscal capacity should be defined. The common approach is to assume that the tax base for user fees is given by private disposable incomes. However, Aaberge and Langørgen (1997) find support for the hypothesis that maximum acceptable fee income (κ) increases with exogenous municipal incomes y. Exogenous municipal incomes are thus regarded as the tax base for user fees. An exogenous income increase gives local governments the opportunity to supply larger quantities without increasing user charges. Even if user charges per unit are reduced, the volume increase may counteract such reductions, such that total fee income increases.

These assumptions about the tax base for user fees are not very useful for the analysis of fiscal disparities, because the principle of locational neutrality requires prices per unit of comparable services to be standardized. The quality and unit costs of utilities are likely to vary across communities, which means that reported unit prices are not directly comparable. Moreover, information on user charges in Norway is incomplete. The lack of adequate measures of prices and quantities for utilities is thus a major obstacle to the estimation of fiscal capacity for user fees. A further complication owes to the fact that price-setting for utilities involves rationing that may violate the principle of locational neutrality.

Due to these problems we simplify the analysis by excluding user fees from the definition of fiscal capacity. This is in accordance with the view that variations in capacity for user fees do not justify implementation of an equalization policy. Central government regulations in Norway state that most types of user charges should be fixed at unit costs or below unit costs. Because unit costs may vary across local environments, these regulations are in conflict with locational neutrality. Therefore, to exclude user fees from the definition of fiscal capacity conforms well with central government policy. Moreover, user fees constitute only a minor part of local government revenues, so it is nevertheless

[8] Intergovernmental grants accounted for 43.8 per cent of incomes (y) in 1994.

unlikely that the results of the analysis are sensitive with respect to the inclusion/exclusion of the user fees.[9]

Fiscal capacity is entirely made up by exogenous components when user fees are excluded. As mentioned in Section 2.4 fiscal capacity is measured by observed exogenous income, including exogenous grants. To examine the impact of grants on fiscal disparities we need to assess the fiscal disparities in a hypothetical context without grants.

This study uses four alternative measures of fiscal capacity. The predominant measure in the literature defines fiscal capacity exclusive of intergovernmental grants, and the capacity-need gap is given by

$$x_0 = y_1 - \hat{\alpha} \tag{3.2}$$

where $\hat{\alpha}$ is total estimated expenditure need. The empirical results show that the aggregate of exogenous taxes y_1 is lower than aggregate expenditure need. Thus, when grants are excluded from the definition of fiscal capacity, alternative sources are required to finance expenditure needs. In this situation the income tax base emerges as a relevant source. To calculate fiscal capacity we thus impose additional taxes on the income tax bases.

The second measure of fiscal capacity is defined by a uniform tax rate that is sufficient to finance the aggregate deficit between exogenous taxes and expenditure needs. In Norway the municipal income tax rate for persons is higher than for companies. Additional taxes are imposed both on persons and companies, but the additional tax rate for companies is fixed at a higher level than for persons, so that the total tax rates for the the two types of tax payers are equalized. The additional tax rates are determined such that aggregate taxes are equal to aggregate expenditure needs.[10] In this case, the capacity-need gap exclusive of grants is given by

$$x_1 = y_1 + \tilde{y}_1 - \hat{\alpha} \tag{3.3}$$

where $\tilde{y}_1$ is the additional taxes imposed on the income tax bases.

The third measure of fiscal capacity relies on an additional income tax where the tax rates are determined such that the loss of total intergovernmental grants are financed by the tax. The additional tax rate for companies is fixed at a higher level than for persons in order to equalize total tax rates. These tax rates are revenue neutral in the sense that aggregate imputed incomes equal observed aggregate tax incomes plus total grants. In this case the capacity-need gap is given by

$$x_2 = y_1 + \tilde{y}_2 - \hat{\alpha} \tag{3.4}$$

where $\tilde{y}_2$ is the additional taxes imposed on the income tax bases.[11]

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[9] User fees accounted for 16.6 per cent of tax incomes, fees and grants in 1994.

[10] The municipal income tax rate for persons and companies were found equal to 17.0 per cent, while the actual 1994 tax rates were 13.0 per cent for persons and 5.5 per cent for companies.

[11] The computed standard municipal income tax rate for persons and companies is 22.3 per cent, which is well below the sum of income tax rates for municipalities, counties and the central government which is fixed at 28.0 per cent in Norway.

The fourth measure of the capacity-need gap includes grants and is defined by

(3.5) $x_3 = y_1 + y_2 - \hat{\alpha}$

This definition is closely related to the concept of discretionary income in the LES model, except that capacity for user fees (κ) is excluded in (3.5).

Summary statistics for the four measures of the capacity-need gap per capita are displayed in Table 3.1. As much as 94 per cent of the municipalities show to have negative gaps when x_0 defines the capacity-need gap. Observed exogenous tax incomes are thus smaller than expenditure needs in a sweeping majority of the municipalities. Although the aggregate gap is zero, the per capita mean of x_1 is negative when each municipality is given equal weight. This is simply due to the fact that the majority of small municipalities have negative gaps exclusive of grants, while the majority of large municipalities have positive gaps. For the same reason the per capita mean of x_2 is negative, while the aggregate gap is positive.

The dispersion information provided by Table 3.1 shows that the spread is increasing as a function of the standard income tax rate. If, however, the gap exclusive of grants includes additional income taxes that are sufficient to finance aggregate expenditure needs (x_1) or total grants (x_2), the spread exclusive of grants is higher than the spread of the gap inclusive of grants (x_3). This result shows that intergovernmental grants reduce fiscal disparities but that significant disparities still remain.

Table 3.1. Level and spread of capacity-need gaps. 1994 NOK per capita

	Mean	Min.	Max.	St. dev.	Δ
x_0	-7 322	-24 325	77 815	7 393	3 073
x_1	-3 912	-21 839	82 209	7 949	3 521
x_2	-563	-19 077	86 439	8 410	3 857
x_3	5 853	-2 476	98 999	7 818	3 142

Since it is of interest to identify the sources that have contributed to the spread of the capacity-need gaps, Table 3.2 provides a decomposition of the Δ-measure with respect to various capacity and need components. Recall that Δ is referred to as Gini's mean difference or the absolute Gini coefficient in the economic literature.

Table 3.2. Per capita means and decomposition of Gini's mean difference by components of capacity-need gaps, 1994

	Component mean (NOK)	x_0	x_1	x_2	x_3
y_1	10 854	63.0	54.6	49.3	42.3
$\tilde{y}_1$	3 410		13.2		
$\tilde{y}_2$	6 759			21.3	
y_2	13 174				70.6
$-\hat{\alpha}$	-18 176	37.0	32.2	29.4	-12.9
Total		100.0	100.0	100.0	100.0

The results of Table 3.2 show that the largest contribution to the spread is given by exogenous tax incomes when grants are excluded from the measurement of the capacity-need gap. Expenditure needs account for 37 per cent of the spread when additional taxes are excluded, but expenditure needs' contribution to the spread decreases when additional income taxes are added. The positive contribution to the spread from expenditure needs shows that there is a negative interaction between the needs ($\hat{\alpha}$) and the capacity-need gaps when grants are excluded from the fiscal capacity. An interesting question is to what extent the introduction of grants-in-aid affects this relationship. For the gap inclusive of grants, expenditure needs and capacity have different effects on the spread. The introduction of grants changes the interaction between needs and capacity-need gaps from negative to positive, which suggests that municipalities with high needs have been overcompensated by the grants-in-aid system as of 1994.

Even in cases where central government policy makers are able to entirely remove fiscal disparities, local self-government may still prevent that the stronger goal of locational neutrality is fully satisfied. Locational neutrality requires equal sectorspecific service levels across municipalities, which means that the distribution of per capita capacity-need gaps should be approximately constant within specific services. The part of the capacity-need gap (inclusive of grants) that is allocated to sector i is given by $\hat{\beta}_i x_3$, where $\hat{\beta}_i$, $i = 1,2,\ldots,8$ are the estimated marginal budget shares of ELES. Recall that the marginal budget shares vary with local tastes and thus differ between municipalities. Like before the capacity-need gap is measured exclusive of fiscal capacity for user fees, since equivalent service levels would not be locationally neutral if financed by different user charges. Group averages of sectorspecific capacity-need gaps by deciles of exogenous incomes (y) are reported for eight service sectors in Table 3.3. The results clearly demonstrate that service levels are increasing with exogenous incomes, which means that residents of rich communities are offered more extensive service levels than residents of poor communities.

Table 3.3. Mean sectorpecific capacity-need gaps by deciles of exogenous incomes in 1994, NOK per capita

	1	2	3	4	5	6	7	8
Decile 1	126	152	138	37	7	158	105	294
Decile 2	156	190	134	52	8	202	115	365
Decile 3	173	208	167	56	6	234	136	426
Decile 4	275	331	275	88	11	366	218	668
Decile 5	271	345	214	109	8	377	183	657
Decile 6	315	408	234	139	5	455	198	778
Decile 7	451	593	383	208	-1	679	293	1158
Decile 8	635	861	457	328	-6	975	357	1616
Decile 9	899	1195	644	448	-9	1387	522	2318
Decile 10	1869	2597	1444	955	-2	2834	1170	4745

Sector 1: Administration
Sector 2: Education
Sector 3: Child care
Sector 4: Health care
Sector 5: Social services
Sector 6: Care for the elderly and disabled
Sector 7: Culture
Sector 8: Infrastructure

4. Fiscal disparity effects of a policy reform

The results in Section 3 indicate that the distribution of total intergovernmental grants does not remove fiscal disparities in Norway. In 1996 a commision appointed by the central government proposed a revision of the grant system in order to reduce fiscal disparities. Political pressures, especially from municipalities facing losses, culminated in an announcement from the prime minister that no municipality should incur grant reductions. Thus, the redistribution proposed by the commission has so far not been accomplished.

If redistribution is not politically feasible within a given level of grants, fiscal disparities can still be reduced if total grants are allowed to increase. This is achieved by distributing additional grants to municipalities with small capacity-need gaps. A natural strategy is to introduce a baseline per capita capacity-need gap, below which municipalities are supplied with additional grants sufficient to catch up with the baseline. To illustrate this procedure, we have computed the costs of introducing different baseline levels which are defined by deciles of the capacity-need gap x_3. The percentage increase in total grants required to finance the different baseline levels is reported in Table 4.1.

Table 4.1. Percentage increase in total grants required to finance different baseline levels defined by deciles of the capacity-need gap x_3

Decile	1	2	3	4	5	6	7	8	9	10
	0.8	2.3	5.1	8.3	13.0	19.9	33.9	52.3	91.2	1063.6

The first baseline level introduces a raise in the gaps of the first decile group to the upper limit of this group. The second baseline level raises the gaps of the first and second decile groups to the largest gap in decile two, and so on, until the tenth baseline level, which is defined by the maximum per

capita gap. As ambitions to equalize gaps are increasing, it becomes increasingly expensive to reduce fiscal disparities subject to the constraint that grants cannot be taken from the rich and given to the poor.

Due to the discouragingly high costs of the policy described above, an alternative strategy is to consider a revenue neutral redistribution of grants. As an alternative to the current central system for distribution of grants-in-aid we introduce a reform designed to equalize capacity-need gaps inclusive of grants, under the constraint of a fixed tax system, and the constraint that negative grants are not permitted. The procedure for distributing grants is as follows: The municipalities are ranked by their per capita capacity-need gaps exclusive of grants, defined by $x_0 = y_1 - \hat{\alpha}$. Fiscal capacity for user fees is thus assumed to be zero. The first step is to distribute grants to the municipality with lowest x_0 (rank 1) so that the per capita gap inclusive of grants is equal to the per capita gap exclusive of grants for the municipality with second lowest x_0 (rank 2). The second step is to distribute grants to the municipalities with rank 1 and 2 so that their per capita gaps inclusive of grants is equal to the per capita gap exclusive of grants for the municipality with rank 3. This procedure is repeated until total aggregate intergovernmental grants have been redistributed to the municipalities. This method does, however, not guarantee that post-grant gaps are fully equalized, since some municipalities with particularly high tax incomes from hydroelectric power plants receive zero grants according to the policy reform, and would have to receive a negative subsidy in order to achieve full equalization of per capita post-grant gaps. The post-reform gaps are equalized at 4 151 NOK per capita, except for 13 municipalities which still have higher gaps than the remaining 422 municipalities even though they do not receive grants.[12]

Summary statistics of observed and simulated grants are reported in Table 4.2. The mean per capita grants under the policy reform differ from the observed mean per capita grants because the computed means are not weighted by the number of residents in each municipality. The spread of post-reform grants is smaller than the spread of actual grants. By comparing the spread of the post-reform gaps displayed in Table 4.2 with the spread of x_3 in Table 3.1, we see that the spread of the capacity-need gap is considerably reduced by the reform, and that the percentage reduction in the spread is especially large when the spread is measured by Δ. This owes to the fact that Δ is more robust against outliers than the standard deviation.

Table 4.2. Summary statistics of intergovernmental 1994 grants, reform grants and post-reform capacity-need gaps. NOK per capita

	Mean	Min.	Max.	St. dev.	Δ
Grants 1994	13 174	4 299	40 931	6 170	3 279
Reform grants	12 023	0	28 476	4 558	2 530
Post-reform gap	4 702	4 151	77 815	4 540	543

Table 4.3 displays the distributions of 1994 grants and changes in grants by losers and winners of the reform. As expected the proportion of winners is high in the lower deciles of the distribution of 1994 grants, while the proportion of winners is low in the higher decile groups. For the highest decile group the proportion of loosers is 100 per cent. The average loss in this group is particularly high. Among

[12] This method corresponds to the grant distribution formula proposed by Bradbury et. al. (1984) with a baseline capacity-need gap of 4 151 NOK per capita and a compensation rate of 100 per cent.

winners the mean difference beween grants after and before the reform is relatively high for the six lowest deciles.

Table 4.3. Mean per capita 1994 grants, mean difference between reform grants and 1994 grants, and per cent of winners and loosers by deciles of exogenous incomes in 1994. NOK per capita

	All municipalities		Winners		Loosers	
Grants 1994	Mean grants 1994	Mean diff. in grants	Per cent	Mean diff. in grants	Per cent	Mean diff. in grants
Decile 1	5 867	1 551	81	2 480	19	-2 514
Decile 2	7 528	1 568	84	2 402	16	-2 841
Decile 3	8 784	1 272	74	2 417	26	-2 059
Decile 4	9 810	1 239	77	2 615	23	-3 441
Decile 5	10 932	44	67	2 202	33	-4 426
Decile 6	12 254	667	73	2 326	27	-3 756
Decile 7	14 131	-1 533	39	1 740	61	-3 594
Decile 8	16 233	-2 137	30	1 306	70	-3 629
Decile 9	19 445	-4 772	7	1 628	93	-5 240
Decile 10	26 824	-9 477	0	-	100	-9 477

To examine how far the policy reform may bring the system towards locational neutrality, the post-reform capacity-need gaps were allocated on service sectors in accordance with the estimated marginal budget shares of the behavioral model presented in Section 2.2. The resulting decile- and sectorspecific means of post-reform capacity-need gaps are reported in Table 4.4. Note that the decile groups are the same as in Table 3.3. The differences in decile group means within service sectors after the reform are quite small, except for the highest decile group where some municipalities have higher capacity-need gaps. For the nine lowest deciles the remaining differences are due to variations in local taste variables that are captured by the marginal budget shares. By comparing the results in Tables 3.3 and 4.4 it becomes evident that the 1994 allocation of grants across municipalities to a great extent explains why service levels do not fulfill locational neutrality. The effect from variation in local tastes on service levels shows, however, to be rather modest.

Table 4.4. Mean post-reform sectorspecific capacity-need gaps by deciles of exogenous incomes in 1994, NOK per capita

	1	2	3	4	5	6	7	8
Decile 1	370	459	425	126	9	498	295	902
Decile 2	373	470	341	146	7	524	263	921
Decile 3	369	460	352	139	6	524	274	928
Decile 4	373	467	334	144	8	522	265	919
Decile 5	370	481	280	166	3	545	236	931
Decile 6	372	489	264	176	1	558	224	942
Decile 7	368	486	287	177	-3	565	229	954
Decile 8	370	504	263	195	-6	579	206	957
Decile 9	373	494	266	186	-4	579	216	967
Decile 10	832	1132	650	392	12	1219	556	2077

Sector 1: Administration
Sector 2: Education
Sector 3: Child care
Sector 4: Health care
Sector 5: Social services
Sector 6: Care for the elderly and disabled
Sector 7: Culture
Sector 8: Infrastructure

5. Summary

Fiscal equalization policies are justified by the principle of locational neutrality, which means that citizens should not be given incentives to migrate across localities in order to obtain lower taxes or higher levels of public services. Fiscal equalization is generally aimed at equalizing the economic choice opportunities for local public service production, while local governments enjoy wide discretion to make their own priorities over different services. Fiscal disparities are those differences that equalization is supposed to remove, and arise from differences in costs and capacity to produce a standard package of public services.

In this paper, fiscal disparity is defined by the capacity-need gap, which is the difference between fiscal capacity and expenditure need. Expenditure need depends on formal and informal service standards that are made contingent on sociodemographic and other environmental factors, as well as costs to fulfil these standards. It is argued that expenditure needs can be identified within a structural model of local government behavior. This paper relies on a modified version of ELES. This approach has certain advantages over the standard reduced form approach. First, the economic interpretation of subsistence parameters of the extended linear expenditure system as sectorspecific expenditure need is intuitively appealing, while parameters in linear reduced form models are more complex and do in general not offer estimates of expenditure need. Second, by applying the two approaches on Norwegian data, the reduced form approach shows to underestimate the variation in expenditure needs.

Fiscal capacity is defined inclusive or exclusive of intergovernmental grants. Measures of fiscal capacity exclusive of grants is derived from local tax bases and a set of standard tax rates. In Norway local tax bases as well as tax rates are determined by the central government. Thus, fiscal capacity is given by observed local public tax incomes. However, since local governments are dependent on grants-in-aid, observed tax incomes are neighter sufficient to finance aggregate expenditure need nor

aggregate expenditures. In this study the current income tax rates are adjusted to levels that are sufficient to finance aggregate expenditure need or aggregate incomes including grants. This approach provides three alternative definitions of fiscal capacity exclusive of grants, derived from different assumptions of standard income tax rates. In addition, fiscal capacity inclusive of grants is defined by total observed local public exogenous incomes.

The empirical results of this study show that the spread of capacity-need gaps increases when intergovernmental grants are replaced by a revenue neutral increase in local income tax rates. This means that fiscal disparities are reduced by the central government grant system when it is compared to a financial system for local governments that depends exclusively on local tax bases. However, there is a tendency that communities with high expenditure need are overcompensated through the current grant system. Although grants to some extent have equalizing effects, significant fiscal disparities still remain. Thus, the levels of local services show to differ significantly between municipalities which means that the goal of locational neutrality is far from being fulfilled.

Finally, a policy reform designed to reduce fiscal disparities in Norway is evaluated. The purpose of the reform is to redistribute grants in order to equalize capacity-need gaps. However, due to the constraint of a fixed tax system, and the constraint that negative grants are not permitted, the post-reform gaps are not completely equalized. Nevertheless, fiscal disparities are significantly reduced by the policy reform. The results also demonstrate that the fiscal disparities maintained by the central government grant system largely explain why service levels do not fulfill locational neutrality, while different local priorities contribute only slightly to the variation in service levels across municipalities.

Appendix

Table A.1. Estimates of subsistence expenditures, minimum budget surplus and maximum user fees parameters [a]

	0	1	2	3	4	5	6	7	8	9
Constant	-0.41 (1.89)	-0.37 (1.62)	-0.77 (1.41)	-0.68 (1.98)	-1.06 (2.09)	0.18 (1.72)	-0.34 (0.62)	0.05 (0.35)	-0.26 (0.49)	1.62 (6.75)
Population share 0-6 years of age				8.17 (3.19)	5.52 (1.58)					
Population share 7-15 years of age			27.85 (8.53)							
Population share 80 years and above					7.95 (2.28)					
Population share 67-89 years of age							14.27 (6.20)			
Population share 90 years and above							150.84 (4.88)			
Children 0-6 years with lone mother/father per capita				13.66 (1.70)						
Mentally retarded 7-15 years per capita			216.53 (2.33)							
Mentally retarded 16 years and above per capita							363.78 (22.03)			
Unemployed 16-59 years per capita						12.78 (3.54)				
Divorced/separated 16-59 years per capita						14.71 (6.21)				
Foreigners from remote cultures per capita						12.67 (3.82)				
Population density			-0.47 (2.12)		0.32 (1.90)			0.15 (1.69)		
Personhours (average travelling time)			1.19 (5.97)		0.49 (3.19)					
Population inverted (thousands)		1.08 (6.08)					0.71 (2.40)			
Dummy for small municipalities		0.22 (2.45)	0.57 (4.65)	0.28 (3.29)	0.31 (3.85)				0.41 (2.14)	
Dummy for urban municipalities						0.19 (1.96)				
Dummy for suburban municipalities								-0.15 (2.89)		
Sewage purification degree									0.51 (3.14)	
Duration and severity of cold winter period		0.13 (6.55)	0.16 (7.18)	0.07 (3.42)	0.06 (3.22)		0.10 (2.53)	0.07 (6.41)	0.18 (3.80)	
Per capita change in municipal income	0.44 (8.51)									
Per capita exogenous income excl. of min. exp. eq. 2 and 5										0.18 (6.71)
R^2 adjusted	0.75	0.84	0.80	0.63	0.50	0.40	0.77	0.65	0.75	0.34

[a] The dependent variables are per capita operating result in equation 0, per capita expenditures in equation 1-8, and per capita fee income in equation 9. All pecuniary amounts are in thousands of Norwegian kroner. T-statistics are in parentheses.

Table A.2. Estimates of marginal budget share parameters[a]

	0	1	2	3	4	5	6	7	8	9
Constant	-0.190	0.113	0.164	-0.251	0.125	-0.012	0.268	-0.076	0.348	0.511
	(2.10)	(2.68)	(2.10)	(4.36)	(2.10)	(0.25)	(2.44)	(2.49)	(3.75)	(6.27)
Per capita private disposable income	0.371	0.003	0.018	0.236	-0.044	0.025	-0.150	0.063	-0.195	-0.326
	(3.56)	(0.08)	(0.22)	(3.94)	(0.68)	(0.43)	(1.30)	(2.06)	(1.85)	(3.64)
Average education level for persons 30-59 years	0.027	-0.007	-0.032	0.031	-0.028	0.002	-0.013	0.037	0.010	-0.027
	(1.56)	(0.78)	(2.22)	(3.51)	(2.40)	(0.19)	(0.60)	(4.52)	(0.60)	(1.76)
Share of socialists in municipal council	-0.254	0.013	-0.015	0.123	-0.002	-0.021	0.072	0.026	0.133	-0.076
	(4.21)	(0.45)	(0.29)	(4.51)	(0.05)	(0.84)	(1.14)	(1.02)	(2.01)	(1.45)
Herfindahl-index for party concentration	0.170	-0.054	0.023	0.002	0.037	-0.014	-0.018	-0.020	-0.074	-0.051
	(1.88)	(0.90)	(0.28)	(0.06)	(0.49)	(0.31)	(0.16)	(0.48)	(0.73)	(0.54)
R^2 adjusted	0.75	0.84	0.80	0.63	0.50	0.40	0.77	0.65	0.75	0.34

[a] The dependent variables are per capita operating result in equation 0, per capita expenditures in equation 1-8, and per capita fee income in equation 9. All pecuniary amounts are in thousands of Norwegian kroner, except for private disposable income, which is in hundreds of thousands. T-statistics are in parentheses.

Table A.1 and A.2 report parameter-heterogeneity in parameters α_i and β_i, repspectively. The parameters were estimated on a sample of 426 Norwegian municipalities in 1993. In the present paper, expenditure needs and marginal budget shares for 1994 are based on model predictions, combining data for 1994 and parameter estimates for 1993. For more details about data and results, see Aaberge and Langørgen (1997).

The model equation numbers refer to
Equation 0: Net operating result
Equation 1: Administration
Equation 2: Education
Equation 3: Child care
Equation 4: Health care
Equation 5: Social services
Equation 6: Care for the elderly and disabled
Equation 7: Culture
Equation 8: Infrastructure
Equation 9: Fee income

References

Aaberge, R. and Langørgen, A. (1997): Fiscal and Spending Behavior of Local Governments: An Empirical Analysis Based on Norwegian Data. Discussion Paper 196, Statistics Norway.

Ahmad, E. (ed) (1997): *Financing Decentralized Expenditures*. Cheltenham: Edward Elgar.

Anderson, J.E. (1994): *Fiscal Equalization for State and Local Government Finance*. Westport: Praeger.

Auten, G. E. (1974): The Distribution of Revenue-Sharing Funds and Local Public Expenditure Needs. *Public Finance Quarterly* **2**, 352-375.

Bradbury, K.L. H.F. Ladd, M. Perrault, A. Reschovsky and J. Yinger (1984): State Aid to Offset Fiscal Disparities Across Communities. *National Tax Journal* **37**, 151-170.

Bradford, D., R. Malt and W.E. Oates (1969): The Rising Cost of Public Services: Some Evidence and Reflections. *National Tax Journal* **37**, 151-170.

Downes, T.A. and T.F. Pogue (1992): Intergovernmental Aid to Reduce Fiscal Disparities: Problems of Definition and Measurement. *Public Finance Quarterly* **20**, 468-482.

Gini, C. (1912): Variabilità é Mutabilità, contributo allo studio delle distribuzioni e relazioni statistiche. Studi Economico-Giuridici della R. Università di Cagliari.

Helmert, F.R. (1876): Die Berechnung des wahrscheinlichen Beobachtungsfehlers aus den ersten Potenzen der Differenzen gleichgenauer directer Beobachtungen. *Astron. Nach.* **88**, 127-132.

Johnson, M.B. (1979): Community Income, Intergovernmental Grants, and Local School District Fiscal Behavior. In P. Mieszkowski and W.H. Oakland (eds), *Fiscal Federalism and Grants in Aid*. The Urban Institute, Washington.

Ladd, H.F. (1994): Measuring Disparities in the Fiscal Condition of Local Governments. In J.E. Anderson (ed): *Fiscal Equalization for State and Local Government Finance*. Westport: Praeger.

Ladd, H.F. and J. Yinger (1989): *America's Ailing Cities*. Baltimore: John Hopkins Press.

Ladd, H.F. and J. Yinger (1995): The Case for Equalizing Aid. *National Tax Journal* **47**, 211-224.

Le Grand, J. (1975): Fiscal Equity and Central Government Grants to Local Authorities. *Economic Journal* **85**, 531-547.

Lluch, C. (1973): The Extended Linear Expenditure System. *European Economic Review* **4**, 21-32.

Oakland, W.H. (1995): Fiscal equalization: An empty box. *National Tax Journal* **47**, 199-209.

Pigou, A.C. (1929): *The economics of welfare*. London: Macmillan.

Ratcliff, K., B. Riddle and J. Yinger (1990): The Fiscal Condition of School Districts in Nebrasca: Is Small Beautiful? *Economics of Education Review* **9**, 81-99.

Shah, A. (1996): A Fiscal Need Approach to Equalization. *Canadian Public Policy* **22**, 99-115.

Thurow, L. (1970): Aid to State and Local Governments. *National Tax Journal* **33**, 23-35.

von Andrae (1872): Ueber die Bestimmung des wahrscheinlichen Fehlers durch die gebedenen Differenzen von *m* gleich genauen Beobachtungen einer Unbekannten. *Astron. Nach.* **79**, 257-272.