International Studies Program

Working Paper 04-21
November 2004

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Designing Intergovernmental Equalization Transfers with Imperfect Data: Concepts, Practices, and Lessons

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1. Introduction

The design of intergovernmental equalization transfer mechanisms, whether as the result of the introduction of a new transfer scheme or as part of the revision of an existing one, is a key element of local government finance reform around the world. While the basic elements and principles of designing intergovernmental fiscal transfer schemes apply universally, less developed and transition countries (LDTCs) often face the additional challenge of designing their transfer mechanisms in the absence of substantial relevant data on local fiscal, demographic, and socio-economic variables. The absence of the necessary data to adequately quantify local expenditure needs and fiscal capacity in order to allocate formula-based equalization grants in an efficient, equitable and transparent manner forms an additional hurdle in the implementation of a sound system of intergovernmental fiscal relations in many developing and transition economies.

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Quite often, the only data many LDTCs appear to have in order to compute suitable measures of subnational fiscal capacity and expenditure needs are actual subnational revenue collections and actual subnational expenditures. Of course, local revenues may provide a poor reflection of fiscal capacity (due to variations in local fiscal effort) and are generally not an appropriate allocation factor for a transfer formula due to the negative incentive effects on local revenue collections. Similarly, actual local expenditures are not an appropriate measure of need since their use would provide incentives for overspending or may simply freeze inequitable historical patterns of local expenditure.[2] In reality, these difficulties have hardly deterred LDTCs in the midst of decentralization processes to seek ways to design a system of equalization grants. In addition most policy experts would agree that even in the absence of the desired data, a formula-based equalization transfer scheme is still preferable to a discretionary, negotiated grant approach. The main issue we want to address in this paper is the challenge faced by fiscal policy practitioners in many LDTCs: how to formulate a system of intergovernmental equalization transfers with imperfect data, or at least without the luxury of first-best data.

This paper seeks to achieve two objectives. First, we seek to provide a comprehensive overview of the alternative approaches that can be taken to measure local expenditure needs and fiscal capacity. Facing the difficulty of designing equalization grant systems with imperfect data, many countries have moved ahead with ingenious and sometimes nearly appropriate methodologies to quantify expenditure needs and fiscal capacity. We cover many of those experiences in the context of the countries where these have been tried.

Second, we explore the implications of designing an equalization transfer-formula in the presence of less-than perfect data. At the present time there is a dearth of comparative evidence and generally very limited guidance in the existing literature regarding what "second-best" approaches can be used in the design of intergovernmental equalization. Our goal is to help fill this vacuum in the literature by assessing different grant mechanisms that are used in LDTCs where we lack first-best measures of expenditure needs and fiscal capacity. In order to assess the performance of the different approaches we rely on local government finance data for the State of Georgia in the U.S., going back to the 1960s. At that time, Georgia was among the poorest U.S. states and in many ways living conditions were similar to those now existing in developing countries.

The advantage of analyzing historical Georgia is that there is practically full availability of first-best data, enabling us to compare alternative measurement approaches as part of the design of equalization grants. In doing so, we consider the performance of alternative measures of fiscal capacity and fiscal need in terms of equalization vis-à-vis their "first best" measures. By simulating and comparing the performance of various transfer schemes in Georgia, we uncover the relative strengths and weaknesses of the different

[2] As discussed in greater detail below, the relationship between expenditures and need is tentative. Actual local expenditures may reflect expenditure needs, but only if local governments have substantive budget autonomy. Furthermore, local expenditure patterns may also affected by variations in fiscal capacity or variations resulting from transfer allocations.

approaches to grant design and seek to translate these fiscal patterns into policy implications for the design of intergovernmental grant schemes in LDTCs.

2. Unconditional Vertical and Equalization Transfers

The general intent of unconditional transfer mechanisms is either to improve the vertical fiscal balance by providing general-purpose funding at the subnational level or to improve the horizontal fiscal balance by compensating for fiscal disparities across regions.[3] Fiscal disparities arise from two main sources. First, local or regional governments may differ in their fiscal capacity, that is in their economic base and therefore in their ability to raise a particular level of revenue with standard rates and administration effort. Second, local governments may also differ in their expenditure needs. Even when localities or regions have the same fiscal capacity or ability to raise revenues, they may differ in the costs they face to provide a standardized basket of public services due to differences in needs arising from different demographic profiles (e.g., the percent of the population of school age or retired), geographical and climatological conditions, incidence of poverty and unemployment, and so on. The differences in expenditure needs among regions may also arise due to differences in costs or price levels related to the provision of a standard basket of public services.[4]

In international practice there are countries that use formulas to equalize both fiscal capacity and expenditure needs (including many developed and transitional countries), countries that use mechanisms that equalize only fiscal capacity, and countries which equalize only expenditure needs differences across subnational governments (Table 1). Typically, to achieve an adequate level of equalization, it will be necessary to equalize both fiscal capacity and expenditure needs (Box 1).

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[3] Even if the purpose of the transfer mechanism is to improve the vertical fiscal balance, as is the case with general or uniform revenue sharing in central government taxes, their design cannot ignore their impact on the horizontal fiscal balance (Bird and Tarasov, 2002). Thus, the choice of tax instruments for revenue sharing matters. For example, revenues from the personal income tend to be more evenly distributed throughout the national territory than revenues for natural resource taxes. The rule or formula behind the revenue sharing also matters for horizontal fiscal imbalances (for example, using the derivation principle versus a capitation rule.) The potential unequalizing impact of revenue sharing is what led to the Soviet Union-type practice of "regulating" (or customizing) different revenue sharing rates for different subnational governments. These were highly discretionary practices. In modern times, Vietnam still "regulates" revenue sharing rates but it does so through an explicit formula that imitates those used in equalization grant systems themselves. See Martinez-Vazquez (2004)

[4] Of course, the sources of these differences in expenditure needs may not be independent. Harsh geographical and climatological conditions are typically accompanied by higher prices of goods and services as well as salaries of public employees.

Table 1.
Equalization goals, allocation factors and international practice

Goals	Factors	Country examples
Enable similar levels of service affordability	*Expenditure needs* indicators (separately or in a combined indicator), or national expenditure standards	India, Italy, Nigeria's Federation Account, South Africa's Equitable Shares, Spain, Uganda's Unconditional Grant
Enable similar levels of fiscal resource availability	*Fiscal capacity* indicators or "representative revenue system"	Canada's Equalization Grant
Enable similar levels of service at similar levels of taxation	*Fiscal gap* = Expenditure needs – Fiscal capacity, OR some other combination of need and capacity	Australia, China Germany, Indonesia, Japan, Korea, Latvia, Netherlands' Municipal Fund, Russia, Uganda's Equalization Grant, United Kingdom
Distribution on an equal per capita basis	Population	Some transfers in Canada, Ecuador, Estonia, Germany, Hungary, and England

Box 1
Equalizing expenditure needs, fiscal capacity, or the fiscal gap

Unconditional transfer formulas in many countries emphasize local expenditure needs in determining the horizontal allocation of resources. For instance, in addition to a fixed amount or "equal share" for each state, Nigeria's formula considers variations in population, land area, and socio-economic characteristics as key determinants in its allocation formula (Alm and Boex, 2002). Likewise, South Africa's provincial "equitable shares" formula is based on six expenditure needs components (Reschovsky, 2003). A focus on the equalization of subnational expenditure needs makes sense if subnational governments have relatively little expenditure autonomy (as is the case in South Africa), or if there are only limited variations in subnational fiscal capacity. Needs-based transfer formulas tend to be more common in LDTCs.

Transfer schemes in a smaller number of countries focus exclusively on fiscal capacity equalization. For instance, Canada's equalization transfer scheme aims to equalize the revenue potential of its provinces, by providing a transfer to those provinces whose ability to collect own-source revenues falls below a certain threshold. An exclusive focus on the equalization of subnational fiscal capacity makes sense if there are substantive variations in subnational fiscal capacity, and if variations in expenditure needs are either limited or, alternatively, addressed by targeted transfer schemes. See Bird and Vaillancourt in this volume for a discussion of whether and how Canada addresses variations in expenditure needs.

Unconditional transfer schemes in many countries pursue both equalization of expenditure needs and subnational fiscal capacity at the same time, by seeking to (partially or wholly) "fill the gap" between subnational expenditure needs and the resources available at the subnational level (including own fiscal capacity plus other transfers). This approach is pursued in Indonesia, Germany, Russia and others countries (Table 1), and is common in many federal countries and larger unitary countries.

3. Alternative Approaches to Measuring Fiscal Needs, Fiscal Capacity and Fiscal Effort under Perfect and Imperfect Data

Different allocation methodologies may be appropriate depending on the exact objective and nature of the transfer scheme. The final allocation of funds among deserving jurisdictions may rely on a proportional distribution formula (by which subnational governments receive transfers in proportion to certain allocation factors), equalization below a certain threshold (by which only jurisdictions that fall below a certain threshold receive equalization transfers), or a variety of other computational approaches. But regardless of the formula mechanism used, the outcomes and ultimate success of the horizontal allocation approach depend critically on how expenditure needs and fiscal capacities are measured. Desirable properties such as incentive compatibility and lack of manipulability impose constraints on the measures of expenditure needs and fiscal capacity that can actually be used. As we remarked above, the task of building an equalization grant formula in less developed and transitional countries is complicated by the lack of data to implement the more proven and accepted methodologies used, for example, in many OECD countries.

In this section we review different methodologies that are used in the international practice to measure expenditure need and fiscal capacity with very different levels of data availability, while still managing to arrive at more or less workable equalization formulas. Although the different approaches can be discussed in abstract and general terms, whenever possible we discuss them in the context of actual country experiences and practices.

3.1 Alternative Approaches to Measuring Expenditure Needs

In the context of equalization grant design, expenditure needs generally refer to the local government outlays that would be necessary to provide a particular standard of service. In practice, there are many options for measuring differences in expenditure needs across subnational governments, often dictated by the availability of data.

The term "expenditure needs" can be misleading unless related to specific standards of service or to some overall envelope of expenditures.[5] Without those bounds, perceptions of what may be a need can easily escalate to completely unaffordable expenditure levels. Naturally the potential level of outlays should be related to the areas of responsibilities of local governments and is expected to vary across jurisdictions according to the population consuming the services (particular characteristics of that population such as age or income) and the costs of delivering the standard service. These costs are generally associated with the relative cost of living in the jurisdiction and they may or may not be independently affected by geography, climate and other specific conditions in the jurisdiction.

There are several problems with this conventional definition of expenditure needs. It is often the case that standards of service have not explicitly been set, or if they have, they may involve such physical detail or may imply such high, unaffordable levels of expenditure that those standards are rendered useless. In the case when referring to some unknown or unusable standards, the conventional definition of expenditure needs becomes circular and empty. In many LDTCs, this vacuum tends to be filled in practice by ad hoc decisions, incrementalism, or by discretionary adjustments and updating of historical expenditure levels.

There are two fundamental dimensions to defining and quantifying expenditure needs. The first dimension is the definition of the aggregate level of affordable local expenditures or the local fiscal envelope, which imposes a budget constraint on the otherwise ambiguous concept of needs.[6] The second dimension is the determination of

[5] The term "expenditure need" will also be referred to here as "fiscal need."

[6] In some actual occurrences, such as in the case of old Soviet norms discussed above, the overall envelope for affordability may have not been present. But in the absence of a mechanism to translate such

the approach used to apportion (either from the top down, or by adding from the bottom up) those need measurements across subnational governments for all areas of expenditure responsibilities assigned to them. Not surprisingly, there are a variety of approaches that have been used in different countries to quantify local expenditure needs, with differences arising from each country's specific budgetary traditions and from the different degrees of data and information available. Although the various approaches used to quantify local expenditure needs involve, to different extents, empirical or practical elements and *a priori* conceptual thinking, these approaches range from extremely crude to quite sophisticated, including:

1. lagged expenditure values;
2. equality or equal per capita expenditure norm;
3. weighted indexes of expenditure needs;
4. per-client (top-down) financial expenditure norms;
5. traditional (bottom-up) physical expenditure norms; and
6. regression-based Representative Expenditure Systems (RES).

Lagged Expenditure Values

In the absence of data and a conceptual framework for quantifying expenditure needs, the use of past values of expenditures is the simplest and most parsimonious approach to quantifying local expenditure needs. The extent to which a local government's lagged expenditure levels accurately reflect the jurisdiction's expenditure needs depends to a large degree on the expenditure and revenue autonomy that local governments enjoy. If local governments have a large degree of discretion over their budgetary decisions, one could argue that local expenditure patterns reveal variations in local fiscal needs or variations in the demand for local government services. These are the basic arguments used for the United States in several now classic papers (Borcherding and Deacon, 1972; Bergstrom and Goodman, 1973). However, if local budget decisions prior to the introduction of equalization grants were made in an arbitrary or discretionary fashion under a centralized system of local finance, there is the risk that variations in local expenditures may be more a function of central political whim than true variations in local needs. Thus, at the very least, caution needs to be employed before one relies on historical expenditure levels as an indication of local expenditure needs.

Needs measures using lagged expenditure values comes in different forms and shapes. In some cases, the computations are just based on the prior year's budget data for local governments. In other cases, the overall envelope of expenditure is quantified in reference to a base year, for example the year prior to the most recent budget year or the year prior to significant decentralization reform in which subnational governments were assigned new competences or expenditure responsibilities. The measure of the overall (aggregate) local expenditure need may be defined, for example, as the total expenditures undertaken by the central government for those same expenditure responsibilities in the year before they became decentralized. Historical patterns may again be used to apportion the relative expenditure needs among subnational governments.

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unconstrained budget norms or needs into "affordable" budget norms, it is impossible to arrive at a practical measurement of subnational need.

Several countries have used and continue to use this approach. For example, in Spain, progressive decentralization of expenditure responsibilities to its regions over the past decades has always taken as a measure of expenditure needs the actual levels of expenditure that were realized by the central government in a particular area prior to the decentralization of the function. The continued use of these values for the purpose of computation of equalization grants and other transfers has created problems of fairness because of changes in the demographics in the intervening years.

In Russia, from 1994 through 1996, expenditure needs were based on baseline data from 1993 and, in 1997, the Ministry of Finance started using expenditure data for 1991 (the year prior to the break from the Soviet Union). The switch to 1991 was based on the belief that that year's expenditures were more representative of actual expenditure needs. The base year data were adjusted for changes in legislation for the years in between in order to approximate the levels of expenditure needs for all regions for the current fiscal year.

The use of lagged values of actual expenditures to quantify expenditure needs has the advantages of simplicity, being affordable and potentially avoiding the perverse incentive effects that would be associated with using the current actual level of expenditures. But the approach also has important disadvantages. Besides becoming obsolete over time due to demographic and other changes, as in the case of Spain, any initial misalignments and inequities in the provision of services by the central authorities would be prolonged rather than remedied by the equalization grants.[7]

Some potential remedies for the obsolescence problem associated with lagged expenditure measures include the indexation of the overall level of expenditures to inflation or a variety of other indexes. The problem with aggregate indexation is that the regional composition of expenditure needs is kept as it was in the past. Another remedy is to select a number of years in which measured expenditure needs remain fixed. After that period a new updated base year for lagged expenditures is chosen. The adjustment can be made ad hoc irregularly and can be done according to a fixed announced rule on a periodic basis, which is the practice in Vietnam where the pre-announced periods of three years are called "stability periods."[8] We must note, of course, that adjustment on a periodic basis introduces (through a process of learning) perverse effects on subnational government behavior: the more local governments spend, the higher would be the measure of expenditure needs to be used in future equalization formula applications and therefore the higher the equalization transfers they may expect (all other things equal).

Overall, the lagged approach is not to be recommended and, in the longer run, may be an unsustainable strategy for measuring expenditure needs. However, it can play a useful

[7] Similarly, basing local need on lagged expenditure patterns would prolong the favorable treatment of capital city region or certain ethnic regions, such as, for example, has been alleged was the case for the island of Java in Indonesia during the Suharto era.
[8] The existence of stability periods in Vietnam is more significant for the computation of fiscal capacity. See the discussion below.

role in the shorter term, especially when the equalization formula needs to be devised and introduced right away. A period of two or three years using lagged or base-year expenditures can give enough time for the government to develop and adopt a superior approach.

Equality or Per Capita Equality

In the absence of any data on local government characteristics whatsoever, one possibility is to assume that each local government jurisdiction has an identical level of need. In this case the formula applied is that of equality (also known as equal shares), by which each local government authority receives exactly the same amount of resources, regardless of its population or any other characteristics. A "formula" based exclusively on equal shares is applied in the distribution of transfers to the village-level in Nepal, where every Village Development Committee (VDC) receives exactly 5 million rupees.[9] The logic behind the "equality" approach is that – if all else is unknown - the best approximation of local expenditure need is that each local government jurisdiction has an identical level of need; each government unit thus receives a lump sum amount identical to the transfer pool divided by the total number of jurisdictions. Although this approach is remarkably simple and transparent, it has very serious shortcomings. The most significant are that it can lead to the possibility of causing significant variations in per capita resource availability (especially if there are large variations in population size among jurisdictions), it fails to encourage formation of jurisdictions of minimum efficient scale, and it can provide an incentive for further fragmentation. Thus, an equal shares approach is generally not recommendable even in the short run.[10]

Whereas there might be certain fixed costs associated with the operation of local governments, the cost of delivering a standard basket of services to a larger population is generally more costly. Even in the absence of consistent or accurate population data for all jurisdictions, the correlation between population and expenditure needs may be recognized by classifying local jurisdictions by sizes into several categories (e.g., Class A, B, C, etc.), and by providing larger shares (greater lump sum grants) to jurisdictions that are classified as more populous. For instance, Bangladesh uses this basic approach to provide capital transfers to municipalities and recurrent grants for operational expenses to Union Councils (World Bank, 1997).

Rather than using absolute equality, the horizontal allocation formula or approach can also pursue equality in per capita terms. This requires data on population by jurisdiction, which in most countries are available on a regular basis from a decennial population census. If data on the geographical distribution of population are available, the criterion of an equal allocation per capita is superior to that of absolute equality, since jurisdictions are not the object of finance *per se*; instead, individual residents/voters are the ultimate

[9] Many other more complex transfer formulas include an equal shares component. For instance, disbursements from the Federation Account to the state level in Nigeria are based 40 percent on equality (Alm and Boex, 2002). The new equalization formula in Indonesia also has a sizable equal shares component (Brodjonegoro and Martinez-Vazquez, 2004).

[10] There are exceptions to the general rule. For instance, Boex and Martinez-Vazquez (2004b) argue that Nepal's VDC block grant in fact conforms to the incidence pursued by policy makers, since most smaller villages tend to be mountainous and have higher expenditure needs.

clients of local government services. As a result, many countries use population as an important factor in arriving at expenditure needs and in some cases it is the sole factor in the allocation formula (i.e., local governments receive a transfer exclusively in proportion to their population).[11] Nevertheless, the presumption that local expenditure requirements are the same for all individuals regardless of where they reside or regardless of their personal characteristics may not be justified. For instance, the cost of delivering identical services may vary across areas while the demand for local public services may vary with demographic profiles or other characteristics of the jurisdictions.

Weighted Indexes of Relative Need

A third, and probably the most commonly used approach to quantifying local expenditure needs – particularly in LDTCs - is to estimate some type of index of relative expenditure need. While some equalization schemes explicitly define such an index of expenditure needs, other transfer schemes implicitly achieve the same when a weighted-factor mechanism is used for the purpose of allocating equalization grants (Table 2).[12]

Table 2
Computing a basic index of expenditure needs

Step 1.	**Determination of the aggregate level of subnational expenditure needs (SEN)** *The computation of a basic index of expenditure needs may be based on historical data, or based on data specified in the budget forecast.*
Step 2.	**Selection of expenditure needs factors** *Expenditure needs factors are selected spanning the main drivers behind differences in expenditure needs and may include population, land area, and/or other local characteristics such as poverty, cost of living and so on.*
Step 3.	**Computation of each locality's relative need share for each factor** *The share of population (* X^1*) for each local government in the entire population is (* $X^1_i / \Sigma X^1_i$ *), the share of land area (* X^2 *) for each local government is (* $X^2_i / \Sigma X^2_i$ *), and so on.*
Step 4.	**Determination of the relative importance or weights of each needs factor** *The weight for the population factor is* a^1 and *the weight for land area factor is* a^2 and *so on.*

[11] In reality equality or per capita-equality measurements of expenditure needs are in fact simply the most basic form of index measure of local needs, an approach to measuring expenditure needs that is discussed next.

[12] Some countries use an index approach mixing expenditure need and fiscal capacity factors. For example, India's current statutory unconditional grants (from the 11th finance commission valid until 2005) are distributed according to an index with the following composition: Population (10%); distance of per capita income from the highest income state (62.5%); infrastructure (7.5%); area (7.5%); fiscal discipline (7.5%) and tax effort (5%).

Table 2
Computing a basic index of expenditure needs

Step 5.	**Calculation of the Index of Expenditure Needs for locality *i*** Need Index $_i = a^1 \cdot (X^1_i / \Sigma X^1) + a^2 \cdot (X^2_i / \Sigma X^2) + \ldots + a^n \cdot (X^n_i / \Sigma X^n)$ *where the weights add to one* $(a^1 + a^2 + \ldots + a^n = 1)$
Step 6.	**Based on the Index, some mechanisms quantify the relative expenditure need for locality *i* as:** Relative Expenditure Need $_i =$ Need Index $_i \cdot$ SEN (where SEN is the aggregate subnational expenditure needs envelope) **Other mechanisms directly determine the size of the transfer based on weighted needs as:** Transfer $_i =$ Need Index $_i \cdot$ Transfer Pool

These indexes attempt to capture, from the simplest to more complex ways, the factors that determine cost differences in delivering a standard package of local government services. In many countries, the factors included in such needs indexes rely on demographic variables (for example, reflecting the special needs of the young and the elderly), other factors such as the level of poverty and unemployment, and differences in the local price level or cost of living.[13] Other formulas – particularly many capital development grant schemes in LDTCs – predominantly or exclusively rely on a number of poverty-related needs measures such as infant mortality rates, illiteracy or other proxies for poverty.

The list of variables or factors entering the index can be short or long, depending on data availability and the specific design of the equalization formula. An example of the simplest multi-factor formula is provided by the formula used (until recently) for the equalization Grant in Uganda which relied on two factors: population, with a weight of 0.85, and land, with a relative weight of 0.15. A more complex quantification of subnational expenditure needs is achieved by the Federation Account formula in Nigeria,

[13] Cost-of-living differences may be proxied by type of location (mountainous or island population) or climate (artic territories, desert areas, and so on).There are two relatively common ways to incorporate price levels in a weighted index of expenditure needs. One could simply incorporate a cost of living (COL) index as one factor in the index; alternatively, one could multiply the relative need index for each jurisdiction by the jurisdiction's COL.

which allocates resources to states in proportion to ten specific needs factors grouped in five needs categories (in addition to a measure of fiscal effort). On the other extreme, the allocation formula used for the general-purpose Municipal Fund in the Netherlands includes 51 individual local needs measures ranging from demographic characteristics to the age of the building stock and residential density.

One problem with the index-based approach to quantifying expenditure needs is that the inclusion (and exclusion) as well as the weighting of particular factors is often subject to political pressure. Local government officials and parliamentarians are prone to fight for the inclusion or heavy-weighting of factors that may be particularly beneficial to a group of specific regions or just one region. Alternatively, policy makers or advisors may simply be misguided in their desire to include certain allocation factors in order to measure expenditure needs. Specifically, capital development funds in some of the least developed countries (for instance the District Development Fund in Malawi and District Development Grant in Nepal) are allocated based on a index of poverty-related indicators (illiteracy, infant mortality and so on) that may in fact have little or no relation to local governments' true expenditure needs. Another tendency is for policy makers to be inclined to "over-design" the measure of expenditure needs by including a large number of factors. However, a much longer list of factors is not necessarily more effective in capturing variations in local expenditure needs than a more compact list. Yet, including more components does make the needs measure more difficult to maintain and less transparent.

Conceptually, determining particular weights for each one of the factors in the needs index is a simple task, as weights ought to represent the relative contribution of each factor to the overall measure of need in monetary terms. However, in reality, these decisions tends to be made in an opaque and quite arbitrary manner. If data were available and local expenditure patterns could be relied on to reveal variations in local fiscal needs or variations in the demand for local government services, simple statistical techniques could be used to identify proper weights (not unlike what is done with "representative expenditure system" methodologies). In most LDTCs those conditions do not hold. Even though other approaches are available to approximate weights for each of the factors in the index (see Box 2), in practice these weights are often determined in an *ad hoc* fashion and again often responding to political pressure.

Box 2
Determining weights for an index of relative need

Several approaches can be used to arrive at a particular set of weight factors in a scientific or objective manner. One approach is to utilize micro cost data to establish how the costs of delivering standard services changes across jurisdictions. Alternatively, one can rely on historical budget allocations to arrive at relative weights for a local needs index.

For instance, in Latvia the relative index of need was constructed consistent with the process described in Table 2 as the weighted average of four criteria: (1) Population of local government; (2) Number of children ages 0-6; (3) Number of children ages 7-18; and (4) Population above retirement age (Martinez-Vazquez, 2000). The total resource envelope for local governments (to which the relative index of need is applied to get at the expenditure need of each local government) was negotiated every year between the central governments and the Union of Local Governments.

Originally, the relative weights were derived using 1994 aggregate budget data on local expenditures (the year before the introduction of the decentralized grant scheme). For instance, the weight on the factor for children under 6 years was computed as the ratio of aggregate local expenditure on kindergarten programs in 1994 to total local expenditures across all jurisdictions in that year. Similarly, the relative weight on the factor for youths from 7 to 18 was defined as the ratio of school expenditures to total expenditures; while for the elderly the relative weight was determined as the ratio of expenditures on social welfare to total expenditures. For population, the relative weight was defined as the residual as the ratio of general services (all but education and welfare) to total expenditures. Two additional needs factors were added in 1998 (the number of children in orphanages and the number of elderly in retirement homes) and all relative weights were updated. Although Latvia computes an index of relative needs, we should note that its approach in many ways is equivalent to defining per-client financial norms or a traditional representative expenditure system (RES) approach.

Another approach is to use statistical analysis to try to find out the implicit weights that the historical data show. For this purpose, one can regress actual (historical) expenditure data as a dependent variable on a set of explanatory variables containing all the factors included in the index of relative need. (Depending on the explanatory variables used, this approach could be considered equivalent to a regression-based RES approach, as discussed further below). However, this regression approach can be problematic for several reasons. First, all the necessary data may not be available. But even if they are, it is quite unlikely that the regression coefficients will produce anything like factor weights adding to one as needed in the construction of the index. Even when the regression coefficients are restricted to add to one, we may be far from being able to interpret the coefficients as weight factors in the index of relative need.

An example of these difficulties is provided by a proposal for the Republic of Georgia in which expenditure needs are approximated by an index with two factors: population (P_i) and mountainous population (M_i); these are the only two possible factors for which there is consistent available information for all local governments (Martinez-Vazquez, 2004b). By taking actual expenditures for each local government (Exp i), in the most recent year (2003) as a measure of the expenditure needs of that local government, then we can try to find the implicit weight for P and M by running a regression on the two factors, $(P_i / \Sigma P) * SEN$ for population, and $(M_i / \Sigma M)*SEN$ for mountainous population, where SEN is the measure of local government aggregate expenditure need for 2003. This latter is quantified as total local government expenditures in that year. Forcing the intercept of the regression to be zero, which we would need to estimate an "expenditure need" equation, we find:

$$\text{Exp (i)} = \quad 1.8211*(P_i / \Sigma P) . SEN - 0.156*(M_i / \Sigma M) * SEN,$$

where we note that the coefficient on the mountainous population factor takes a negative value. When we further force the regression coefficients to sum to one, we obtain similar results:

$$\text{Exp (i)} = \quad 1.538* (P_i / \Sigma P) . SEN - 0.538* (M_i / \Sigma M) * SEN.$$

There are many reasons why the regression coefficients take those values, but the simplest one is that during 2003 higher public expenditures at the local level took place in the capital Tbilisi and other cities, which have no mountainous population. Thus, in 2003, other factors such as existing infrastructure or political considerations may have been more determinant factors of actual expenditures at the local level, demonstrating the limited usefulness of the regression-based approach if historical allocations are not reflective of objective expenditure needs.

One difference between the index approach used in Latvia and the one discussed for the Republic of Georgia is that the latter attempt to capture variations in the costs of producing local services rather than number of local clients. As a result, the assignment of weights for Georgia's need index requires a somewhat different type of reasoning. Consider again the case of Georgia with two expenditure need factors: the number of total population (P) and mountainous population (M). In this example, assigning weight α to the first factor and 1- α to the second factor, can be interpreted as share α of aggregate expenditures being related to standard costs of providing public services in an average locality while the remaining share 1-α comes from additional costs incurred in mountainous areas. The meaning of α becomes clearer if we consider the expenditure need formula:

$$\text{Need}_i = \quad (P_i / P) \cdot \alpha \cdot SEN + (M_i / M) \cdot (1- \alpha) \cdot SEN$$

Because mountainous population is included in total population, it would be counted twice when apportioning the aggregate level of subnational expenditure needs (SEN) among localities. First it is accounted for with weight α as part of the total population, and then it is accounted for with weight 1- α specifically as mountainous population. Thus, mountainous population is accounted for with a total weight of α+(1- α)=1, while non-mountainous population is given a weigh of only α.

For all these reasons, the relative index approach to expenditure needs requires careful assessment and thorough discussions with all stakeholders to ensure that the main causes for substantial differences in the demand and costs of local public service delivery across jurisdictions are captured in the index.

Ideally, the index formula should be based on a relatively limited number of factors as the inclusion of too many variables reduces transparency. It is also more costly and difficult to update a larger number of variables on a regular basis and larger designs with many factors can introduce more opportunities for political manipulation. In short, a balance needs to be struck between simplicity and transparency, and the need to find factors that equitably reflect the true fiscal need of local governments. Variables used as factors should accurately reflect needs, come from an independent source, and be free of manipulation by either central government or subnational governments. The use of "productive inputs" such as the number of local government employees, school buildings and hospital beds as allocation factors cause inefficiencies since they provide incentives that could distort expenditure decisions.

A final note with respect to the computation of expenditure need indexes regards the frequency of updating the measure. With better data, methodological fine-tuning and political pressure, the index formula can be changed frequently, in some cases yearly. Yet, the resulting lack of institutional stability reduces the revenue predictability, making budget planning so much harder for local governments.

Recent examples of LDTCs that have adopted a relative index approach include Malawi, Indonesia and the Russian Federation (Box 3). These countries provide a sampling of the different emphasis given to the factors to be included in the formula as well as the different, more or less *ad hoc*, approaches used to determine the weights. Among developed countries, Australia has one of the most sophisticated applications of what could be considered an index approach. Essentially the approach in Australia is to start with an equal per capita transfer which is adjusted for differences in delivering costs (for a standard set of services), as well as for differences in revenue capacity across subnational governments. The adjustments or "relativities" include 41 expenditure categories.

Box 3
Recent Examples of Index of Relative Need Approach to the Estimation of Expenditure Needs: Malawi, Indonesia and the Russian Federation

Malawi

District governments in Malawi receive grants from the District Development Fund (DDF), which is a decentralized development financing facility established by the Government of Malawi with support from a number of donor organizations, including the UNDP and the UNCDF (Boex, Kampanje and Mwadiwa, 2001). The DDF is apportioned among rural districts on the basis of a horizontal allocation formula that is perceived to reflect local expenditure needs, thus implicitly arriving at a weighted-needs index:

First, 30 percent of the DDF resources are allocated to district councils based on the "equal shares" principle. This reflects the assumption that all districts – regardless of population size of other characteristics - are assumed to have a certain fixed need for capital infrastructure.

Second, 70 percent of the DDF is allocated based on four factors, all equally weighted, notably:

- Population,
- Land area,
- Illiteracy, and
- Infant mortality.

Indonesia

As part of Indonesia's equalization mechanism (DAU), a straightforward index of expenditure needs is constructed – again consistent with the approach outlines in Table 2 (Brodjonegoro and Martinez-Vazquez, 2004). Based on four expenditure needs factors, initially (in 2001) the factor weights adopted were 0.25 for all factors. By 2002, the measure had evolved to:

$$\textit{Expenditure Needs} = ALE\,(0.4\,PI + 0.1\,AI + 0.1\,RPI + 0.4\,CI),$$

where:

- ALE: Average Local Expenditures = (Total Local Expenditures + Deconcentrated Funds) / Number of Local Governments
- PI: Population Index = Local Population/Average Local Population
- AI: Area Index = Local Area/Average Local Area
- RPI: Poverty Index = Number of Local Poor People/Average Local Poor People
- CI: Construction Price Index = Local Construction Price Index/100

Indonesia's measure of expenditure needs is slightly different from similar needs indexes; rather than being based on the relative share of each factor (e.g., the relative share of the national population that resides in a local government), Indonesia's index is based on the ratio between each factor and its average value (e.g., local population/average local population). We should note, however, that computationally these two approaches are fully equivalent.

Changing the Composition of the Index of Budget Expenditures (IBE) in the Russian Federation

In Russia's equalization fund (the Fund for the Financial Support for the Regions, or FFSR), the index of budget expenditures (or expenditure needs) is used to "normalize" or adjust per capita revenues. The formula assigns equalizing transfers to regions for which the normalized per capita revenue falls below some threshold.

Up to 2004, the computation of the Index of Budget Expenditures used the formula: $IBE_i = (R_i / N_i) / (R / N)$, where R_i stands for the sum of expenditures needs assessed separately for 15 expenditure categories; R stands for the sum of R_is across all regions; and N_i and N stand for the regional and national population respectively. For all expenditure categories except housing and utilities, the expenditure need for a particular service was derived from a per client norm by applying two adjustment coefficients to account for differences in service need and production costs. The cost coefficients were the same for all the 14 categories (excluding housing and utilities) and were derived by taking into account wage costs, price level, utility costs, and accessibility of the region's localities by transport.

The *Index of Budget Expenditures* will be calculated differently starting in 2005, as the weighted sum of three subindexes for relative differences in wages k_i^w, housing and utilities costs k_i^h, and the price level k_i^p respectively:

$$IBE_i = u^w \cdot k_i^w + u^h \cdot k_i^h + (1-u^w-u^h) \cdot k_i^p$$

Each of the three subindexes will be calculated through an additive and/or multiplicative aggregation of 3-4 different indicators and normalized by the population-weighted average so that the population-weighted sum of each subindex across all regions equals to one. The subindex for relative differences in wages k_i^w takes into account three different forms of wage allowances mandated by the federal government and the proportion of population residing in small settlements. The subindex for relative differences in housing and utilities costs k_i^h takes into account the federal norm for housing and utilities costs set for the region (both in nominal value and relative to personal income) and accessibility of the region's localities by transport. The subindex for relative differences in price level k_i^p takes into account the consumption bundle price, proportion of population under and over working age, the proportion of population residing in small settlements, and accessibility of the region's localities by transport.

Per Capita (Per Client) Expenditure Norms

Some countries avoid the challenges of finding and statistically manipulating data to arrive at some measure of expenditure needs by adopting a system where the local government sectoral allocation is devised in a "top-down" manner. Under this approach, the national government - through a priority setting process that cuts across sectors (generally through Cabinet-level discussions) - determines sectoral resource envelopes including resource envelopes for local government programs and activities. The local government programmatic allocations are then divided by the aggregate number of clients served, generating an expenditure norm that is used as a means of computing the per-client expenditure needs. This can be used directly to allocate intergovernmental grants, or can be entered in an equalizing grant formula. A straightforward example of a per-client expenditure norm is the Quality Basic Education (QBE) transfer in the State of Georgia, USA, where a per-student financial norm is determined from year to year based on resource availability in the annual budget process. For instance, in 2005, each school district in the state was assured instructional resources equivalent to $1600 per enrolled student.[14]

In this example, the expenditure norm for primary education is derived by deciding what share of total funding available to the state should go to local governments for this activity, after considering all funds available and all other competing demands on the funds, and dividing the available resources by the total number of primary students in the state. Furthermore, when costs vary substantially between local jurisdictions (as is the case, for instance, in a country like Indonesia), the actual amount of the norm per capita could potentially be adjusted upwards or downwards by multiplying the norm by a series of indexes to reflect regional differences in the cost of provision (Table 3).

Client-based expenditure norms or even the sectoral or programmatic envelopes for local government sectors can be prescriptive, forcing local government to spend according to these envelopes and norms; they can be indicative, merely becoming guidelines that are helpful to the local governments in setting their own budget allocations; or they may just simply be notional and used only for computational purposes

[14] See Rubenstein (2000) and Governor's Education Finance Task Force (2004) for more details on the finance of QBE in Georgia. In fact, QBE provides slight variations in expenditure norms based on whether students are "regular" students; special-needs students; or talented-and-gifted students, as well as a limited number of other factors.

There are several advantages to a client-based expenditure norms approach. One is the relative simplicity of the process, both in terms of decisions and data requirements. This approach also avoids the perverse incentives in expenditure decisions that existed in the past in transitional countries when they were using physical norms (discussed below). Another advantage is that despite the use of norms, there is a guarantee that the notional or prescriptive measure of expenditure needs will always be affordable. Defining expenditure needs in this "top-down" manner is a realistic and effective mechanism for using public resources in accordance with national priorities while recognizing the government's overall resource constraints.

Table 3
A Simple Top-Down Norm-Based Determination of Expenditure Needs

Step 1.	First, the central government sets the envelope or overall amount of expenditures for local governments that will be used for the calculation of needs in the following year.
Step 2.	Next, the total amount of local expenditures is divided into separate aggregate expenditure functions (education, health, and so on) to determine the notional amounts of that would be spent on the aggregate expenditure functions.
Step 3.	The next step consists of arriving at a basic expenditure norm for each main functional expenditure category by dividing the notional amounts by the objective criterion or number of clients in the entire country (population, or number of students and so on).
Step 4.	Given the basic norm for each expenditure category, the expenditure need for each local government is equal to the product of three items: a) the basic expenditure norm (per capita, or per student, etc); b) the population or the number of students, etc. in the locality; and c) a vector of coefficients that work to adjust the expenditure need up or down for special needs and/or differential costs of service provision.

There are some potential shortcomings as well with this approach. The sectoral or programmatic trade-offs made at cabinet level, involving national priorities and other considerations, may not necessarily have a clear connection to real service needs (Martinez-Vazquez, Boex and Ferrazi, 2004).[15] There is also the risk that the budget formulation process could potentially result in a non-transparent process where incremental resources are provided to sectors and programs that are subjectively felt to be "needed" or desired at the center without clear and direct links to sectoral outcomes. In

[15] An important question is how the priorities are identified and quantified. In countries like Ukraine and Latvia these priorities are based on political decisions for marginal resource changes (increases and decreases) to last year's allocations. Conceptually, these priorities may be determined through some estimate of service standards which the government is committed to achieving. However, to the extent that the norms are just notional and not prescriptive, the choices ultimately made by local governments in the use of the available resources may be efficient.

developing country contexts, political affiliations of cabinet members and legislative allies can play a particularly dominant role in such priority setting.

A recent example of a country adopting a top-down per capita expenditure norm approach is Ukraine (Martinez-Vazquez and Zeikate, 2002). In fact the steps described in Table 3 fit well the Ukrainian approach. The United Kingdom has used a similar approach but with some peculiarities (Box 4). To some extent the "per client" approach is also used in the Czech Republic for the transfers that finance the functions delegated by the central government to local governments (Oliveira and Martinez-Vazquez, 2001). It should be noted that in the case of the Czech Republic the decisions on norms are made at the top but this is not a top-down comprehensive approach as is the case in Ukraine. The approach in Vietnam is similar: expenditure needs of the local government are derived of the basis of the prevailing system of expenditure norms, which are supposed to cover all current expenditures (salaries, operation and maintenance, and so on) and (some minimum amount of) capital expenditures. The norms are adjusted for different regions depending on geography and remoteness, and are primarily specified as monetary amounts per capita.

Box 4

Expenditure Needs in the United Kingdom

The British government starts by assessing how much expenditure local government as a whole will have to finance through grants and Council Tax. This amount is known as Total Standard Spending. The Government helps meet about three-fourths of the Total Standard Spending by distributing grants. The funding from these grants is known as Aggregate External Finance. The difference between Total Standard Spending and Aggregate External Finance is the approximate amount local authorities would need to raise through Council Tax if they spent at the level of Total Standard Spending.

To calculate the Standard Spending Assessments (SSA) for each jurisdiction, the Government takes into account population, social structure and other demographic characteristics. The SSA is the government's assessment of the appropriate amount of expenditure that will allow the local authorities to provide a standard level of services, on the bases of demographic, social and geographic characteristics. There are seven basic fields taken into account to calculate the SSA: education, social services, highway maintenance, age of the population, number of children and special characteristics of them, fire and police and other services. To arrive at the assessment in each field, more detailed information is taken into account. For example, for education, factors taken into account include the number of school pupils, school pupils with special needs, cost differentials across districts and so on.

Traditional (Bottom Up or Physical) Expenditure Norms

If one were to ask a local government accountant (not familiar with the finer points of fiscal decentralization) to quantify the expenditure needs of his or her local governments, it is almost certain that he or she would think of a bottom up approach where the local governments financial "needs" would be equated to costs of providing the current level of local services, or the summing up of expenses required to offer a standardized basket of subnational government services. The essence of the traditional approach to expenditure norms or standards is to compute a detailed costing of the inputs needed to deliver a standard (national or minimum) level of public services. The correct application of this approach requires that the "standard levels" have been defined and that cost or price information exists for all those items. Although in some way quite intuitive, this approach is quite demanding because of the type and detail of information required. The approach also requires very explicit procedures for how to cost all aspects of the expenditure responsibilities of subnational governments.

A classical example of defining expenditures needs through a myriad of ineffectual physical norms is provided by the budgeting practices of the former Soviet Union, where the Planning Bureau, the Ministry of Finance, line ministries and other federal agencies employed literally thousands of budgetary norms to be applied at all levels of government and by all implementation agencies, such as what type and quantity of food will be provided to different types of patients in public clinics and hospitals (Martinez-Vazquez, 1994). Because these norms were too complex and there was no mechanism to assure their affordability, they were not actually applied. Nevertheless, and not surprisingly, many local governments and implementing agencies insisted on using them as the basis for their budget requests. A large number of the countries created from the dissolution of the Soviet Union, including Russia, and some former planned economies in Central and Eastern Europe, experienced significant difficulties in shedding the old practices over their years of transition during the 1990s. The real inability to make those traditional bottom-up expenditure norms operational and affordable led to the slow but systematic abandonment of the physical standards approach of old Soviet times in these countries.[16]

Despite their shortcomings, traditional expenditure norms are still relied on in defining expenditure needs in a variety of LDTCs. For instance, it is common (especially in unitary countries) that line ministries and other central agencies decree a series of national standards and minimum norms for physical facilities and service delivery, which supposedly need to be satisfied by subnational governments (Alm and Martinez-Vazquez, 2002). It is in the presence and awareness of these standards and norms that the concept of "expenditure needs" almost necessarily evokes the summation and quantification in monetary terms of those norms. Whether this is conceptually the right approach has been much debated, most recently for example in Tanzania and Indonesia (Boex and Martinez-Vazquez, 2004; Martinez-Vazquez, Boex and Ferrazi, 2004). What is certain is that such an approach may be too data intensive and too costly for most LDTC.[17]

[16] Nevertheless, in many of these countries there continue to be official and unofficial calls for a return to the old system of norms. In some countries, such as Russia, governmental commissions labored unsuccessfully for years to revive a new system of norms. See Martinez-Vazquez and Boex (2001). In some other countries, such as Ukraine, a new system of per capita norms were developed for budgetary and equalization purposes that largely avoid the problems of the past. The Ukraine example is further discussed below.

[17] Denmark and Japan are two examples of data intensive approaches.

Because the minimum standards of service delivery are generally specified by sectoral ministries or agencies with their narrow agendas and incentives to push standards up, another significant disadvantage of this approach is that there is no guarantee that the expenditure needs so derived are affordable within the overall budget resource envelope. The insufficiency of funds invariably requires a downward adjustment of the estimated local budget needs, thus not complying with the specified standards. Lack of achievement of the unaffordable standards frequently becomes a source of frustration for subnational government officials and lead to voters' protest. This pretty much was the situation in the former Soviet Union and is still a common occurrence in some transitional economies, as well as in many developing economies. Another risk with the use of many specific expenditure norms for services is that they may be specified in physical terms, such as the number of hospital beds in the case of health services. As we have commented before, this type of physical norm can easily lead to perverse incentives in expenditure behavior.

Few economies have the data or the administrative capacity to deal adequately with highly detailed expenditure norms in this bottom up approach. However, this approach is prevalent in Denmark, Japan, the Netherlands and Sweden, for example. In all of these countries the system identifies a large number of services provided by local government to account for the expenditure need, with units of measurement, unit costs, and modification coefficients for each of them.[18]

In the same vein as traditional expenditure norms, a common application of the bottom-up approach in determining local expenditure needs involves the direct summation of actual or implied expenditures. For instance, as is common practice in many African countries, both Uganda and Tanzania (prior to 2004) determine the wage needs of local authorities based on the actual wage bill for local teachers and other local government staff (Boex et al., 2003; Uganda LGFC, 2003). China, an important transitional country, has been using this type of simple bottom-up approach in the quantification of expenditure needs. For example, the determination of standard expenditures in China's general equalization grant (also known as the transitory grant – because its formula was supposed to be transitory), the measure of expenditure needs fundamentally involves classifying local expenditures into 12 categories (education, health, government administration, etc.) and then using simple methodologies, such as adding up personnel

[18] For example in Sweden, the standard costs per capita are calculated on the basis of 15 indexes (using on average between 4 to 5 variables for each index. Some indexes use regression analysis for their determination and others use formulas. The indexes that account for expenditure needs or costs of providing services for municipalities are: 1) Child care (age structure, parental employment, population density); 2) Care of the elderly (age structure, balance of the genders; occupational background, rural areas); 3)Individual and family care (single women with children, migration, non-Nordic national, density of the settlement); 4)Compulsory schooling (rural areas, age structure, home language); 5) upper secondary school (age structure, study program preferences); 6) Water and sewage (sparseness of settlement, geological conditions); 7) Street and roads (traffic, weather conditions); 8) unemployment rates; 9) Constructions costs; 10) heating costs; 11) Frigid zone allowance; 12) additional expenditure due population loss; 13) Additional expenditure due weak population base (population within a radius of 30 and 90 Km); 14) Administration, travel and rescue services (population, population density, degree of urbanization).

and office outlays, to arrive at expenditures needs.[19] As already noted, the main problem with adding up outlays is that it sends perverse incentives for expenditure decisions at the local level. An important problem in China's subnational sector is overstaffing. Russia's recent experience provides an example of how to progressively refine the measurement of expenditure needs based on individual per capita norms to incorporate the elements that can account for cost differences across subnational jurisdictions.

A problem with adding up expenditure standards is budget affordability or feasibility. However, several approaches can be used to tackle this problem. The current approach used in South Africa for the S grant (for municipal basic services) provides a good example of how this can be done. The S grant is set to equal the cost of providing basic municipal services to the members of all the poor households in each municipality. Thus for municipality i, the grant is $Si = (\alpha)(b)L\ Hi$; where α is a phase-in parameter (with $0 < \alpha < 1$), b is a budget-adjustment parameter set to adjust the size of the grants to the available budget, L is an estimate of the annual per capita cost of providing basic public services, and Hi is the number of residents of municipality i living in poverty. Thus, the two parameters in the formula, α and b, can be used to achieve affordability or budget feasibility at budget time (Reschovsky, 2003).

The Representative Expenditure System Approach

The Representative Expenditure System (RES) approach is a sophisticated and rather complex expenditure needs measure that was developed in the United Sates by the now defunct U.S. Advisory Commision on Intergovernmental Fiscal Relations (Rafuse, 1990a,b and Tannenwald 1998 and 2002).

The computation of the index of fiscal need for each subnational government involves several steps. First, the methodology identifies what the main drivers are for expenditures in each of the major expenditure functions assigned to subnational governments (for example, for general administration it may be population, for elementary education the number of students, or for roads, miles of highway and traffic intensity or vehicle miles). The second step identifies determinants of the costs of providing a given level of service other than the prices of the inputs used by the subnational governments (these are known as the "workload" factors). If there are several determinants, a weighted average of the determinants is constructed as a composite workload factor. In the third step, the total subnational expenditures in each expenditure function is multiplied by each subnational government workload factor to arrive at how much each subnational government would have spent in that expenditure category if it had provided the standard level of service. In the fourth step the estimated per capita "standard" spending for each function is adjusted for the relative costs of the inputs for that expenditure function. In the fifth step, the adjusted per capita standard spending levels for each function are added to arrive at the subnational government per capita spending on a "standard expenditure package". Finally, these total figures are indexed to the actual total subnational per capita spending to arrive at the index of need for each subnational government.

[19] See Zhang and Martinez-Vazquez, 2002. Besides the general (or transitory) grant other grants with equalization objectives include the pre-tax sharing system grants, grants for minority regions, grants for increasing wages of civil servants, and others.

A modification to the traditional RES is a regression-based Representative Expenditure System (Shah, 1994). The regression–based approach has the advantage of being more flexible than the traditional RES, as there is no need to link specific spending categories to specific client-bases. Instead, the regression estimates will verify the existence and strength of linkages between local expenditures and multiple needs bases at the same time. Yet, while the regression-based approach arguably yields the most precise measure of local expenditure needs, the measure is often less well-understood and considered less transparent due to the technical and the indirect nature of the link between specific expenditures and specific needs.

3.2 Alternative Approaches to Measuring Fiscal Capacity

Fiscal capacity has been defined in a variety of ways but perhaps the most accepted definition is as the level of revenues that a subnational government could potentially raise using its assigned taxing powers and tax bases if it were to use the average level of tax effort across all subnational governments in the country. The obvious reason to base fiscal capacity on potential revenues so defined (as opposed to actual revenues) is that basing equalization transfers on actual local collections would induce perverse behavior by subnational governments: those governments that make a higher effort and collect more would see reduced equalization transfers. Another important reason for not using actual revenues is that actual collections might provide a poor reflection of fiscal capacity if there are variations in local fiscal effort. Of course, these concerns presume that subnational governments have autonomy or discretion to exercise lower or higher tax effort by changing enforcement effort, tax rates, tax bases, or even the ability to introduce taxes or not.

This being said, it is important to realize that in many countries subnational governments have quite limited tax autonomy and that the bulk of their revenues come from tax sharing in national taxes or from different forms of transfers. This is especially true of most LDTCs. In the case of revenue sharing and intergovernmental transfers, fiscal capacity can in most cases be safely measured by the actual or forecasted level of shared revenues and transfers. Two important qualifications need to be made to this statement. First, there are countries, such as is the case in Russia, Ukraine and many other former Soviet republics, where tax administration officials have a *de facto* "dual subordination," meaning that they respond to their official bosses in the hierarchical structure, ultimately the central authorities, but also respond for a variety of practical reasons to the local authorities.[20] Where this situation of dual subordination exists it will not be safe to assume that the effort to collect shared revenues cannot be affected by the local

[20] In many instances, local authorities can provide housing, salary bonuses and other perks to central tax administrators. In the former Soviet Union most government employees were subject to formal dual subordination. Vietnam nowadays also suffers from similar problems (see Martinez-Vazquez, 2004). China created in 1994 separate tax administrations for central and local taxes to avoid the problems associated with dual subordination (mostly that tax administrators would defend the interests of the subnational governments at the cost of central government interests) but dual subordination problems have persisted. (World Bank, 2002.)

authorities. In some cases it will also be necessary to estimate potential shared revenues to avoid perverse behaviors by subnational government officials. Second, it is also assumed that local government authorities do not have the power to actually affect the size of the tax bases for either their own or shared taxes.[21]

Notwithstanding the fact that in many LDTCs own taxes represent a small part of subnational government revenues, it is important in the measurement of fiscal capacity not to give disincentives to local tax effort and to look for ways to measure their fiscal capacity that preserve the right incentives. This is particularly the case since own-source revenues are not only an important source of financing for local government, but also serve as an important accountability mechanism for local officials. Several approaches are used in the international practice to quantify subnational fiscal capacity, which are reviewed and assessed immediately below, including:

1. Lagged own revenue collections
2. Basic proxies for the local ability to tax/ability to pay (such as personal income of Gross Regional Product)
3. More sophisticated measures of fiscal capacity, such as the Representative Revenue System

Lagged Revenues

A first available proxy or measure for the fiscal capacity of a subnational jurisdiction is the (per capita) level of own revenue collections or lagged values of revenue collections**,** for example the revenues collected last year. Similar to the problems encountered with actual expenditures as a measure of fiscal need, actual revenues provide an unsatisfactory measure of capacity for two main reasons. First, there are several elements that can create a gap between the amount of revenue raised by a regional or local government and the *potential ability* of that subnational government to raise revenue: (i) two local governments with the same fiscal capacity may collect different amounts of revenue as a result of applying different tax rates or defining taxable income in different ways, by for example, granting different levels of exemptions; (ii) two local governments with the same fiscal capacity may collect different amounts of revenue due to variances in the enforcement effort with which revenues are collected; (iii) two local governments with the same fiscal capacity may collect different amounts of revenue as a result of different levels of taxpayer compliance (for the same enforcement effort). Thus, while tax rates, enforcement effort and taxpayer compliance all affect the actual level of revenue collections, they do not affect the *potential ability* of regional or local governments to collect revenues.

[21] If subnational authorities can actually affect the size of the tax bases, it may not be wise to use actual shared revenues in the measure of fiscal capacity. In addition, if subnational authorities can actually affect the size of the tax bases, using the conventional measure of potential revenues (for a given tax base) may not be safe either since this type of calculation would still induce perverse subnational government behavior; this time not so much in exercising less tax effort but in actually working to reduce economic activity and tax bases where they count for the equalization formula.

Second, it is clear that using actual revenue collection as a measure of fiscal capacity in an equalization formula would provide a negative incentive for subnational revenue generation, as it would reduce equalization transfers for subnational governments that collect more revenues. In addition, using past collections or lagged revenues does not satisfactorily address the problem of negative incentives. Although the impact of the incentive is reduced, it is likely that sooner or later subnational governments will "learn" that higher collections translate into lower transfers.

Despite these problems, past revenue collection can be used in some creative ways that more or less reduce the negative incentive effects to tax effort. For example, Vietnam freezes the estimates of fiscal capacity based on historical collections for a number of yeas in their "stability periods." Another example of one of these creative approaches is provided by Ukraine's current methodology for estimating fiscal capacity for its equalization grant system (see Table 4). The essence of Ukraine's approach is that fiscal capacity is defined first in relative terms by computing the ratio of actual (own) revenues per capita of the jurisdiction to the average (own) revenues per capita for all jurisdictions for a base year (Martinez-Vazquez and Zeikate, 2002). Fiscal capacity is then derived from multiplying the ratio coefficient for each jurisdiction by the aggregate revenue forecast (for all local governments). This approach dilutes the impact that actual collections behavior by a jurisdiction may have in its estimate of fiscal capacity.

The incentive effect is completely eliminated in Germany's approach to fiscal capacity, which is measured as average tax revenue per capita multiplied by the population of each state.[22] However, the constant per capita revenue norm means that Germany's fiscal capacity measure does not take on board any subnational variations in tax bases.

Table 4
Computing a measure of fiscal capacity: Historical average of the locality's per capita revenue relative to the national average per capita revenue

Step 1.	***Select revenue sources and time window*** Select revenues sources, the collections of which can serve as a proxy for the locality's overall revenue-raising capacity. Select time period for which data on the yield of the chosen revenue sources are available (and are relevant for the present)
Step 2.	***Define the Index of Relative Fiscal Capacity*** The Index of Relative Fiscal Capacity K_i can be defined as the historical average of $\frac{\sum Per\ Capita\ Local\ Yield_j}{\sum Per\ Capita\ National\ Yield}$ where the summation is performed over the chosen revenue sources.

[22] City-states have a weighted factor of 1.35 on the population.

Table 4
Computing a measure of fiscal capacity: Historical average of the locality's per capita revenue relative to the national average per capita revenue

	This index reflects the historical average (two or three years, for example) of the locality's per capita revenue relative to the national average per capita revenue from the selected sources.
Step 3.	***Compute Fiscal Capacity*** Fiscal capacity for locality *i* equals: $\text{Fiscal capacity}_i = K_i * \text{Aggregate Local Revenue Forecast}$ This amount reflects the amount of collections that each locality is expected to have, given its historic revenue base and the macroeconomic forecast.

Basic proxies for ability to tax/ability to pay

Moving away from fiscal capacity measures based on actual revenue collections, a widely used approach to measuring fiscal capacity is to use a proxy or a combination of proxies capturing the general ability of subnational governments to raise taxes, whatever those taxes actually are. One such basic measure is the per capita level of personal income, which is widely available and has the advantage of simplicity. Of course, to the extent that local taxes are applied to commercial property or business income and transactions, personal income may fail to accurately measure a local government's revenue potential.

Another widely used proxy measure for fiscal capacity is gross regional product (GRP), which is the subnational equivalent of Gross Domestic Product at the national level (GDP). GRP may be considered a more comprehensive measure of the fiscal capacity than per capita income because GRP includes income generated within a region irrespective of the location of residence of the worker or producer. A third proxy for the local ability to tax is the Total Taxable Resources (TTR), which is a modified version of GRP and excludes certain items such as central taxes and transfers from the measure of fiscal capacity since they do not provide a potential tax base.

All these proxies and others take specific shape in different country contexts. For example, Uganda uses household expenditure data as a proxy for revenue capacity while South Africa uses average monthly income per capita in each municipality as a measure of their fiscal capacity. In India, the tax capacity of each state is approximated by the difference between the per capita income of the state and the highest per capita income state. In the case of Switzerland, fiscal capacity is estimated as an index of several weighted factors including per capita National Income in the individual Canton and several measures of tax burdens and per capita tax revenues of the Cantons (Dafflon, 2001).

Representative Revenue System

Some countries (for example, Australia, Canada, the United States, and more recently Russia) use or have used a multi-dimensional measure of fiscal capacity known as the Representative Revenue System (RRS).[23] Similar in nature to the Representative Expenditure System discussed earlier, the basic idea underlying the RRS is to calculate the amount of revenue that a region would collect given its tax bases if it were to exert average fiscal effort. This is done by collecting data on revenue collections and tax bases for each of the taxes under consideration for every subnational region. Based upon information on all tax bases for every region, as well as the national average, and fiscal effort for each of the taxes, one can compute the amount of revenues that each jurisdiction would collect under average fiscal effort. This amount is then considered to quantify the fiscal capacity of each jurisdiction.

The main benefit of RRS is that computations are made at a disaggregated level and based on detailed knowledge of (proxies for) the statutory tax bases. Naturally, the accuracy of the RRS is determined by data availability. For instance, in Canada, the fiscal capacity of a province is a measure of its ability to raise revenues from more than 30 revenue categories – including personal income tax, corporate income tax, sales taxes, property tax, and other sources. The revenue potential for each province is computed based on the size of respective tax bases and the assumption that each province applies an average level of tax effort (i.e., average effective tax rates). Provinces with revenue raising ability, or fiscal capacity, below a threshold or 'standard' amount receive equalization payments from the national government.[24] In many LDTCs, the required data are not available to compute similarly detailed RRS assessments. Instead, it is possible to apply a simplified RRS (based on a single proxy tax base) or a modified RRS to arrive at reasonable measures of fiscal capacity (see Table 5 and Box 5, respectively).

Table 5 **A Simplified Representative Revenue System (RRS)**	
Step 1.	**Select proxy measures for the tax base (T)** Select a measure of a subnational jurisdictions' own-source revenues (i.e., regional revenue collections) and a proxy for an applicable measure of the subnational tax base, such as aggregate personal income or gross regional product.
Step 2.	**Define the Average Effective Tax Rate (AETR)** The average effective tax rate can be defined as:

[23] The RRS was developed at the now-defunct U.S. Advisory Commission on Intergovernmental Relations. See Akin (1973) and U.S. Advisory Commission on Intergovernmental Relations (1986, 1988, and 1993).
[24] The 'standard' measures the average fiscal capacity of five 'middle income' provinces – Quebec, Ontario, Manitoba, Saskatchewan and British Columbia.

Table 5 **A Simplified Representative Revenue System (RRS)**	
	AETR = $(\sum_i \text{Own source revenues}_i) / (\sum_i \text{Tax Base}_i)$ This coefficient reflects the average share of own revenue collections (in relation to the subnational tax base) that is collected across all jurisdictions.
Step 3.	**Compute Fiscal Capacity** Fiscal capacity for jurisdiction *i* equals: $\text{Fiscal capacity}_i = \text{AETR} * \text{Tax Base}_i$ This amount reflects the amount of collections that each jurisdiction would have if it exerted an average level of fiscal effort in collecting own-source revenues.

Overall, the RRS is a more thorough and complete method of measuring the fiscal capacity of a region. It is based on disaggregated data and takes into account variations in effective tax rates among various tax components and non-tax revenue sources. As a result, fiscal capacity as measured by the RRS can be considered a more accurate representation of a region's true fiscal capacity. However, by the disaggregated nature of the computations, the measure is data intensive and, therefore, it is not always possible to use it or use it fully.

The main benefit of the Representative Revenue System (RRS) as a measure of fiscal capacity is its accuracy. However, the method's intensive data requirements may prevent its implementation in many LDTCs. An alternative solution that would maintain much of the accuracy of the RRS while reducing its data requirements is by introducing regression analysis to the RRS method (Martinez-Vazquez and Boex ,1997). The use of regression analysis in the Representative Revenue System dramatically reduces the data requirements for the measurement process. Rather than collecting data on the actual collections and tax bases for every single tax component, the regression-based RRS method only requires information on the total amount of revenues collected for each jurisdiction plus data on a series of proxies for the tax bases for each subnational government. While the integrity of the data still needs to be guarded, the requirements on the proxies for the tax bases are somewhat less strict. Most importantly, there is no need to group revenue items into separate components and to specifically match each tax component with a standard tax base.

Box 5

The Modified RRS approach in Indonesia

Fiscal Capacity = LOR + (PT + LTF + PIT + 0.75*NRS)

LOR : Predicted Local Own Revenue = a + b*GRDP Services

PT : Property Tax Revenue Sharing
LTF : Land Transfer Fee Revenue Sharing
PIT : Personal Income Tax Revenue Sharing
NRS : Natural Resources Revenue Sharing
GRDP Services: The service component of gross regional domestic product

This example of Indonesia shows a partial use of a regession-based RRS approach to estimate capacity for local tax revenues, while the capacity measure for all shared revenues is taken to be the next year's. This is justified because local governments control local taxes but have no control at all on shared taxes with the central government.[25]

3.3 Do Measures of Fiscal Effort Belong in an Equalization Formula? If so, how should it be measured?

A further policy decision in the formulation of equalization grants is whether to incorporate tax effort as part of the intergovernmental transfer mechanism. This is a controversial issue. If local governments are presumed to deliver pure private goods (excludable and rival) without significant inter-jurisdictional externalities, the generally accepted principle is that the transfer systems should neither encourage nor discourage tax effort by subnational governments.[26] As the argument goes, there is no *a priori* justification for the public sector to reward those subnational jurisdictions that decide to tax themselves more and thus consume a large share of their incomes through the local government level. In fact, the introduction of tax effort in the formula opens the formula to potential manipulation by local governments, with the potential outcome of redistributing funds away from more needy local governments to high spenders and wealthier local governments.

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[25] Notice that only 75 percent of the natural resource revenue sharing is taken into account in the formula. This is a concession to the natural resource rich provinces, which in the past felt exploited by the central authorities. See Brodjonegoro Martinez-Vazquez (2004).
[26] Stimulating revenue performance can be accomplished in a number of ways besides introducing incentives in the equalization formulas, such as introducing matching grants. We will not further discuss these issues here and rather continue to concentrate on equalization transfers.

These theoretical arguments notwithstanding, the fact is that numerous countries incorporate some measure of tax effort in their equalization formulas. One main argument used is that the transfer system can be used to try to stimulate subnational governments to use revenue raising capacity when little of this capacity is used, with subnational governments relying instead on intergovernmental grants and revenue sharing.[27] Thus, if there is a serious problem with the lack of revenue mobilization, the question is whether or not the equalization formula should promote or give incentives to stimulate tax effort or revenue performance. One answer may be that encouraging subnational tax effort may be justified at least on a temporary basis, but clearly this issue will not be resolved here. Among developing countries, the following introduce a tax effort element in their transfers system: China,[28] Ghana, India,[29] Nigeria, Mexico, Colombia, Nicaragua, Ecuador, Venezuela, and Sri Lanka.[30]

Fiscal effort can be defined as the degree to which a government or subnational region utilizes the revenue bases available to it. As such, the level of fiscal effort is affected by the level of the tax rates applied (if subnational governments have discretion over rate), by the level of exemptions granted (again if subnational governments have discretion over the structure of the tax), and by the tax enforcement effort exerted by the tax administration authorities. Thus, if we want to encourage higher tax effort by subnational governments on a temporary basis, it is not a simple matter to measure it.

The level of fiscal effort is appropriately measured as the ratio of the actual amount of revenues collected to some measure of fiscal capacity. But as we have seen in the previous discussion, estimating fiscal capacity is not an easy task. Therefore many of those countries that incorporate fiscal effort in their equalization formulas resort to a measure of <u>increases</u> in own source revenue collections relative to the previous year(s), such as in the case of Nigeria and Colombia.[31] The disadvantage of this approach is that subnational governments that initially exerted a high level of fiscal effort have little room to increase their measured fiscal effort further, and thus this approach may not reward those jurisdictions with higher levels of fiscal effort. Another disadvantage of this mechanism is that it certainly rewards subnational governments that had previously low levels of fiscal effort. Furthermore, this approach fails to recognize that changes in local revenue collections over time are often more the result of changes in the local tax base well beyond the control of local officials rather than actual changes in local fiscal effort.

Other developing countries do a better job at estimating tax effort. For example, Nicaragua's tax effort is only measured through property tax revenues, the most important source of revenues over which local governments have discretion. To arrive at

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[27] For instance, Prud'homme (2003) argues that local residents are fooled by some type of fiscal illusion, and demand a below-optimal level of public services in the presence of a large transfer system.
[28] In China this takes place through the VAT tax rebate component of the transfer system.
[29] India's current equalization formula gives tax effort a 5 percent weight.
[30] Some developed countries also use tax effort factors; for example Australia and Canada, but the latter only in its Territorial Formula Financing for the Far North and Northwest territories, which are generally less developed.
[31] Colombia's "fiscal efficiency" factor in the formula is measured as the growth in local revenues per capita on the last 3 years.

tax effort, the revenue from the property tax in the previous year is divided by a measure of potential property tax revenue, which is calculated using a system that estimates the amount of taxable property in the municipality times its corresponding tax rate.[32]

4. Simulating Different Transfer Approaches: Local Government Finance in Georgia circa 1960

A key challenge for policy makers and policy analysts assessing intergovernmental transfer schemes in developing countries – which were developed in the absence of "perfect" data - is that practitioners or analysts are unable to compare the functionality of the system at hand to the performance of the first-best transfer system that would have been possible under perfect data availability. One possible way to learn something about which "second-best" measures of fiscal capacity and expenditure needs might perform well in the context of a developing economy would be to compare the performance of a several second-best approaches against the counter-factual of a transfer system for a developing economy where "perfect" data is available. One approach followed in some earlier studies (for instance, Vaillancourt 2001) has been to explore historical data for local government finances in a relatively lesser-developed part of a developing country. Such an approach assures the adequate availability of data to construct a "first-best" counter-factual, which is generally impossible in a developing country.

For the purpose of this study, we argue that around the year 1960, the State of Georgia in the U.S. and its local government (finance) structure presented many of the features of a "typical" middle-income developing economy today. The State's economy was largely rural (74 percent), with over one-third of the population living below the poverty line, and one-third of the housing stock lacking basic amenities such as piped water (Table 6).[33] As far as the State's local government structure in 1960, Georgia was divided into 159 counties, with its structure of local government having changed little since the 1850s. Anecdotal evidence suggests that the size of counties in Georgia was historically based on the desire for every resident to be able to commute to his or her county seat by mule-drawn cart in a day. Although (unlike in many developing economies today) certain local government services in Georgia were provided by municipalities and school districts, the sub-county nature of municipalities and the county-wide nature of all but a few school districts allows for the analysis to proceed at the county-level by aggregating all necessary local data into county-based local government areas.

[32] Of course, this presumes that local property valuations are performed in a consistent and unbiased manner.

[33] Vaillancourt (2001) selected the Canadian provinces of Newfoundland and Prince Edward Island for a similar exercise. His selection was based on the fact that while good historical data are available for the provinces, the income levels in these provinces during the 1950s (which were in fact somewhat lower than average income levels in Georgia in 1960) approximate income levels of current middle-income developing countries such as Morocco, Ukraine and China.

Table 6.
Local Government (County) Characteristics, Georgia, 1960

	Average	Std. Dev.	Minimum	Maximum
Population	24,799	53,483	1,876	556,326
Land Area (sq. mi.)	366.5	152.8	125.0	912.0
Population density (pop / sq. mi.)	73.8	141.7	4.4	1,063.7
Percent population under 18	41.0	3.4	24.0	48.1
Percent population over 65	8.3	1.7	1.0	13.5
Percent population rural	74.2	25.5	6.2	100.0
Percent housing w/o piped water	33.6	12.7	7.7	64.9
Infant Mortality Rate (per 1000)	34.4	14.4	0.0	96.8
Median Family Income (US$)	3,140.4	977.8	1,612.0	6,873.0
Per Capita Personal Income (US$)	1,210.2	338.8	505.9	3,334.4
Poverty Rate	34.0	12.1	6.8	60.2

Source: Computed by the authors based on U.S. Bureau of the Census (1960); University of Georgia (1963); and Georgia Department of Public Health (1962).

Local governments in Georgia – then as now - provided a variety of typical local government services such as primary and secondary education, some public health services, parks and recreation, local infrastructure and community development. Data from the 1962 Census of Governments show that local services were funded by a combination – roughly evenly split – of own-source revenues and intergovernmental grants received from the state government (Table 7). In turn, local own-source revenues were roughly evenly divided between local tax revenues and non-tax sources, with property taxes accounting for an average of about one quarter of total local revenues. Transfers were provided through a variety of different targeted and sectoral grant mechanisms. Although local governments in developing countries typically enjoy less revenue autonomy than their historical counterparts in Georgia, the overall environment for local government finance in Georgia in 1960 was altogether not so different from many decentralized developing economies today.

Table 7.
Local Government Finances in Georgia, 1962
(Per capita dollars)

	Average	Std. Dev.	Minimum	Maximum
Local Revenues	128.76	23.89	15.06	204.00
of which Intergovernmental Grants	69.41	16.70	9.84	122.65
of which Local Own Revenues	59.34	24.57	5.23	162.38
of which Property Taxes	*30.24*	*12.84*	*2.38*	*102.16*
of which Other Taxes	*3.65*	*2.37*	*0.15*	*15.05*
Local Expenditures	129.46	27.05	13.22	240.65
of which Education	70.10	11.27	7.99	98.23
of which Capital Expenditures	18.02	16.08	0.59	116.50

Source: Computed by the authors based on U.S. Bureau of the Census (1960); Census of Governments (1962).

Based on the fiscal and other data available for Georgia counties around 1960, in the remainder of this section we set out to compute various different measures of local expenditure need and fiscal capacity which would typically be used in the development of a formula-based unconditional grant system. In the next section, we then compare the performance of these approaches with different levels of technical sophistication and data-intensity, and identify which "second-best" measures correlate most closely to the "first-best" approach.

A. *Alternative measures of local expenditure needs*

Based on the data available for Georgia for 1957-1960, we were able to compute a total of eight alternative - and progressively more sophisticated - measures of local expenditure need, namely:

1. Actual local expenditures and lagged expenditures.
2. Equal per capita expenditure norm.
3. The proportion of poor households.
4. The proportion of households without piped water.
5. An index of need based on infant mortality.
6. An index of expenditure needs (similar to a Human Development Index) based on poverty, water access and infant mortality.
7. A "traditional" Representative Expenditure System (RES).
8. A regression-based Representative Expenditure System (RES).

Perhaps the most plain and apparent proxy for a local government's level of expenditure needs is the local government's actual expenditure level. County governments in Georgia engaged in local spending at an average rate of $129 per person, ranging from a minimum of $13 per capita to around $240 per person (Table 7). However, there are two major problems with the reliance on actual expenditures as a measure of local expenditure needs. First, as already noted above, the inclusion of actual expenditures in a transfer formula would provide local governments with a perverse incentive to increase expenditures beyond their efficient level. Second, a perhaps more importantly, local expenditure levels may simply be a poor reflection of local expenditure needs, as discrepancies should be expected to exist in actual expenditures and the cost of an average basket of local government services. Differences in local preferences, variations in the demand for local services, and spending constraints dictated by local resource availability may all contribute to variations in actual local spending, while leaving unaffected a local government's expenditure needs. Since many countries seek to mitigate the incentive issue in part by using lagged local expenditures collections, we also compute lagged local expenditures (extracted from the 1957 Census of Government) as an alternative proxy for local expenditure needs.

An alternative approach to quantifying local expenditure needs that would avoid the efficiency and equity issues of actual (or lagged) local expenditures is reliance on an equal per capita expenditure norm. Such a per capita expenditure norm would assume that each local resident has an identical level of expenditure need, and thus would not vary at all across local jurisdictions. Based on aggregate actual local expenditures of \$609.4 million and a state population of 3.9 million, one could posit that as the basis for computing fiscal needs, each local government has expenditure need equal to a norm of \$154 per person.

A third methodology to compute a "second-best" measure of expenditure needs relies on several socio-economic and demographic characteristics that are typically associated with poverty reduction and local expenditure needs. For instance, if the population in a local government jurisdiction is relatively poor, the need for local government services (a function of both demand and cost) is expected to be greater. Particularly in countries that are pursuing a poverty reduction strategy, reliance on local poverty as an indicator of local government need may be an attractive option. As such, relying on available census data, we computed an index of local expenditure needs in proportion to the number of residents below the poverty line in each county.[34] Thus, for instance, if a local government contains 5 percent of the state's poor households, this measure assumes this county to have 5 percent of the aggregated expenditure needs at the local government level.

Since poverty counts (or even good poverty estimates) at the local level are not available in many developing or transition countries, policy practitioners may seek to rely on secondary indicators of poverty for which data may be available, such as housing characteristics, infant mortality figures or illiteracy. Likewise, based on available data for housing in Georgia (in particular, the number of housing unit that had no piped water) and the infant mortality count in each jurisdiction, we computed alternate local expenditure needs measures in proportion to these factors.[35]

Naturally, each of these preceding local expenditure needs measures only take into account one possible measure of local expenditure needs. Mirroring practices in many developing countries, for the purpose of our analysis of local government finance, we construed a local needs index (similar to a Human Development Index) which takes into account the weighted average of three available needs measures (poverty, water access and infant mortality). Mirroring another common practice in developing countries, the relative weights are arbitrarily assigned to equal one-third for each of the three factors.[36]

A potentially more realistic (but correspondingly much more data-intensive) approach to quantifying local expenditure needs is presented by the "traditional" Representative Expenditure System (RES). While this approach might be used in practice in the context

[34] Since the definition of the poverty threshold in the U.S. in 1960 varied according to family composition, we were unable to determine the exact number of poor residents by county based on the available data. For instance, the family poverty threshold for a family of two persons under age 65 for 1960 was set at \$1982. (U.S. Census Bureau, 2005). Correspondingly, we approximated the number of persons below the poverty line in each county based on the percent of families that had an income of under \$2000 (which is reported by the census) multiplied by the number of county residents.

[35] The infant mortality rate (Georgia Department of Public Health, 1962) was multiplied by each county's population in order to arrive at the infant mortality index.

[36] As noted in Section 3 of this paper, the selection of relative weights need not be done on an arbitrary basis.

of some developing countries, the quality of its results will depend crucially on the availability of expenditure data by function, and the availability of data on plausible client-bases for each expenditure category. For instance, in the case of 1960 Georgia, we were only able to identify two local spending categories. Local education was the only specific spending category for which we were able to obtain both spending data and a plausible corresponding client-group (namely the population of school-aged population). The financial (per-client) norm for education under this simple traditional RES suggested a local expenditure need of $260 per school-aged child (computed by dividing the aggregate local education spending of $276 million by the 1.06 million school-aged children). The only other spending category included in this traditional RES comprises all non-education spending, and uses population as its client-base ($84 of non-education spending per resident).

The final – and arguably the most complex - approach to quantify local expenditure needs is a regression-based Representative Expenditure System. Based on the available Georgia data for 1960, we experimented with a number of demographic, social and economic variables as potential explanatory variables for per capita expenditures in Georgia, including total population; percent of the population under 18 and over 65, respectively; percent of the population that lived in a rural place; the poverty rate; population density; infant mortality rate; and the enrollment rate. Guided by the relative significance of independent variables, the most successful RES model we were able to identify took on the form:

$$\text{PC EXP}_i = \beta_0 + \beta_1 \text{ POP} + \beta_2 \text{ RURAL} + \beta_3 \text{ METRO}$$
$$+ \beta_4 \text{ NOWATER} + \beta_5 \text{ POP<18} + \beta_6 \text{ TAXBASES} + \varepsilon_i$$

where population (POP) is measured in thousands, METRO is a dummy variable for counties within metropolitan areas, and all other independent variables (RURAL, NOWATER, and POP<18) are specified in percentages. TAXBASES represents a vector of local tax bases (including the value of taxable property, personal income and local payroll) to control for the impact of fiscal capacity on local expenditures. In computing the measure of local expenditure need using the regression results, the impact of fiscal capacity on expenditures is removed by assuming that all counties have an average level of fiscal capacity, so that:

$$LOCAL\ NEED_i = 99.2 + 0.046\ POP_i - 0.19\ RURAL_i - 18.6\ METRO_i$$
$$- 0.30\ NOWATER_i + 0.65\ POP < 18_i \ + \overline{TAXBASES}$$

The explanatory power (R^2) of the estimated model equals 0.45, and all independent variables were found to be statistically significant at 1 percent or greater. Based on this regression-based RES approach, local expenditure needs were estimated for each local government as the predicted value of per capita expenditures multiplied by each local government's population base.
The estimated local expenditure needs based on the regression-based RES is compared with the other seven proxies of local expenditure need in Section 5 of this paper.

B. Alternative measures of fiscal capacity

Similar to the computation of the different measures of local expenditure need based on the data available for Georgian counties in 1960, we also computed several alternative measures of local fiscal capacity, ranging from less to more sophisticated. These proxies include:

1. Actual and lagged local revenue collections;
2. Poverty as a proxy for local fiscal capacity;
3. Regional income level as a proxy of local fiscal capacity;
4. Average per capita personal income;
5. Traditional Representative Revenue System; and
6. Regression-based RRS

Again similar to the preceding discussion of local expenditure needs, the most obvious measure for a local government's level of revenue potential or fiscal capacity is the local government's actual own-source revenue collections. As highlighted in Table 7, own-source revenue collections in Georgia in 1962 ranged from $15 per person to $204 per capita, with an average level of local revenue collections of $129 per person. Yet, as was the case for the use of actual expenditures, the reliance on actual revenues as a measure of fiscal capacity would raise significant equity and efficiency issues. First, actual revenues may not reflect actual fiscal capacity – which should measure the potential of local governments to collect revenues. Use of actual local revenue collections in an unconditional transfer formula would reward well-endowed local governments who exert little of no fiscal effort, while penalizing poor local governments who exert a high level of fiscal effort despite their weak revenue base. Second, as discussed earlier, reliance on actual revenue collections as a measure of fiscal capacity in a transfer formula would provide local governments with an incentive to reduce own source revenue collections in anticipation of a larger grant. In order to circumvent this incentive issue, we also computed lagged revenue collections (along the lines of Ukraine's fiscal capacity measure) as an additional second-best measure of fiscal capacity.

As an alternative measure of fiscal capacity, data could be used for average personal income or median household income. Since household wealth arguably forms an important – if not the most important - local tax base, it is reasonable to expect that higher household incomes relate to a higher level of local revenue collection. This measure is further particularly expedient in developing countries where such data is peridically available from household expenditure (or income) surveys. For Georgia around 1960, county-level data on total personal income was extracted from Georgia's Statistical Abstract (1963), with per capita levels of personal income ranged from $505 to $3,334, averaging $1,200.

While the necessary personal income data may be available for local government areas in some developing countries, other countries may not produce such income data below the regional level. In order to determine whether there is value in using regional income as a proxy for local income as a measure of fiscal capacity, we compute average personal income per person for Georgia's nine economic regions (State Economic Areas, as defined by the Bureau of the Census in 1960) as an alternative measure of fiscal capacity for each of the counties located in the respective state economic areas. This approach results in a significant reduction of the range of fiscal capacity estimates from a minimum $1,006 to a maximum $2,066.

Another possible, albeit admittedly very indirect, proxy for a local government's revenue potential could be the share of the local population that is non-poor. In case there is no income of economic data available whatsoever at the local level, this proxy might be warranted on the assumption that there is a correlation between the relative number of presumptive taxpayers and local revenue collections.

A conceptually much more accurate (and conversely, more data demanding) approach measuring fiscal capacity is to relate local revenue collections to specific tax bases through a Representative Revenue System (RRS). A traditional RRS computes fiscal capacity by first, defining as many revenue categories as local revenue for which data on collections and the size of the tax base are available; second, measuring the overall average effective tax rate (AETR) for each different revenue category (as a ratio of aggregate local collections and the aggregate tax base), and third, computing the revenue potential for each subnational government by applying the various AETRs to the different local tax bases in locality. In the traditional RRS based on the historical Georgia data, we are able to identify only two distinct revenue categories: property tax collections and all other revenues. The average effective tax rate for local property taxation is $4.70 per $100 of taxable property, based on an aggregate assessed value of taxable property of $4.2 billion and aggregate local property tax collections of $198.3 million. The presumptive tax base for all other local government revenues is personal income, for which the average effective tax rate was computed at $2.59 per $100 of local personal income.

Although additional data were available on tax bases by county in Georgia from various census sources (including payroll and retail sales), we were unable to include these in the traditional RRS approach because we have no specific data on corresponding revenue collections. However, the regression-based RRS approach (like the regression-based RES) does not require direct linkages between specific revenue instruments (or categories) and specific tax bases. Instead, the regression itself will quantify the relative (direct and indirect) impacts of the various tax bases on the total amount of local revenue collections. Based on the available data for Georgia, the regression model with the highest explanatory power for per capita local revenues (PC REV) resulted in the equation:

$$\begin{aligned} \mathrm{FISCALCAPACITY}_i &= 50.3 + 0.024\ \mathrm{PC\ PROPERTYVALUE}_i \\ &+ 0.0027\ \mathrm{PC\ PERSINC}_i + 0.12\ \mathrm{PC\ PAYROLL}_i + \overline{\mathrm{NEEDS}} \end{aligned}$$

with a predictive power of 0.73, and all revenue parameters statistically significant at the 10 percent level or better. NEEDS reflect a vector of local needs measures (included in the RES regression above) which are controlled for and held constant for the purpose of computing local fiscal capacity. Inclusion of additional potential tax bases as independent variables (e.g., local retail volume) did not result in significance or an increase in the model's predictive power.

C. Which are the "true" measures of fiscal need and capacity

We started out this paper with the observation that unconditional grant systems generally aim to provide funding to equalize fiscal needs, fiscal capacity or the "fiscal gap" between needs and available resources. In order to achieve any of these three objectives, we need to consider which measures of expenditure needs and fiscal capacity should be considered "first-best".

The perception by some is that although actual local revenues and expenditures are unsuited as measures of needs and capacity in a transfer system due to their perverse incentive effects, they otherwise come quite close to reflecting actual needs and capacity. This would generally imply that measures such as lagged or base-year expenditures and revenues would be appropriate "true" measures of fiscal need and capacity. While we believe that correlation with actual expenditures and revenues is an important indicator of a well-performing proxy of needs and capacity respectively, there is no conceptual reason to consider that these measures are the best available proxies for need or capacity. Since there is no independently verifiable "true" or best measure of either expenditure need or fiscal capacity, we have to make a subjective judgment.

Instead of considering actual (or lagged) expenditures or revenues as the most appropriate indicator of fiscal need or capacity, we believe that the technically most sophisticated techniques (notably local expenditure needs computed using a regression-based Representative Expenditure System and local fiscal capacity measured by a regression-based Representative Revenue System, respectively) quite possibly provide the best possible measures. While all other measures of need and capacity are based on assumed relations between client- and tax-bases on one hand and expenditure needs and revenue potential on the other, regression-based RES and RRS quantify the strength and provide statistical feedback on the certainty of the relative relationship between tax base and collections. As such, we believe that regression-based RES and RRS – which are among the most data-intensive approaches – are most likely to provide us with the closest or first-best approximation of local expenditure needs and fiscal capacity. [37]

[37] Putting regression-based representative revenue and expenditure systems to good use requires that certain conditions are met besides data availability, for example adequate levels of expenditure and revenue autonomy at the local level. These conditions will not always be met. Thus even when data are fully available it may not be appropriate to try to implement an equalization formula based on representative systems. This paper does not suggest the use of representative systems as an ultimate goal in equalization formula design, but rather it uses this approach in a controlled environment to assess how well simpler methodologies may perform in arriving at expenditure needs and fiscal capacity measures.

5. Results

The relatively plentiful data for county-level governments in Georgia in 1960 allow us to quantify nine different measures of local expenditure needs and seven different measures of fiscal capacity. By combining the alternative measures, we could quantify the fiscal gap using 63 different combinations of fiscal needs and capacity measures. The question of interest, of course, is how well do each of the different measures compare against each other, and how well do they perform against the presumed first-best measures that rely on regression-based methodologies with data that are often unavailable in developing countries?

Our analysis here consists of three parts. First, we compare the various fiscal needs measures, and see how they compare to each other. Naturally, specific attention is paid to which second-best measure performs best in approximating the first-best measure of local expenditure needs. Second, we similarly look at the comparison and performance of the various fiscal capacity measures. Third, we quantify the first-best fiscal gap (local expenditure needs minus fiscal capacity) and compare its incidence pattern to the performance of the 62 second-best combinations that we were able to simulate based on the available data.

In our analysis, we compare the results of the different methodologies in two different ways. First, we compute the simple correlation coefficients for the various per capita levels of local needs and capacity. The correlation coefficient allows a statistical comparison of the different methodologies, albeit without taking into account the impact of variations in jurisdiction size on the ultimate allocations.[38] Also, the correlation coefficient is not helpful (as we note below) in assessing the performance of the per capita norm-based measure of local needs (since it contains no per capita variations). Therefore, in addition to the correlation coefficient, we have computed the total absolute deviation from the first-best option (referred to here as the "Index of Fit" or IOF) for a standard size transfer pool.[39] For each needs or capacity measure, the IOF indicates the amount of funds that would have to be reallocated in order to achieve the first best incidence in the distribution of a transfer pool of $1,000,000. For the purpose of analysis, we compute the IOF for the different second-best measures in Tables 8 and 9 not only against the first-best measure, but also against actual local expenditures and revenues, respectively.

[38] As a result, if a measure is a particularly poor predictor for fiscal capacity or needs of highly populated local government jurisdictions, then the correlation coefficient will over-state the performance of the measure at hand.

[39] Thus, the total absolute deviation (or index of fit) is computed as the sum over all counties of the absolute difference for each county between (1) the simulated allocation of $1,000,000 proportion to the first-best measure of needs (or capacity) and (2) the same grant pool allocated based on an alternative measure. The range of the IOF is from zero (perfect fit; no redistribution needed) to 2 (completely lack of fit; the entire fund needs to be redistributed in order to achieve the incidence of the first-best approach).

A. Assessing the different measures of fiscal need

The different proxies for local fiscal need are compared in Table 8, based both on the correlation of per capita needs (in the top panel of the table), as well as based on the Index of Fit (in the bottom panel). The first observation regarding the various measures of local expenditure needs is that – based on both the correlations as well as the IOF results - regression-based RES is not only arguably the best local needs measure on conceptual grounds, but that the first-best measure also achieves the closest correspondence with actual local expenditure patterns (r=0.54; IOF=$171,000).

Table 8.
Comparison of Different Measures of Local Expenditure Needs for Georgia, 1960

	Regr. RES	Trad. RES	Pov. Index	No Water	Infant Mort.	Index	P.C. Norm	Lag Exp.	Act. Exp.
	Correlation Coefficient, Per Capita Measures								
Regression RES	1.00								
Traditional RES	0.08	1.00							
Poverty Index	-0.22	0.69	1.00						
No Water Index	-0.53	0.53	0.58	1.00					
Infant Mortality	0.16	0.30	0.22	0.14	1.00				
Composite Index	-0.37	0.68	0.78	0.90	0.48	1.00			
Per Cap. Norm	0.00	0.00	0.00	0.00	0.00	0.00	1.00		
Lagged Expend.	-0.27	0.38	0.51	0.50	0.00	0.50	0.00	1.00	
Actual Expend.	0.54	-0.11	-0.26	-0.36	-0.06	-0.34	0.00	-0.05	1.00
	Index of Fit (Rank) from:								
Regression RES	--	0.085	0.471	0.880	0.260	0.484	0.059	0.911	0.171
Rank	--	2	5	7	4	6	1	8	3
Actual Expend.	0.171	0.226	0.581	0.978	0.351	0.596	0.202	1.017	--
Rank	1	3	5	7	4	6	2	8	--

Also notable is that there are substantive variations among the performance of the different measures. Although some combinations of measures reveal substantive positive correlation, many of the stronger positive correlations in the table are in fact spurious (particularly between the composite index and its components). More remarkable is the weak or seeming lack of correlation between many of the measures and the negative correlation between many of the measures with the regression-based RES approach and actual expenditures, respectively. Similarly, analysis of the IOFs supports the contention that the performance of the expenditure needs measures varies widely. Based on the index of fit from the first-best regression-based RES approach, the ranking of remaining measures of local expenditure needs range from per capita financial norm approach; the traditional RES; actual per capita expenditures; the expenditure needs index based on infant mortality; poverty; the composite needs index; the water access measure; and finally, lagged expenditures. Highlighting the poor performance of the worst-performing expenditure needs measure (lagged expenditures) is the fact that the index of fit between it and the first-best measure (based on a grant pool of $1,000,000) is an incredible $911,000.

Perhaps a surprising result of the simulations is that the best-performing alternative measure of local expenditure needs (even if we consider – despite efficiency concerns - actual and lagged expenditures) is the per capita expenditure norm, which allocates local expenditure needs exclusively in proportion to population. While this measure is in fact the least demanding in terms of data requirements, it clearly outperforms more technically complex measures such as the traditional RES and the composite index of local needs, and even performs better than actual expenditures. The policy implication of this finding – if confirmed by similar studies in other countries - would be that reliance on a simple per capita financial norms would be an appropriate and relevant measure of local expenditure need in the design of an unconditional (general purpose) transfer formula.

Based on the analysis contained in Table 8, poorly performing measures of local expenditure needs include the poverty measure, the composite needs index, water access and lagged expenditures. In fact, these four measures have an IOF from the first-best measure from slightly below $500,000 to over $900,000 (based on a simulated grant pool of $1,000,000). The weak performance of the poverty measure reveals a general weakness of efforts to allocate resources in a "pro-poor" fashion: the objective of (local) public spending is to fund government services and infrastructure to all residents - both rich and poor, not just the poor. Likewise, the poor performance of the composite needs index suggests that combining several different poverty-related measures into a single index – a common practice in many developing countries - does not necessarily improve the performance of the needs measure. Vaillancourt (2001) concludes the same in regards to various composite indices simulated for Newfoundland and Prince Edward Island.

B. <u>Assessing different measures of fiscal capacity</u>

The comparison of fiscal capacity measures provides an overall picture quite different from the analysis of fiscal needs measures. Arguably all simulated measures of fiscal capacity function as at least an adequate proxy of (the first best measure of) fiscal capacity; all (cross-)correlations are positive, most are substantive, and the indexes of fit indicate that all measures provide a reasonable measure of fiscal capacity. To be fair, we ought to note that the data requirements needed for any of these measures are still relatively hard to obtain in many developing and transition countries.

We again note that the regression-based Representative Revenue System (RRS) not only arguably provides the best measure conceptually, but is the fiscal capacity measure that correlates the closest with actual local revenue collections (r=0.83; IOF=$154,000).

If we were to exclude actual revenues as a viable alternative based on efficiency grounds, the order of second-best options based on IOF ranking from best to worst is: traditional RRS; personal income; average regional personal income; the percent of the population that is non-poor; and lagged revenues. Yet, even the worst-case scenario performs relatively well; only $223,000 would have to be redistributed from and to counties in order to get to the first-best allocation of resources.

Table 9.
Comparison of Different Measures of Local Fiscal Capacity for Georgia, 1960

	Regress. RRS	Trad. RRS	Personal Income	Regional Pers. Inc	Non-Poor Index	Lagged Own Rev	Actual Own Rev
Correlation Coefficient, Per Capita Measures							
Regression RRS	1.00						
Traditional RRS	0.90	1.00					
Personal Income	0.61	0.76	1.00				
Regional Pers. Inc.	0.29	0.36	0.42	1.00			
Non-Poor Index	0.63	0.61	0.72	0.47	1.00		
Lagged Own Rev.	0.70	0.57	0.44	0.17	0.46	1.00	
Actual Own Rev.	0.83	0.72	0.54	0.29	0.53	0.80	1.00
Index of Fit (Rank) from:							
Regression RRS	--	0.079	0.085	0.176	0.185	0.223	0.154
Rank	--	1	2	4	5	6	3
Actual Own Rev.	0.154	0.167	0.162	0.270	0.268	0.166	--
Rank	1	4	2	6	5	3	--

C. Assessing different measures of the fiscal gap

If our ultimate purpose in designing a formula-based grant is to equalize the fiscal gap between fiscal needs and fiscal capacity, what lessons does the simulation based on the Georgia data bear? In order to explore this question beyond the separate analysis of fiscal needs and capacity measures, Table 10 quantifies the Indexes of Fit between the "first-best" Fiscal Gap (needs minus capacity; restricted to prevent negative fiscal gaps) and all other second-best combinations of fiscal needs and capacity that we simulated based on the available data. As such, Table 10 allows us to compare the performance of all different combinations of need and capacity measures in achieving the first-best allocation pattern. The grey areas in the table are not attainable in a second best world due to data limitations or due to incentive concerns with using actual expenditures and revenues.

If we first consider which local expenditure needs measures (contained in the columns in Table 10) generally perform best, the performance of the per capita financial expenditure norm and the traditional Representative Expenditure System stand out as performing significantly better than any of the other expenditure measures. This is consistent with the analysis of the fiscal needs measures above. Furthermore, in the context of fiscal gap measures, both of these factors perform substantially better as measures of fiscal needs than either actual local expenditures or lagged expenditures (but without the associated incentive problems).

Having identified and selected the two most likely expenditure needs measures, the best-performing fiscal capacity measure in quantifying a second-best fiscal gap (given the two selected expenditure needs measures) is in fact regional personal income. While this ranking is not universal across all other measure of local expenditure needs, this finding is consistent for the two main needs measures under consideration. At the same time, we observe again that the performance of the different fiscal capacity measures is much more similar, and that given the selection of the fiscal need measure, virtually all measures of fiscal capacity seem to perform at least adequately.

Another observation of interest is that, in equalizing the fiscal gap, personal income, the non-poor index and regional personal income levels – which all fared relatively poorly as measures of fiscal capacity in isolation (Table 9) – achieve a good approximation of the fiscal gap. The performance of these proxies is in fact better than more intuitive second-best measures of fiscal capacity (such as actual collections or lagged collections) or conceptually more appealing alternatives (such as the traditional RRS). In other words, our results suggests that just because a potential allocation factor is not the best measure of fiscal capacity (or fiscal need for that matter), this does not mean that it may not be the best suited for quantifying the fiscal gap to be equalized.

Thus, depending on the selection processes and criteria, policy makers may arrive at one of several acceptable choices for a second-best fiscal gap measure in the historical Georgia exercise. Interestingly, the gap between actual expenditures and actual revenues (which local governments would consider their actual fiscal gap) proves to be a fairly poor indicator of the first-best fiscal gap measure, ranking only 19th behind numerous other plausible second-best options. Likewise, lagged expenditures and revenues performed quite poorly as proxies for expenditure needs and fiscal capacity, respectively. In contrast, measures of fiscal needs and capacity which have relatively limited data requirements seem to perform very well in quantifying the fiscal gap to be filled by the simulated equalization grant in Georgia.

6. Conclusions

Before drawing any lessons from the simulations for Georgia in 1960, we should caution against over-generalizing the results. Although we believe the results obtained for Georgia hold some general conclusions for the design of intergovernmental grant systems in the presence of imperfect data (particularly for developing countries), we recognize that the specific results of the current exercise are unique to the data availability and the social, economic and fiscal conditions prevalent in Georgia in 1960. While some of our results and conclusions were consistent with earlier studies (e.g., Vaillantcourt 2001), such exercises should be further replicated to confirm their general applicability, preferably on the basis of actual developing country data.

However, in general, we believe this exercise has contributed to the body of knowledge on transfer design. First and foremost, it has demonstrated the importance of measurement issues and the selection of allocation factors in the process of designing and implementing an intergovernmental grant scheme. Table 10 highlights the huge variation of outcomes that can be achieved with the same formula but with different measurement methodologies, particularly when it comes to the measurement of local expenditure needs. In addition to more careful analysis of proposed measures of fiscal need and capacity, much greater attention should be paid to the collection of sound data that could serve as an appropriate basis for these measures.

A second general conclusion from the current study is that the best measures of fiscal needs and capacity are not necessarily data-intensive. In fact, one of the best-performing formulas in the current exercise relied exclusively on two variables: population, in order to construct the per capita financial expenditure norm, and regional household income, in order to compute the fiscal capacity measure. Indeed, more computationally complex measures of need and capacity did not necessarily fare any better, and in fact often performed worse. Given the poor performance in our simulations of many commonly used measures of expenditure need and fiscal capacity (particularly measures based on lagged expenditures and revenues as well as pro-poor composite indexes), the selection of these measures may actually reduce the effectiveness of the transfer schemes in achieving their policy objectives.

Table 10.
Index of Fit (total absolute deviation) from first-best fiscal gap measure
(Rank in parentheses)

	Regr. RES	Trad. RES	Poverty Index	No Water	Infant Mort.	Index	P.C. Norm	Lagged Exp	Actual Exp	Average
Regression RRS	0 (0)	0.209 (10)	0.747 (37)	0.909 (50)	0.59 (28)	0.752 (39)	0.145 (3)	1.026 (58)	0.42 (23)	0.533 (28)
Traditional RRS	0.100 (1)	0.235 (13)	0.737 (36)	0.896 (49)	0.592 (29)	0.732 (35)	0.198 (8)	1.008 (56)	0.387 (20)	0.543 (27)
Personal Income	0.119 (2)	0.226 (11)	0.784 (42)	0.922 (52)	0.611 (31)	0.771 (40)	0.180 (6)	1.032 (60)	0.48 (25)	0.569 (30)
Regional Personal Inc.	0.259 (14)	0.172 (5)	0.774 (41)	0.921 (51)	0.573 (26)	0.751 (38)	0.170 (4)	1.037 (61)	0.588 (27)	0.583 (30)
Non-Poor Index	0.271 (15)	0.192 (7)	0.829 (48)	0.944 (54)	0.593 (30)	0.806 (45)	0.202 (9)	1.065 (62)	0.635 (33)	0.615 (34)
Lagged Own Revenue	0.329 (18)	0.412 (22)	0.809 (46)	0.958 (55)	0.636 (34)	0.826 (47)	0.396 (21)	1.03 (59)	0.479 (24)	0.653 (36)
Actual Own Revenue	0.227 (12)	0.327 (17)	0.789 (44)	0.928 (53)	0.625 (32)	0.786 (43)	0.308 (16)	1.024 (57)	0.348 (19)	0.596 (33)
Average	0.186 (9)	0.253 (12)	0.781 (42)	0.925 (52)	0.603 (30)	0.775 (41)	0.228 (10)	1.032 (59)	0.477 (24)	

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