MACROECONOMIC VERSUS RTS MEASURES OF FISCAL CAPACITY: THEORETICAL FOUNDATIONS AND IMPLICATIONS FOR CANADA[1]

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INTRODUCTION

In Canada, as in other federal countries, financial transfers from the national government provide an important share of the revenue available to subnational (provincial and local) authorities. Recognizing that provinces vary widely in fiscal capacity—that is, in their ability to raise revenue from their own sources—and having taken the political decision to limit inter-provincial fiscal disparities, Canada distributes its federal-to-provincial transfers so as to compensate, in part, for these capacity variations. The main compensation mechanism is a program that gives general-purpose (unrestricted) equalization grants to each province that falls below a certain capacity standard, with per capita grant amounts apportioned in a negative relationship to the province's own revenue-raising ability.[2] Under such an arrangement, the method of measuring fiscal capacity strongly affects the distribution of equalization funds, and hence both the tax rates that provinces impose and the levels of services they provide.

Since 1982, Canada has based the distribution of equalization aid on a fiscal capacity measure known as the Representative Tax System (RTS) Index. This type of index, introduced by U.S. economists in the early 1960s, measures the relative revenue per capita that each province would raise if it applied a national-average tax rate to its actual tax bases (but with provincial tax bases defined and measured in a uniform, "nationally representative" manner).[3] As calculated by the Department of Finance, 1999-2000 values of the Canadian RTS vary among provinces by a factor of 2.3, ranging from a low of 61.3 for Newfoundland to a high of 142.0 for Alberta, where 100 represents the average capacity of the nation as a whole.[4] Based on these scores, seven of Canada's ten provinces qualified for equalization aid in 1999-2000, with aid allotments varying from $326 (Saskatchewan) to $2,014 (Newfoundland) per capita (Canada Department of Finance, 2001).[5]

Now the question has been raised (or has re-emerged) of whether the RTS index is the appropriate indicator of fiscal capacity. Should it be retained in Canada's equalization aid formula, or should it be replaced with a different capacity measure? In particular, would a macroeconomic variable, such as the per capita gross domestic product (GDP) of a province, provide a more valid basis for distributing equalization funds?

To help answer these questions, this paper assesses the theoretical validity and conceptual soundness of both the RTS indicator and selected macroeconomic capacity indicators. I examine the logic underlying each measurement method, the compatibility of each method with pertinent economic theory, and the suitability of the method, in principle, for its intended use in the equalization program. The macroeconomic indicators considered include personal income, broader measures of resident income, gross domestic product and related product measures, and certain composite indicators, including the income-product amalgam known as total taxable resources. Some of these are discussed in more detail than others, depending on the range of conceptual issues raised by each approach.

The paper does not offer a full evaluation of the rival approaches. Such an evaluation would have to cover not only the theoretical aspects but also such practical matters as the availability, quality, and timeliness of data; the appropriateness of specifications and statistical methods; and even the political acceptability of the different indices. To best serve Canadian policymakers, these practical aspects should be examined by persons who, unlike myself, are well informed about the economies and public finance systems (especially the tax systems) of the individual provinces, as well as the relevant economic and financial statistics. What follows, then, should be viewed as pertaining to only one portion of the broader review process necessary to decide which capacity measure is best-suited for Canada.

THEORETICAL FOUNDATION

"Fiscal capacity" refers, in general, to the relative ability of a subnational unit of government (or a set of such units) to generate funds from its own revenue sources. For the purposes of this paper, the relevant unit is the public sector of a Canadian province, meaning the combination of the provincial government and all its subordinate local governments. A fiscal capacity index is, in operational terms, a ratio or percentage measure representing the own-source revenue per capita that a province would generate in a particular year under specified hypothetical standard conditions (for example, if each province taxed itself at national-average rates or devoted a standard percentage of provincial GDP to public purposes), expressed relative to the own-source revenue per capita that would be generated nationally under the same hypothetical conditions.

By convention, fiscal capacity indicators generally measure relative ability to generate nominal dollars, not price-adjusted ("real") dollars. This is not because the index developers have failed to recognize that costs of public services vary geographically but rather because the specialized methods and data sets needed to measure cost variations make separate treatment necessary. Questions as to whether Canada's equalization aid formula should reflect cost as well as capacity differences and how the former might be measured deserve serious attention, in my opinion, but are beyond the scope of this paper.

A basic premise underlying all attempts at capacity measurement is that one can distinguish analytically between a province's ability to generate revenue (fiscal capacity) and its choices about how much revenue to generate (fiscal effort). Fiscal capacity is posited to be an inherent characteristic of a province's economy, determined by the province's economic resources, economic activities, and/or revenue bases. It is intended to represent what the province's people and governments could do, not what they choose to do. Consequently, a fiscal capacity index should reflect the economic or financial resources or revenue bases on which the province can draw but should not reflect decisions of the provincial government or local governments about how much revenue to raise or in what forms to raise it. Whether, or to what degree, the RTS or any proposed alternative capacity indicator achieves this separation is a key consideration in judging its theoretical soundness.

The Provincial Budget Constraint

The body of positive economic theory to which the idea of fiscal capacity is most closely related is the theory of subnational—that is, state and local, or provincial and local—fiscal behavior. That theory seeks to explain interjurisdictional and intertemporal differences in levels and patterns of public spending and taxation and also to provide a basis for predicting public-sector responses to changes in circumstances, including, for example, responses to increments in federal financial aid. One key concept from that theory, the *budget constraint* facing a governmental unit (henceforth I will say "province"), provides the conceptual foundation for fiscal capacity measurement.

The budget constraint of a province represents the range of fiscal choices available to the people and governments of that province in a particular time period. Basically, it is a mathematical statement to the effect that a province's total expenditures for all purposes, public and private, cannot exceed the total funds available to the province's private and public sectors. In its most basic form, the provincial budget constraint stipulates that the combinations of public revenue per capita and private disposable income per capita among which a province can choose are limited by the province's total purchasing power, where total purchasing power consists of

- the province's *total resident income, comprehensively measured*—that is, the total income of all economic units, both households and businesses, within the province, *less* taxes paid to the central government
- *plus* central-government financial aid to the provincial government and its subordinate local governments
- *plus* taxes and other public revenues collected from nonresident households and businesses, known as *exported taxes*.

The concepts of "total resident income, comprehensively measured" and "tax exportation" are crucial in assessing fiscal capacity indicators, and both require explanation.

Total resident income, comprehensively measured, is an idealized income concept, broader than personal income or any of the other income variables found in conventional economic statistics. It includes all business income, not just the portion, dividend payments, reflected in personal income statistics. In principle, it corrects for deviations of conventional income accounting from "economic income," such as capital consumption allowances in excess of true economic depreciation. Particularly important for capacity measurement, it takes account (again, in principle) of all returns to real and financial assets, including such things as imputed returns to residential property and realized and unrealized capital gains. Thus, it would be unnecessary, if a comprehensive resident income measure were available, to worry about including separate wealth components, in addition to income components, in a capacity index.[6] Full quantification of anything closely approximating so broad a definition of provincial resident income has been, and is likely to remain, infeasible, in large part because of the difficulty of measuring the wealth components. Nevertheless, the concept provides a useful benchmark against which to judge the comprehensiveness of alternative capacity measures.

Tax exportation is the phenomenon that most complicates capacity measurement. Without it, there would be much less scope for theoretical controversy. Tax exportation occurs whenever a province succeeds in collecting taxes or other public revenues from nonresident persons or businesses.[7] The items taxed may include sales of goods and services to nonresidents, earnings of nonresidents who work in the province, proprietary income of nonresident owners of businesses, property located in the province but owned by nonresidents, and the portion belonging to nonresident stockholders of corporate profits taxable by the province. In principle, one could measure the rate of exportation (fraction paid by nonresidents) of each individual type of tax and of all of a province's taxes combined.

The extent to which a province can extract taxes from nonresidents depends partly on geography, a key factor being proximity to the population centers of other provinces—or, in the case of Canada, to population centers of the United States. Proximity obviously influences, for example, the prospects for retail sales to nonresidents and the number of nonresidents who can commute to work in the province. Geography also is a major determinant of the potential for tourism, which is in some instances a major source of exported taxes.

The composition of a province's economic activity also affects the percentage of taxes that can be exported. Apart from tourism, such other activities as financial services can generate substantial exported taxes (as, in the U.S., for Delaware and New York). But the exported taxes that seem most to affect fiscal capacity are taxes on extraction of oil, coal, gas, and other natural resources. In both the U.S. and Canada, most customers and most owners of the energy-producing industries live outside the states or provinces in which those industries are located, making it possible for those states or provinces to generate large amounts of revenue from resource taxes that fall mainly on nonresidents.

According to estimates prepared in 1985 (which, to my knowledge, have not been updated), rates of tax exportation varied from about 5 to 25 percent among the U.S. states (excluding Alaska), an average national rate of about 9.3 percent.[8] Ignoring these variations—which is what the U.S. did, in effect, by choosing per capita personal income as its main capacity indicator—produced errors in fiscal capacity scores ranging up to 10 or 15 percentage points for certain states. I do not know whether any tax exportation estimates exist for Canada; if not, it would be prudent to assume that inter-provincial variations of comparable magnitude might exist.

The budget constraint facing a province can be expressed, in simplified form, as

$$R + D = Y + eR,$$

or, equivalently,

$$R(1-e) + D = Y,$$

where R is own-source provincial revenue per capita; D is per capita disposable income (money available for private spending) after both federal and provincial taxes; Y is per capita resident income, comprehensively defined and after federal taxes; and e is the fraction of own-source revenue raised from nonresidents, or the tax exportation rate. This equation expresses the proposition that total provincial income (broadly defined and after federal taxes) must be divided between private use and financing of the nonexported share, $1 - e$, of own-source revenue.

The per capita revenue raised by a province depends, of course, not only on the province's fiscal options, represented by the foregoing budget constraint, but also on fiscal effort, the share of "economic income" the province chooses to devote to the public sector. What counts for measuring fiscal capacity, however, is not the choices but the options. Given a province's budget constraint, its fiscal capacity is determined, regardless of how light or heavy a tax burden that province's governments decide to impose. Since the provincial budget constraint depends only on comprehensively measured resident income, Y, and the tax exportation rate, e, each province's fiscal capacity should be fully determined, in theory, by the same two factors as well.

For instance, if we were to define a province's fiscal capacity as the relative per capita revenue that the province would generate by devoting a nationally standardized fraction, b, of its resident income to the public sector, the foregoing budget constraint would become $R(1-e) + Y(1-b) = Y$, which implies $R = bY/(1-e)$. The corresponding fiscal capacity index would take the form,

$$C = \frac{R}{R_0} = \frac{Y/(1-e)}{Y_0/(1-e_0)},$$

where the variables without subscripts are for the province and those with 0 subscripts are for the nation as a whole. This may be termed an export-adjusted relative income index.

Unfortunately, in practice we have available neither a satisfactory measure of provincial economic income nor any estimates of provincial rates of tax exportation, so such an index cannot be constructed directly. Lacking the necessary ingredients, we are left to choose among a variety of empirically manageable indices that approximate the theoretical ideal to greater or lesser degree. These include the RTS index and the various macroeconomic indices currently under discussion.

Drawing on the framework above, I assess the theoretical validity and conceptual soundness of both RTS and macroeconomic indicators in terms of the following criteria:

- *Comprehensiveness*. How close does the indicator come to taking into account, directly or indirectly, all elements of a province's total resident income, comprehensively defined?
- *Treatment of tax exportation*. To what extent, and in how appropriate a manner, does the indicator take account, directly or indirectly, of a province's ability to collect revenue from nonresidents?
- *Extraneous factors and feedback*. To what degree is the indicator free from being influenced by a province's economic or fiscal choices or other extraneous factors—i.e., factors that do not enter into the computation of, or serve as proxies for, resident income or its components or tax exportation rates?
- *Structure*. Are the constituent factors of the indicator assembled in a manner compatible with theory, and are the index parameters or weights, if any, consistent with what is known about patterns of subnational fiscal behavior?

THE REPRESENTATIVE TAX SYSTEM

Before commenting on the RTS's validity, I think it instructive to note the reversal of the role of the RTS between the current Canadian debate and earlier U.S. debates over capacity measurement. In Canada, the RTS is used to distribute federal equalization aid, and the argument is over whether it should be replaced by a macro indicator of income or economic output. In the U.S., the main capacity indicator in use when capacity measurement was last seriously debated (in the mid-1980s) was per capita personal income (PCPI), and the argument was over whether PCPI should be replaced by either a broader macroeconomic indicator or an RTS index like the one Canada uses now. The outcome in the U.S. was a victory for the status quo. PCPI is still the fiscal capacity factor in most U.S. formulas for distributing federal aid to states; the RTS, though repeatedly put forth as an alternative, has never been accepted. (More recently, however, PCPI has been replaced in two U.S. formulas by the aforementioned indicator of "total taxable resources," which is discussed below.) Although the U.S. debates did little to change policy, they did much to clarify the strengths and weaknesses of the RTS and macroeconomic approaches, and some of those findings can be put to good use in the current Canadian situation.

The Canadian RTS Index

Canada constructs its RTS index by adding up, for each province, the per capita revenue yields that would be obtained by taxing each provincial tax base at a national average ("representative") rate, and then expressing the resulting total yield as a percentage of the similarly calculated per capita yield for the nation as a whole. For the purpose of this calculation, each of more than 30 provincial tax bases—the personal and business income tax bases, the general sales tax base, various selective sales and license tax bases, the property tax base, multiple resource tax bases, etc.—is first defined and measured (or, where necessary, estimated) in a nationally uniform, standardized (again, "representative") manner. Equivalently, the RTS can be calculated as a weighted sum of relative per capita tax bases, where the weights are the proportions of total provincial revenue derived nationally from each type of tax. The latter formulation has the advantage that it brings out clearly the relative importance of each tax base in determining the provinces' RTS scores.

The composition of Canada's RTS index for 1998-1999 is summarized in Table

1. The line items are either individual tax bases or groups of related tax bases. The numbers are the percentages of total revenue (more precisely, revenue subject to equalization) accounted for by each type of tax, as reported in Canada Department of Finance (2000). Table 2 shows the 1999-2000 RTS scores by province, ordered from highest to lowest.

I comment below on the comprehensiveness of the RTS and the adequacy of its treatment of tax exportation and then on the broader issue of the logical soundness of the RTS approach. The latter topic subsumes the questions of whether the various RTS tax bases are legitimate capacity factors and whether the RTS structure, including the index weights, comports with theory. Except for a few remarks in passing, I do not deal with questions about how the index developers have selected, defined, and measured individual RTS tax bases. Some such questions clearly warrant attention—at least if one assumes that the RTS will be retained—but they need to be examined in more detail than is possible here, and in light of the Canadian data.

Comprehensiveness

Does the RTS provide comprehensive coverage of resident income? One must first ask, "compared with what?" In U.S. debates, where the comparison usually was with PCPI,

Table 1. Composition of Canada's RTS Index, 1998-1999

Tax Base	Weight (%)
Personal income tax	27.3
Business income and capital taxes (2 bases)	9.3
General sales tax	14.8
Selective sales taxes and license fees (10 bases)	11.8
Oil, gas, and other energy and resource taxes (12 bases)	2.4
Property taxes	18.9
Payroll taxes	4.2
Lottery revenues	2.4
User charges and miscellaneous (4 bases)	8.8
TOTAL	100.0

Table 2. RTS Scores by Province, 1999-2000

Alberta	142.0
Ontario	107.9
British Columbia	99.5
Saskatchewan	91.0
Quebec	85.1
Manitoba	80.4
Nova Scotia	73.6
New Brunswick	71.3
Prince Edward Island	66.7
Newfoundland	61.3
ALL CANADA	100.0

RTS proponents had some grounds for claiming greater comprehensiveness. For instance, the RTS reflects certain portions of business income (e.g., retained earnings) and certain returns to assets that a PCPI index leaves out. On the other hand, the RTS is less comprehensive than PCPI in other respects. For instance, its income component excludes elements of personal income not subject to income taxation, even though such elements obviously contribute to residents' purchasing power. It is not entirely clear how these differences in coverage balance out, but if the RTS is more comprehensive, it can only be by a modest amount.

But when the comparison is against a broader macroeconomic indicator of resident income—say, a measure of provincial income analogous to gross national income—the issue of comprehensiveness tilts against the RTS. For instance, unlike a PCPI index, a broader provincial income index would cover the non-dividend portion of measured business income; and unlike an RTS index, it would cover both the taxable and the nontaxable components of measured personal income. Therefore, if comprehensiveness in representing resident income were the only criterion, a broad macroeconomic indicator would be preferred.

Treatment of Tax Exportation

The most persuasive claim made for the RTS by its U.S. proponents was that the RTS, unlike PCPI, takes tax exportation into account. This argument is generally valid. Clearly, the RTS does a better job than any index of resident income, even the broadest one, in representing the capacities of energy-tax-exporting and other major tax-exporting states. For instance, the RTS covers earnings of nonresident workers (insofar as they are taxable), business and property income received by nonresident individuals and companies, and the opportunity to tax energy production for the export market, all of which are missing from PCPI.

Some of the RTS's apparent advantage in this regard evaporates, however, when it is compared not against PCPI or another resident-income variable but against a macroeconomic output measure such as per capita GDP. A GDP index does reflect such things as the profits, interest, rents, and other forms of non-wage income generated within a province but received by nonresident owners of businesses or property, hence it also reflects the potential to extract revenue from nonresidents by taxing those income flows. Still, the RTS retains its advantage in one major respect: unlike the macroeconomic indicators, it takes into account exportation that does not involve cross-border income flows—namely, exportation based on taxable sales to nonresident visitors (tourists and others) to the province in question.

The RTS method does not quantify actual provincial rates of tax exportation but rather, in effect, attributes to each province the exportation rate that would exist if the province taxed all its revenue bases at national-average rates. Thus, exportation rates are exaggerated where provinces apply below-average rates to exportable taxes and understated where they apply above-average rates. As I have shown elsewhere (Barro, 1985), the resulting distortions of the RTS scores of major U.S. energy-producing states have been large in some instances. If one were to assume, not unreasonably, that states or provinces attempt to set rates for heavily exported taxes so as to maximize the proceeds, it would follow that one should use actual rather than average tax rates to calculate yields from resource taxation; but to do so would clash with the standard RTS approach. There seems to be a tradeoff, in this regard, between accurate measurement of the contribution of exportation to fiscal capacity and full adherence to RTS methodology.

The Logic of the RTS

RTS Tax Bases as Capacity Factors

The two issues just discussed are minor compared with the more fundamental issue of whether the tax bases that enter into the RTS are legitimate fiscal capacity factors. From my perspective, many of them are not. Much of the RTS index—Canadian and U.S. versions alike—is made up of tax bases that reflect patterns of consumption or resource use within a state or province rather than resource availability or purchasing power. In consequence, RTS scores reflect the economic and fiscal choices made by a province's people and its governments. This violates the premise that a capacity index is supposed to measure what each province is capable of doing, not what it chooses to do.

Consider the general and selective sales tax bases, which together account for almost 27 percent of the total weight of the Canadian RTS index. Suppose that no sales taxes were exported—that is, assume, for the moment, that all taxable sales are to residents of the province in question. Suppose further that two provinces have equal per capita incomes, but one has lower per capita retail sales than the other. For the difference in taxable sales to exist, the residents of the first province must be allocating a larger fraction of their income to expenditures not subject to retail sales taxation. For instance, they may be spending more on untaxed food, saving more, or devoting a larger share of income to the public sector. According to the RTS method, this province has lower fiscal capacity than the province whose residents choose to spend more of their income on taxable retail purchases. But such a result makes no economic sense. Under our assumptions, the two provinces have identical budget constraints, which means that their inhabitants could, if they so chose, spend identical amounts per capita for all purposes, public and private. They have exactly the same purchasing power and the same range of economic and fiscal choices. It cannot be correct to say that a difference in people's preferences for untaxed food, savings, and public services, on one hand, versus, say, taxable consumer durables, tobacco, and alcoholic beverages, on the other hand, translates into an inter-provincial difference in fiscal capacity; yet that is what the logic of the RTS method requires. Once the level of resident per capita income is known, knowing the volume of sales to residents adds no information regarding the ability of a province to finance its public sector. Only sales to nonresidents, which allow the province to collect exported taxes, add to the capacity that a given per capita income implies. I conclude, therefore, that inter-provincial variations in per capita sales to residents should not influence a fiscal capacity index; only variations in sales to nonresidents should be reflected in the capacity calculations.

Much the same can be said, but with some additional complications, of the property tax base (19 percent of the total RTS weight), particularly its residential component. A difference in per capita residential property value between provinces with equal per capita income may signify either that (1) the residents of one province choose to consume more housing, on average, than residents of the other province—that is, they buy larger or higher-quality homes—and spend less on other goods or services, or (2) one province has higher housing prices than the other—meaning that its residents must pay more for homes of equal size and quality. Neither possibility implies that the province with more residential property per capita is better able to pay for public services. If anything, higher property values stemming from higher housing prices should be *negatively* associated with fiscal capacity, since the residents of the province with high housing costs will be left, other things being equal, with less money to spend for everything else, including public services. I would add the qualification, however, that to the extent, if any, that returns to residential property are not reflected in income figures (e.g., because of unmeasured appreciation), property value may serve as an imperfect proxy (homeowners' equity would be more appropriate) for an unmeasured component of wealth. For that specific reason, residential property value may have a legitimate role in the capacity index, but one that merits much less weight than the standard RTS method assigns.

When this same mode of analysis is applied to all the major RTS tax bases, it becomes apparent that the inclusion of consumption tax bases and other extraneous factors in the index seriously undercuts the RTS's claim to validity. The general sales, selective sales, and license tax bases have theoretically justifiable roles in a capacity indicator only to the limited extent that they represent the bases of exportable taxes. The residential and nonresidential property tax bases play legitimate roles in the index only insofar as such taxes are exported or, as mentioned above, to the extent that they serve as proxies for otherwise unmeasured wealth. The RTS method of assigning weights to these tax bases grossly overstates their importance relative to that of income. In sum, tax bases that make up nearly half the RTS index either should not be in the index at all or should receive much less weight than the RTS method accords them.

The theoretical problem identified here stems directly from the basic RTS premise that fiscal capacity is a function of the statutory tax bases available to a province rather than the province's underlying income and wealth. From that premise stems the failure to distinguish between those tax bases that correspond to, or serve as proxies for, elements of income or wealth and those that reflect only, or mainly, patterns of consumption or resource use. In the RTS index, statutory tax bases that have only a limited legitimate role in a capacity index, mainly that of representing opportunities for exportation, are assigned weights far in excess of their true incremental contributions to capacity. In my U.S. work, I was able to offer estimates (Barro, 1985) of the resulting distortion of RTS capacity scores. Whether Canada's RTS scores are similarly distorted, and whether equalization allotments are significantly skewed as a result, are issues requiring empirical analysis, not issues that a theoretical critique can address.

The RTS Structure and the Validity of Index Weights

The mathematical structure of the RTS index, a weighted sum of per capita tax bases, implies that (1) an increment in any statutory tax base increases a province's fiscal capacity, (2) a province's fiscal capacity is the sum of its independently determined capacities to impose each statutory form of tax, and (3) the capacity to raise revenue from a particular tax depends only on the size of the base on which that tax is levied, not on any other element of the province's income or wealth. The notion, in other words, is that income generates a capacity to raise income taxes, property generates a capacity to raise property taxes, and retail sales generate a capacity to tax sales, but income does not influence the capacity to tax either sales or property. Canada not only presents figures on the supposed capacity to raise each separate type of tax but even calculates equalization aid amounts one tax base at a time.

This conception of capacity is unacceptable from an economic perspective. First, the ability of a province to pay for public services depends ultimately on the overall purchasing power of its people, as supplemented through tax exportation, regardless of the forms in which taxes are collected. Citizens must pay all taxes, whether based on sales, property value, gasoline consumed, or cigarettes smoked, either from current income or by drawing down assets. Second, as already discussed, some statutory tax bases make no independent contribution to ability to pay. There is no sales tax capacity per se, only the opportunity to tax income as it is expended for taxable retail purchases. Third, if one province has a higher per capita personal income than another, that province has greater ability to collect not only income taxes but also all other types of revenue from individuals—consumption taxes, property taxes, and even such nontax items as lottery proceeds. To assume the contrary yields nonsensical results. For instance, if income were not directly taxable by provinces, the RTS methodology would imply that differences in income had no bearing at all on how much revenue different provinces could obtain.

To illustrate why the RTS approach is ultimately flawed, I offer this slightly surrealistic but instructive hypothetical example: Suppose that provinces were required to raise their revenue from a head tax—that is, a flat levy of X dollars per person. According to the logic of the RTS, each province's capacity to raise revenue from this tax would depend on the size of its tax base, which, in this case, would be the number of heads. But RTS scores are calculated by comparing *per capita* tax bases, and since the number of heads per capita would be exactly one everywhere, we would be forced to conclude, according to RTS methodology, that every province has identical capacity to generate head-tax revenue. Does this make sense? Clearly not, since the amount of head tax each province's residents could pay obviously would depend on the residents' income. What we would expect to see as provinces chose their tax rates is a positive relationship between provincial per capita income and the size of the tax on each head. That is, the amount of revenue raised per capita would vary in relation to general purchasing power per capita, notwithstanding the complete equality of the nominal tax base, heads per capita, across provinces. The same would be true—income would remain the key determinant of spending (as modified by differences in the potential to export taxes)—even if provinces were obliged to rely entirely on such non-income bases as property and sales.

Feedback from Fiscal Choices to Fiscal Capacity

All fiscal capacity indicators are susceptible to some degree to influences of fiscal choices on capacity scores, but the RTS index seems to be particularly vulnerable in this regard. Of the three main feedback mechanisms identified in the capacity literature—spatial shifting of economic activity, changes in levels or mixes of spending in response to differential tax rates, and capitalization of taxes into asset prices—only the first applies to income. In comparison, the first two mechanisms apply to sales tax bases, and all three apply to property tax bases. Moreover, while spatial shifting occurs gradually, the other feedback effects can occur quickly. Thus, the distorting effects of feedback on capacity scores are likely to be more serious for the RTS index, which is based heavily on sales and property tax bases, than for the macroeconomic measures.

Of particular concern with respect to the RTS is the likelihood of a feedback effect from fiscal effort to fiscal capacity. Such an effect arises because, other things being equal, provinces that devote larger percentages of resident income to the public sector will have less income remaining for private consumption, including housing consumption and the types of consumption subject to general and selective sales taxes. Consequently, if two provinces have identical budget constraints but one exerts greater fiscal effort than the other, the former will have lower taxable sales and residential property per capita, and so will appear—incorrectly—to have lower capacity, as measured by the RTS method. Thus, the RTS has a built-in tendency to underestimate the capacities of high-effort provinces and to overestimate the capacities of low-effort provinces, even apart from any tax-induced changes in private-sector economic behavior.

MACROECONOMIC INDICATORS

The Canadian authorities now seem to be considering several macroeconomic indicators as potential replacements for the RTS index in the equalization aid formula. These indicators differ in such respects as whether they are gross or net of capital consumption, whether they are measured in market prices or at factor cost, and whether they have been adjusted to exclude direct federal taxes. From a theoretical perspective, however, a more fundamental distinction is that between macroeconomic indicators of *income received* and *income produced.* Income received is income attributable to labor supplied by, and property owned by, residents of a province, even if that labor is used, or the property is located, outside the province. Income produced is income attributable to labor or property located within the province, even if that labor is supplied, or the property is owned, by nonresidents. For instance, an income-produced measure includes the earnings of nonresidents who work in the province but excludes the earnings of residents who work outside the province; for an income-received measure, the opposite is true.

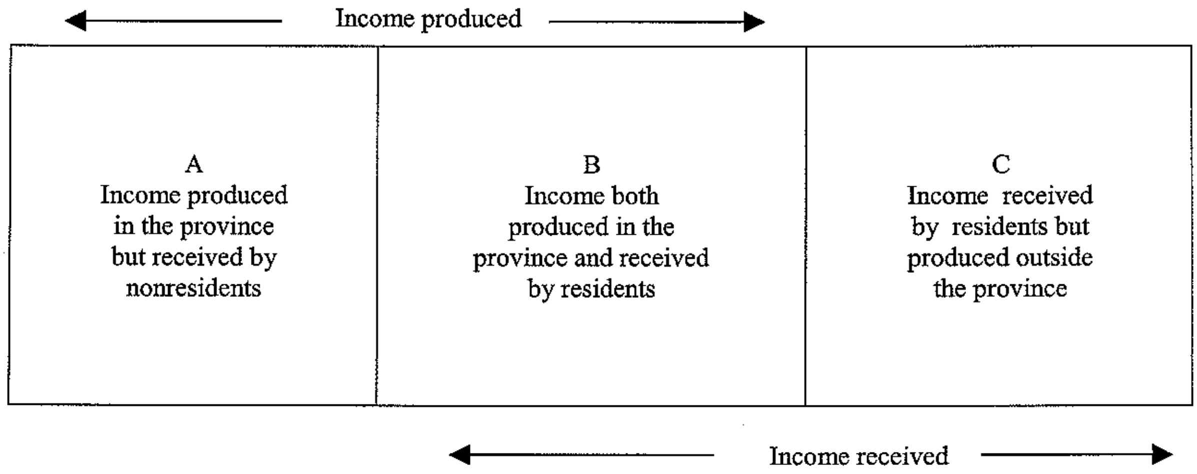
Consider the three-way categorization of income depicted in the following diagram. The central block [B] represents income that is both produced within a province and received by that province's residents. The left-hand block [A] represents income produced in the province but received by nonresidents. Taken together, blocks A and B constitute the province's total income produced. The right-hand block represents income received by a province's residents from activities undertaken outside the province's borders. Taken together, blocks B and C represent the province's total income received, including the portion earned from work performed or property owned in other provinces or other countries.

The diagram underscores the point that no standard macroeconomic indicator reflects the full range of income or product flows potentially taxable by a province. Each omits either block A or block C. I first comment below on indicators of income received, then on indicators of income produced, and finally on possible nonstandard indicators that take both types of income into account.

Indicators of Income Received

Personal Income

Per capita personal income (PCPI) cannot be considered an acceptable fiscal capacity indicator, its wide use in U.S. intergovernmental aid formulas notwithstanding, both because it is insufficiently comprehensive and because it does not take tax exportation into account. As already noted, it covers the income of households but not the income of businesses (other than dividend payments to individuals) and omits several types of returns to assets. Because the omitted items tend to be more


Income produced
A
Income produced in the province but received by nonresidents
B
Income both produced in the province and received by residents
C
Income received by residents but produced outside the province
Income received

than proportionately higher in places with high measured personal income, the general effect of the omissions is to understate the capacity of higher-income places and to overstate that of lower-income places. With respect to exportation, using PCPI as a capacity indicator is tantamount to assuming that all states or provinces have equal ability to export, but this is clearly far from the truth. In the U.S., reliance on PCPI has resulted in serious understatement of the capacities of states with high exportation rates, such as the energy-producing states of Alaska, Wyoming, Texas and Louisiana and the tourism-intensive states of Nevada and Hawaii, and overstatement of the capacities of many northern industrial states.

In the Canadian case, a PCPI index shows much less variation among provinces than the RTS index. As can be seen from Table 3, which is based on 1998 personal income figures, PCPI values would vary by only a factor of 1.4 among provinces, as compared with 2.3 for the RTS. Alberta, with about the same PCPI as Ontario, would no longer appear as an outlier; Manitoba and Quebec would score sharply higher and Saskatchewan significantly lower than according to the RTS. The Atlantic provinces would appear not nearly as underprivileged. But many of these results would be spurious—the result of failure, in the cases of Alberta and Saskatchewan, to take exportation of energy taxes into account and, in other cases, to include elements of business and property income. Although PCPI has been mentioned in the current Canadian discussion of alternative indices, it does not appear to be a serious candidate to replace the RTS. This is probably for the best, given its clear unsuitability for that role.

Broader Measures of Provincial Income

At least some of the gaps in coverage of a PCPI index could be eliminated by selecting a broader measure of provincial income, but I cannot say precisely which extensions are feasible because of lack of familiarity with Canada's province-level statistics. The alternatives include provincial analogs of certain indicators from national income accounting, such as gross and net national income (the latter normally called just "national income"). The former is a very broad income aggregate, essentially equal to gross national product (GNP). The latter is a net measure, derived from the former by subtracting capital consumption allowances and indirect business taxes. The provincial counterparts of either variable would include elements of business income that personal income excludes. Note, however, that these indicators do not reflect federal taxes or

Table 3. Index of Per Capita Personal Income by Province, 1998[1]

Alberta	108.9
Ontario	108.3
British Columbia	99.2
Manitoba	93.3
Quebec	92.5
Nova Scotia	86.6
Saskatchewan	85.5
New Brunswick	84.7
Prince Edward Island	79.8
Newfoundland	77.0
ALL CANADA	100.0

federal transfer payments to persons, which makes them not entirely suitable, as is, for the intended application.

Perhaps a more attractive option would be to construct a modified income indicator, specifically tailored to represent the income streams from which provincial own-source revenue can be drawn. The starting point could be personal income (which does include federal transfers to persons). The modifications would include adding the portions of business income that personal income omits, adding whatever components of normally non-included returns to assets (such as capital gains) could be estimated from existing data, and subtracting federal personal taxes and direct business taxes .

But note that even the broadest measure of income received by a province's residents would not reflect opportunities for tax exportation. Income that is generated within the province but received by nonresidents, and hence the potential for taxing that income, would be ignored. Every measure of income received, no matter how comprehensively defined, is inherently deficient as a fiscal capacity indicator in this important respect.

Gross Domestic Product and Other Measures of Income Produced

Perhaps for the reason just mentioned, the macroeconomic indicators that the Department of Finance seems to be considering as possible replacements for the RTS are not indicators of income received but rather indicators of income produced. They include the gross domestic product (GDP) of a province; net domestic product (NDP), which is GDP less capital consumption allowances; and variants of the two measured at factor costs rather than market prices (i.e., excluding indirect business taxes). The option also has been mentioned of adjusting these indicators by adding federal transfers to persons and subtracting direct federal taxes.

A Canadian GDP indicator would deviate much less drastically from the currently used RTS index than would the previously discussed PCPI index. As shown in Table 4, Alberta would remain an outlier, but less so than under the RTS. Manitoba's and Saskatchewan's capacity would look somewhat higher, and British Columbia's somewhat lower. The Atlantic provinces would still score lower than all the others, but by considerably lower percentages than suggested by the RTS. The ratio of the highest

Table 4. Index of Per Capita Gross Domestic Product by Province, 1999-2000, Compared with the RTS[1]

	GDP Index	RTS Index	Percent Difference
Alberta	132.9	142.0	-6.4
Ontario	109.0	107.9	1.0
Saskatchewan	94.7	91.0	4.0
British Columbia	94.1	99.5	-5.4
Quebec	86.8	85.1	2.0
Manitoba	86.3	80.4	7.3
New Brunswick	77.9	71.3	9.3
Nova Scotia	75.8	73.6	5.4
Newfoundland	71.5	61.3	16.6
Prince Edward Island	69.0	66.7	3.4
ALL CANADA	100.0	100.0	100.0

score to the lowest would be 1.9, as compared with the RTS highest-to-lowest ratio of 2.3.

The GDP-type indicators are neither more nor less comprehensive than correspondingly broad indicators of income received. They cover all income generated within a province, including the portion received by nonresidents, but exclude income received by residents from outside sources. The income-received indicators include the last-mentioned component but exclude the income produced within the province that flows to nonresidents. At the national level, the two are essentially equal, but the same is not necessarily true, of course, for individual provinces. There was some confusion about this point in the earlier U.S. debates over fiscal capacity, because GDP was often put forth as a more comprehensive measure of ability to pay than PCPI. It is indeed more comprehensive, but only because PCPI is a less-than-complete measure of resident income, not because it is a measure of income received.

GDP, NDP, and their variants do reflect some forms of tax exportation, but the question is whether they do so thoroughly and in an appropriate manner. Exportation is covered in the sense that the income streams on which most—but not all—exported taxes are levied are counted as part of income produced. For instance, GDP includes the earnings of nonresident workers, the rental income received by nonresident landlords, the profits earned by nonresident business owners, and the income generated by energy production (such as corporate income and royalties) that flows to nonresident owners of energy resources. Note, however, that no income-produced measure distinguishes between goods and services sold to a province's residents and those sold to nonresidents, so none reflects the existence of exported taxes on retail sales.

As to the manner in which exportation is treated, the key point is that a GDP measure (indeed, any macro measure) gives equal weight to all types of income, with no regard to the potential each type carries for tax exportation. Consider energy taxes. The energy industry pays not only the normal taxes that apply to all industries—on income, property, etc.—but also special taxes on the volume or value of production. In consequence, income produced in the energy sector is more highly taxed than other income, in addition to which taxes on such income are more heavily exported than other taxes. But an income-produced index does not adequately reflect these phenomena. It gives no greater weight to energy income than to any other kind of income, even though each dollar of energy income yields more exported taxes. Thus, although GDP, NDP, etc. do better than aggregate income indexes in representing potential tax exportation, they still do not give exportation the full weight it deserves.

Of course, a GDP indicator omits, by definition, all income received by a province's residents from production occurring outside the province. Such income generally is taxable by the province of residence in Canada, so leaving it out distorts the capacity figures. To avoid both this problem and the obverse problem of omitting income received by nonresidents, U.S. analysts formulated the next indicator discussed, total taxable resources.

Composite Macroeconomic Indexes

I now comment briefly on two types of composite macroeconomic indexes, each of which seems to have the potential to overcome certain limitations of the standard macroeconomic indicators. The first type, Total Taxable Resources (TTR), was produced by the U.S. Treasury Department and is now in limited use for allocating certain U.S. federal grants. The second type, the Export-Adjusted Income index, is an indicator I proposed and demonstrated in the 1980s but that has not been further developed for practical use.

Total Taxable Resources

Recognizing that neither an indicator of income received nor an indicator of income produced encompasses all the income flows taxable by states and localities, officials at the U.S. Treasury Department set out in the mid-1980s to devise an indicator that would achieve more complete coverage. The resulting measure, perhaps somewhat overexuberantly named Total Taxable Resources, is defined as "the unduplicated sum of the income flows produced within a state and the income flows received by its residents that a state can potentially tax" (Compson and Navratil, 1997).[9] In terms of the earlier block diagram, the indicator is intended to cover all three income components: income produced in a state and/or received by state residents. The U.S. Congress selected TTR as the capacity factor to be used in allocating funds under two relatively small programs of categorical federal aid to states and has directed the U.S. Treasury Department to develop annual TTR estimates.[10]

Although the TTR concept is simple, practical implementation has proven difficult because of data limitations, and the existing TTR figures do not fully reflect the underlying idea. In principle, one could begin with a province's GDP and add to it the various components of income received by residents from outside the province. The additions would include wages from work outside the province; rent, interest, and dividend payments received by residents from investments and property holdings outside the province; and profits and capital gains accruing to residents from out-of-province business activities and investments. Alternatively, one could begin with a broad measure of resident income, and add to it the various components of income generated within the province but received by nonresidents. The latter would include the wages of nonresidents workers who commute into the province and the rents, interest payments, profits, etc. derived by nonresidents from business activities or property located within the province.

Initially, the U.S. Treasury Department did not use either of these methods but relied instead on a crude proxy measure, constructed by averaging each state's shares of national GDP and national personal income. More recently, it has adopted a version of the GDP-based approach. The method consists of (1) subtracting from state GDP certain components not taxable by states, such as federal indirect taxes and social insurance contributions, (2) adding estimated earnings of state residents from work outside the state and receipts of dividends and interest from outside the state, and (3) adding certain other income flows not included in state GDP, such as net realized capital gains and federal social insurance payments. But data gaps have precluded such other important adjustments as subtracting federal income taxes and capital consumption allowances and adding federal transfers other than for social insurance. Therefore, the resulting indicator falls well short of the ideal. Still, it has been deemed acceptable for practical use.

I do not know the Canadian data, but since Canada has both GDP and NDP figures by province, it should be able to implement the TTR concept at least as well as, and perhaps better than, the U.S. The resulting indicator would be more comprehensive than either a GDP-type measure or a broad measure of income received and would cover tax exportation to the same extent as GDP. It would seem preferable, therefore, to the macroeconomic indicators thus far considered in the Canadian debate.

Export-Adjusted Income (EAI) Indexes

This type of index is based directly on the proposition that fiscal capacity should be expressible as a function of a province's per capita resident income, broadly defined, and its tax exportation rate. One form for such an index, shown earlier, is $C = kY/(1 - e)$, where the variables C, Y, and e have the same meanings as before and k is a constant. An alternative form is $C = bY + E$, where b is a standard fraction of income devoted to the public sector and E is the amount of exported taxes per capita that the province can generate under a specified standard policy. The first (multiplicative) form reflects the assumption that a certain percentage of a province's taxes can be exported, while the second (additive) form presumes that a certain amount of exported taxes can be raised. The latter amount, E, can be construed as either the maximum revenue the province can extract from nonresidents by setting optimal rates for its exportable taxes or the amount the province would raise at standard (e.g., national average) tax rates. With the latter approach, the EAI index would become, in essence, a composite of a macroeconomic index of income received by residents and an RTS-type index of capacity to raise revenue from tax exportation.

The general idea of being able to adjust an income index for exportation is very appealing, but under more detailed scrutiny certain theoretical, as well as practical, concerns emerge. First, although Phares (1980) was able to estimate the rates of exportation of individual taxes, major gaps in the then-available U.S. data on interstate financial flows forced him to rely on strong, sometimes arbitrary assumptions. Canada probably has much better data today than the U.S. had then, which means that better-grounded estimates of exportation rates might now be feasible. But, second, that the preceding paragraph mentions three different methods of representing the potential to export taxes underscores that not enough is known yet about how exportation should best be modeled. Empirical research might help to clarify the matter, but certainly not in the near future. Third, tax exportation rates are likely to prove highly sensitive to the rates each province sets for its exportable taxes. Unless this problem can be circumvented, perhaps by making operational the notion of optimal, export-maximizing tax rates, each province's EAI score would be a function of the province's own fiscal decisions.

For the aforesaid reasons, the EAI index generally has to be considered a concept for future development, not a near-term candidate for practical application. It might be reasonable, however, to consider one immediate, limited application of the EAI approach. Exported energy taxes, which contribute importantly to the fiscal capacities of certain Canadian provinces, are not reflected adequately in the conventional macroeconomic indicators, or in TTR. They could be singled out for special treatment in an EAI-type indicator of the form $C = bY + E^*$, where Y is a GDP or TTR measure and E^* is the estimated revenue that a province obtains from exported energy taxes. This would be an ad hoc formulation, clearly lacking in theoretical purity, but probably yielding more valid results than an unadorned macroeconomic indicator.

CONCLUSIONS

The conclusion I can offer most confidently is that an ideal, or close-to-ideal, fiscal capacity indicator has not yet been produced. The RTS indicator now used in Canada has serious theoretical flaws, as a result of which the provinces' fiscal capacity scores undoubtedly are distorted, but to an as-yet unmeasured degree. The macroeconomic approach is better grounded in positive economic theory, but the standard macroeconomic indicators found in national income accounts do not reflect, or reflect fully, the varying ability of provinces to export taxes to nonresidents. If a decision one way or the other had to be made today, the question would be whether one of the imperfect macroeconomic indexes now in hand comes significantly "closer to the truth" than the RTS index. But if the decision can be deferred, as seems to be the case, then the option of constructing an improved macroeconomic indicator should also be considered.

The most important shortcoming of the RTS methodology is that it ensures that fiscal capacity scores will be strongly influenced by both the consumption choices of each province's people and the fiscal choices of each province's governments. The RTS thus violates the premise that a fiscal capacity indicator—especially one to be used in an equalization formula—should measure how much revenue a province is capable of raising, not how much it chooses to raise. But at the same time, the RTS does take into account, albeit with some under- or overshooting, the provinces' varying ability to collect taxes from nonresidents. As one step towards deciding whether replacement of the RTS is warranted, Canada could undertake an empirical exercise, such as was once conducted in the U.S., to estimate, at least roughly, the magnitudes of the deviations in RTS scores attributable to the aforesaid theoretical difficulties.

Among the macroeconomic alternatives to Canada's RTS index, some would offer little improvement or even make matters worse, but others promise more valid estimates of capacity differences among the provinces. An index of per capita personal income (PCPI) cannot be considered an acceptable capacity indicator because it is insufficiently comprehensive and fails to take exportation into account. Broader measures of resident per capita income, though better than PCPI, would not be suitable either, because they also fail to deal with tax exportation. Of the immediately available "off the shelf" indices, gross domestic product (GDP) per capita (or one of its variants) is the most promising potential RTS replacement. It is more comprehensive than the RTS in several respects and takes partial account of tax exportation. Still, it appears that a composite indicator based on GDP may be a better candidate than GDP itself.

In my opinion, it would be desirable to construct a Canadian version of the composite indicator Total Taxable Resources (TTR), which is now in limited use in the U.S., and to compare it against both the GDP-type indexes and the RTS. TTR offers broader coverage than any conventional macroeconomic indicator of the income flows potentially taxable by a province. As a slightly longer-run venture, it would also be worthwhile, I believe, to construct and evaluate composite indices of the export-adjusted income (EAI) type—that is, indices that combine a macroeconomic income indicator with estimates of each province's potential exported taxes. Taking account explicitly of revenue from exported energy taxes would be an appropriate first step in this direction. Ultimately, I would look to the composite indicator approach to yield a capacity measure superior to both the standard macroeconomic variables and the RTS.

NOTES

[1] This paper draws heavily from the author's earlier article, "State Fiscal Capacity Measures: A Theoretical Critique" (Barro, 1986). The discussion has been substantially modified, however, to reflect Canadian issues and certain more recent developments in capacity measurement.

[2] In addition to the explicitly designated equalization program, Canada also has another large intergovernmental aid program, the Canada Health and Social Transfer (CHST), that has significant equalizing properties. The CHST is not discussed in this paper. The workings of the equalization program are explained in Boucher and Vermaeten (2000) and Canada Department of Finance (2001). The detailed data and equalization calculations for 1998-1999 are presented in Canada Department of Finance (2000).

[3] The literature distinguishes between the Representative Tax System (RTS), which covers all the tax bases of a state or province, and a somewhat broader indicator called the Representative Revenue System (RRS) that also takes into account certain nontax revenue bases, such as user charges and lottery proceeds. Because the Canadian index does include these nontax revenue bases, it should be labeled, strictly speaking, an RRS index. In this paper, however, I adhere to what has become the standard Canadian usage and retain the RTS label.

[4] Figures provided by the Department of Finance, based on the Department's 5th official estimate for 1999-2000.

[5] Basically, a province is eligible for aid if its RTS score falls below a standard RTS score, defined as the average RTS score of the five "middle income" provinces—Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia. Each province receives an amount of aid per capita proportional (subject to certain constraints) to the difference between its RTS score and that standard. The details are presented in Canada Department of Finance (2001).

[6] That is, income, comprehensively defined, is the sum of currently earned income; returns to assets (net property income), and increases in the value of assets (appreciation). Given this definition, it is redundant to speak of a wealth component of fiscal capacity, because all wealth has already been taken into account on an income-equivalent basis.

[7] In the United States, a second major form of tax exportation, known as federal offset exportation, arises out of the deductibility of state and local income and property taxes from federally taxable income. The effect of this deductibility is to shift part of the burden of state and local taxes to federal taxpayers throughout the country. I understand, however, that such deductibility is not a feature of Canada's federal income tax system, so the federal-offset form of exportation does not have to be taken into account in this discussion.

[8] These estimates, presented in Barro (1985, 1986), were prepared by Prof. Donald Phares, using methodology developed in an earlier study (Phares, 1980).

[9] Compson and Navratil (1997) note that the label "total taxable resources" is a misnomer as it implies that the measure captures all taxable resources within a state. In fact, it does not capture potentially taxable returns to wealth not reflected in measured state income.

[10] The two programs using TTR are Community Mental Health Services grants and Substance Abuse Prevention and Treatment block grants.

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