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Fiscal Federalism

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Giuseppe C. Ruggeri

ABSTRACT: This paper discusses the methodology for the calculation of federal fiscal flows in a federation and the measurement of interregional redistribution. It identifies five major steps: (a) the selection of the approach for calculating federal fiscal flows, (b) the allocation of federal revenues and expenditures among regions, (c) the choice of the appropriate concept of regional economic disparities, (d) the selection of the relevant indicators of interregional redistribution, and (e) the estimation of these indicators. It concludes with some suggestions for further research, stressing the need to develop a common methodology and to place the study of interregional redistribution in a dynamic context.

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1. Introduction

Two fundamental functions of government are to mitigate fluctuations in economic activity (stabilization) and to reduce inequality of opportunities and outcomes among individuals and families (redistribution). In unitary states these functions are performed by one order of government, although program delivery may be decentralized. In federations, both federal and regional (states or provinces) governments perform these functions. Moreover, federations usually incorporate inter-governmental fiscal relations to address regional differences in size, resource endowments, economic performance, and fiscal capacity.

The fiscal relationship between federal and sub-national governments raises three main equity issues. First, does the federal fiscal system reduce regional economic disparities (regional development and interregional redistribution)? Second, does it restore a reasonable balance between the revenue-raising powers and spending responsibilities of the federal government and the regional governments combined (vertical fiscal balance)? Third, does it reduce fiscal disparities among regions (horizontal fiscal balance)?

This paper addresses primarily the first question. The change in the relative economic position of different regions due to federal fiscal activity may be called interregional redistribution. It differs from income redistribution because it compares average income levels among regions rather than income levels among individuals, regardless of their place of residence. While the two concepts are related – a province with a larger share of low income residents will likely have a lower average income – they address different issues within a federation.

All items in the federal revenue structure can potentially generate interregional redistribution. Federal spending comprises two major groups: (a) programs delivered directly by the federal government (federal programs) and (b) joint programs delivered by regional governments but partly financed by the federal government through conditional or unconditional grants. Both components may generate interregional redistribution.

To measure interregional redistribution economists compute net fiscal flows (the difference between what the residents of a region gain from federal government direct spending and intergovernmental transfers and what they contribute to the federal coffers). They also use selected indices of interregional redistribution to facilitate

comparisons over time within a country, or international comparisons for a given year. Some of the measurement issues arising from the calculation of regional fiscal flows and indices of interregional redistribution are evaluated in this paper.

The study of interregional redistribution requires four major steps. The first step develops the methodological tools for calculating net fiscal flows (Section II). The second step develops the economic concept for the analysis of interregional redistribution (Section III). Section IV presents various indices of interregional redistribution. The fourth step - interpreting the estimated indices - is performed in Section V. The final section contains some concluding remarks and some suggestions for further research.

2. The calculation of net regional fiscal flows

The calculation of net fiscal flows requires separate allocations for the following elements of the federal fiscal system: (a) the regional allocation of federal revenues, (b) the regional distribution of federal grants, and (c) the regional distribution of direct federal spending, which comprises (i) purchases of goods and services, (ii) transfers to persons and business, and (iii) interest on the public debt.

Before discussing the approaches to the interregional allocation of federal revenues and expenditures, it is necessary to address some general methodological issues. First, interregional redistribution strictly interpreted involves shifts of fiscal resources among regions through the intermediation of the federal fiscal system. Therefore, the analysis should be confined to a country's residents only. This means that federal taxes borne by non-residents and payments to non-residents should be excluded from the calculations. Second, tax structures incorporate tax bases, statutory rates, and special tax preferences and spending programs delivered by the tax system (tax expenditures). Recorded data on federal revenues are net of the effects of tax preferences and tax expenditures. Because net fiscal flows are calculated as the difference between federal revenues and expenditures assigned to a region, these balances remain unaffected if tax expenditures are treated as spending items or as negative taxes. The official data incorporate the specific approach to the regional distribution of tax preferences and tax expenditures used by the agency that makes the allocation. A more consistent, but time consuming, approach would allocate the gross

revenues first and then apply the same methodology to allocate tax preferences and tax expenditures.

Alternative approaches

There is no universally accepted approach to the measurement of federal fiscal flows. Three different approaches have been often used in empirical studies: (a) cash-flow; (b) benefit; and (c) economic gain.

The cash-flow approach focuses on the location where revenues are collected and disbursements are made. It has more of an administrative than an economic foundation because federal flows are measured according to record keeping procedures. This feature makes the cash-flow approach the preferred option by statistical agencies. As it is often applied, this approach has two main short-comings. Its regional allocation of federal revenues may have little connection with the burden that is borne by the residents of a region. Also, its focus on the way expenditures are recorded sometimes leads to inconsistent approaches. For example, in Canada's provincial economic accounts, the allocation of federal payments for wages and salaries is based on the place of employment, reflecting the location where factor income is generated. Federal purchases of other goods and services, however, are allocated where these items are consumed.

The benefit approach focuses on the residence of the individuals who receive the benefits of government services and make contributions to their financing. It is a direct extension of fiscal incidence, adding the residence dimension to the analysis. The contributions of a region to the federal coffers and its gains from federal spending are the aggregation of the contributions made and benefits received by the residents of that region. Being directly linked to fiscal incidence analysis, this approach presents the same measurement difficulties in the allocation of government purchases of goods and services. Since the focal point is the individual, the comparison among regions and the interpretation of the federal fiscal flows under the benefit approach is based on consumption rather than income. This means that estimates of the degree of interregional redistribution based on this approach are interpreted from a welfare perspective.

A third approach has recently been proposed by Ruggeri and Yu (2000). Called the economic gain approach, it contains elements of the cash-flow and benefit approaches, but focuses directly on jurisdictions. Its conceptual foundation is the

recognition that interregional redistribution deals with the economic position of different regions in a country, therefore, measures of this type of redistribution should be linked directly to jurisdictions, not individuals. Moreover, the comparison of regional economic conditions is based on income rather than consumption, a feature more consistent with the way regional economic disparities are measured and analyzed.

The economic gain approach avoids some of the measurement issues associated with the other two approaches. It assigns federal revenues to the agents whose economic activity adds to the tax bases in a region. Thus, it measures the contribution that a region makes to the federal coffers through the tax revenues generated collectively by its residents. It allocates federal purchases of goods and services by the economic gains received by a region, measured by the factor income generated in that region by federal spending. By focusing on the economic activity in a region, the economic gain approach bypasses the issues of how to allocate different types of public goods (pure public goods, impure public goods, etc.).

Allocation methodology

While these three approaches differ in terms of the conceptual foundations and the method of measuring federal fiscal balances, large shares of federal revenues and expenditures would be allocated in the same manner under each of these approaches. The specific allocation under each approach is discussed below.

Federal revenues

Although revenue structures differ among countries, there are sufficient similarities to allow for a general approach to the regional allocation of federal revenues. First, a distinction is made between tax and non-tax revenues. The latter usually include five items: (a) royalties, (b) investment income, (c) fines and penalties, (d) sales of goods and services and (e) miscellaneous non-tax revenues. Tax revenues may be grouped into four major categories. **Income taxes** include taxes on individual income and on corporate profits. **Payroll taxes** are taxes on wages and salaries levied usually on both employers and employees for Social Insurance Contributions (old age pensions and unemployment insurance) and for health care insurance. **Real property taxes** include taxes levied on immovable property owned by individuals and businesses and capital taxes paid by corporations. **Taxes on goods and services** may be direct (on the consumer) or indirect (on the producer). They may be broad based (general sales taxes)

or product specific (excise taxes, custom duties), and they may include the remitted profits of government enterprises. They also include a variety of fees and charges, such as motor vehicles fees and licenses.

To evaluate different approaches to the measurement of federal fiscal balances, we may divide federal revenues into: (a) revenues that are not shifted and (b) revenues subject to shifting. For the first category, the person who pays the tax is also the person who bears the full burden of the tax. In this case, the location of the tax payment (cash-flow approach) is the same as the place where the economic activity expands the tax bases (economic gain approach) and the tax burden is borne (benefit approach). Therefore, all three approaches would yield the same results.

Taxes not subject to shifting

The items in this category are determined with reference to tax incidence analysis. They include: (i) personal income taxes, (ii) direct taxes on consumers, and (iii) payroll taxes imposed on employees.

Personal income taxes. In tax or fiscal incidence studies, personal income taxes are commonly allocated to individual taxpayers on the basis of their residence. This approach assumes that the person who pays the tax is also the person who bears its burden. Although recent studies suggest that personal income taxes may be subject to some degree of shifting due primarily to (a) tax-induced migration (Bingley and Lanot 2002), (b) bargaining based on after-tax wages (Lookwood and Manning 1993), and (c) human capital decisions also based on after-tax income (Montmarquette 1974), in my view, the assumption of no shifting remains valid in the case of interregional redistribution. Even when such shifting may occur, it is likely to be confined within a region.

Payroll taxes. There are various categories of payroll taxes. Payroll taxes may be imposed on employers and/or employees. We may separate (a) payroll taxes that have direct linkages to the financing of benefits they provide (taxes that finance specific social insurance programs) from (b) general payroll taxes with no connection to the benefits provided to those who pay them.

Payroll taxes on employees with direct benefit linkages are similar to a price for a service rather than a tax, and their inclusion in tax incidence studies is questionable. Their inclusion is more justifiable for interregional redistribution because the benefits may not be matched precisely by the contributions, thus creating winners and losers on

the basis of residence. Moreover, the residence of a person who paid the tax may not be the same residence at the time of receiving the benefits. General payroll taxes on employees are equivalent to the portion of the personal income tax levied on labour, and are generally allocated to the workers who pay them based on the location of employment.

The potential for shifting exists for general payroll taxes on employers. Empirical evidence indicates that, over the long-run, the burden of these taxes is largely shifted back to labour, an assumption commonly used in tax incidence studies (Kesselman 1997). This assumption is even more valid for employer payroll taxes linked to the benefits they finance. In competitive labour markets, when employees realize that the payment is directly linked to the benefit, labour supply and demand curves will shift by the same degree and the tax is borne entirely by them. This means that the three approaches to the measurement of federal fiscal balances yield the same results for both employer and employee payroll taxes.

For the analysis of interregional redistribution, we must recognize that these taxes and their benefits (when identifiable) should be included in the calculation and that both taxes and benefits should be assigned to those who pay them and who receive the cash payments.

Consumption taxes. These taxes may have a broad base (national value-added taxes) or a narrow base (excise taxes and custom duties). They may be levied on consumers or producers, thus providing some opportunities for tax-shifting.

For direct taxes on consumers, either broad-based or excises, the standard incidence assumption is based on the “uses” side of household budgets, implying that their burden is borne by consumers in proportion to their total consumption (broad-based taxes) or their consumption of the taxed goods and services. Browning (1978) argued that, since these taxes affect the consumer price index and since most government transfer payments are indexed for inflation, recipients of government transfers are automatically compensated for this tax. Its burden, therefore, falls on factor income. Ruggeri (1993) showed that this change in incidence is not very convincing because there are sources of income other than transfers that respond to price increases automatically (for example, investment income and wages with escalator clauses) or through negotiations. Thus, at most one may adjust for the portion of transfers that are fully indexed for inflation. Within the framework of interregional redistribution, this potential adjustment to the standard incidence approach would affect the results only to

the extent that it differed substantially across regions. The case for using the standard assumption for interregional redistribution may be even stronger for excise taxes because the taxed goods are more likely to be used in the region where they were purchased than overall purchases. Therefore, the revenues collected by the federal government from these taxes can be allocated among regions in proportion to general consumption expenditures in the case of broad-based taxes and the consumption of specific goods and services for excise taxes. Thus, for direct consumption taxes, all three approaches to the measurement of federal balances are likely to yield the same results.

Real property taxes on owner-occupied residences. These taxes are generally levied by local governments and their incidence has little relevance for studies of interregional redistribution, which focus on federal fiscal flows. Nonetheless, it may be useful to briefly summarize their treatment in tax incidence analysis.

Three components of real property taxes are subject to taxation: land, structures, and permanently installed equipment. This tax is imposed on owner-occupied residential structures, rented residential structures, and non-residential structures. For the first category, the occupant is the owner of the land and the structure and the consumer of the residential services. Therefore, he/she bears the full burden of the tax under any incidence assumption or approach to the measurement of federal fiscal balances.

Taxes subject to shifting

Three main categories of taxes are subject to shifting: (i) corporate income and capital taxes, (ii) indirect consumption taxes, and (iii) real property taxes other than those on owner-occupied residential structures.

Corporate income taxes. Under the cash-flow approach, corporate income taxes are allocated among regions on the basis of negotiated formulas which include the location of the head office, the wages paid and other relevant information. Under the benefit approach, the regional allocation of these revenues requires a number of steps because of the potential interregional shifting of tax liabilities. First, we must deduct the portion paid by non-residents. Then we must determine who bears the burden of corporate taxes based on tax incidence studies (Auerbach 2005; Gravelle 1994; Gravelle and Smetters 2006; Harberger 1962, 2006; Judd 2006; Randolph 2006).

These studies suggest that the incidence of corporate income taxes is different for a closed economy than for an open economy with perfect mobility of capital. In the first case there is no possibility of tax exporting among countries and the tax must be borne by domestic consumers and/or factors of production. Theoretical models, starting with Harberger (1962) suggest that in a closed economy the corporate income tax is borne by all owners of capital (recipients of interest, dividends, rents and capital gains) and this approach is used in some studies of tax incidence (US Congressional Budget Office 2001; Vermaeten, Gillespie and Vermaeten 1994). Since the federal corporate income tax is applied uniformly across the country, it would be borne by the owners of capital by region in proportion to their shares of capital income. Additional regional effects may be generated if there are special interactions between federal and provincial tax systems that facilitate tax exporting among regions. In open economies there is the possibility of tax exporting and the incidence of corporate income taxes is affected by a variety of economic factors. In general, we may distinguish between an average world corporate tax rate and the differential rate in each country. With respect to the average rate, the world becomes the closed economy and the associated closed economy incidence conclusions remain valid. For the differential country rate, with perfect capital mobility this component is borne largely by domestic labour. In calculating federal fiscal balances, one may use a compromise approach by allocating the tax in part to domestic consumption, in part to capital and in part to labour. Similar conclusions apply to taxes on corporate capital.

Although the economic gain approach focuses on the activities that generate the tax bases in a region instead of the tax burden imposed on that region, the results of tax incidence analysis are relevant also for this approach. First, the tax revenue that would be imputed to non-residents as suppliers of capital should be excluded from the measurement of interregional redistribution. Second, the tax that would be imputed to the domestic suppliers of capital should be allocated on the basis of their residence, which would be approximated by the regional distribution of capital income. Third, any portion of corporate income taxes that is shifted forward should be allocated to the region where the agents contribute to this tax through their spending, approximated by the regional distribution of consumption. Finally, the portion of this tax that is shifted backward to labour should also be included in the distribution of revenues because it affects the economic position of a region (lower labour income) and its fiscal capacity.

Thus, the same compromise suggested for the benefit approach may be applied also to the economic gain approach.

Indirect consumption taxes. Some consumption taxes are levied on producers and sellers, thus generating some shifting. For firms producing tradable goods and services, these taxes may be shifted backward to labour if capital is perfectly mobile and both exporters and import-competing firms are price takers. For producers of non-tradable goods and services, there is the possibility of forward shifting to consumers. Under the cash-flow approach, the issue of shifting is irrelevant. Under both the benefit and economic gain approach, these taxes raise similar issues as corporate income taxes and how their burden is allocated among regions depends on the assumptions about their degree of forward and backward shifting.

Real property taxes. Economists agree that the burden of the tax on land is borne by landowners due to its immobility. For structures, there are two conflicting views. The traditional view assumes capital mobility and immobility of renters and owner-occupiers, and market power by the owners of commercial and industrial properties. In this case, taxes on structures are borne by owner occupants, owner-operators and renters, and consumers in general. The new view assumes that workers and consumers are more mobile than structures, therefore, the tax cannot be borne by consumers or wage earners, and its incidence falls entirely on the owners of capital. Thus, the incidence of the property tax is more like the incidence of a corporate income tax than an excise tax. In tax incidence studies, the real property tax is usually broken down into its components (residential, commercial and industrial) and each component is assigned different incidence assumptions, which sometimes reflect a compromise between these two views (Ruggeri, Van Wart, Howard 1994; Vermaeten, Gillespie, Vermaeten 1994). Under the cash-flow approach, the revenue from this tax would be allocated to the region where the tax is collected. Under the other two approaches, the possibility of tax shifting of the portion imposed on non-residential structures would allow for the distribution of the tax burden to residents of other regions.

Non-tax revenues

Non-tax revenues include: (i) royalties from natural resources, (ii) remittances from government enterprises, (iii), other investment income, and (iv) sale of goods and services. These revenues usually represent a small share of total federal government revenues, but raise a number of conceptual and measurement issues.

Royalties are the price charged for selling natural resources to private sector agents. In the cash-flow approach, they would be assigned to the region where the resource transaction takes place. However, these resources are usually traded in a world market where their prices are set internationally. Often they face a price inelastic demand. In this case, these royalties are mostly passed on to consumers and can be treated as excise taxes. Any excess of the domestic royalty over the average world royalty would be borne by domestic labour.

The cash-flow approach would assign the revenue from these royalties to the region where they are collected (the region where production takes place). Under the benefit approach, if we assume full forward shifting and if details of the sources of these royalties are known, their revenue can be allocated on the basis of a region's consumption of the good on which the royalty was levied. If the federal government collects royalties from a variety of natural resources and data are available only for their aggregate values, regional shares of total consumption expenditures may be used instead. A similar allocation would be used under the economic gain approach because the tax base would be generated by the consumers of the goods on which the royalty is imposed.

Remittances from government enterprises are similar in nature to corporate profits generated by government-owned businesses and taxed at a rate of 100 percent. However, there are no shareholders to whom the burden of this implicit tax can be shifted. The entire revenue arises from an excess of the price over the average cost (net of the corporate tax paid). Therefore, this revenue may be treated as an excise tax and may be allocated in the same manner as royalties.

Other investment income comprises largely interest payments on loans and investments and is the flip side of interest on the public debt. Its revenue is neither from taxation nor from the sale of a publicly-provided good or service. Yet it is part of the federal government's general revenue used to finance spending programs. Since it would be allocated in the same manner under all three approaches to the measurement of federal balances, and since generally it is not large in amount, one may allocate it among regions in accordance with the regional distribution of interest income, or use the data published by government statistical agencies when available.

Sales of goods and services generate revenues in exchange for government provided goods and services, in a manner similar to a private business. In theory, these transactions should be excluded from federal fiscal balances. However, for currently-

produced goods and services, the cost of providing them is already included in the federal government expenditures and distributed among regions in unknown manner. The allocation of revenues and expenditures for this item would not be the same under the three approaches to federal balances. Under the benefit approach, the benefit and payment would be treated as a simultaneous transaction. In this case, one can neutralize this item by excluding it from the calculations of federal balances on the revenue side and then subtracting its regional distribution found in government publication from the expenditure side. The cash-flow approach in theory would assign the revenues to the location of consumption or use and the expenditures to the location of production. In practice, it is likely that both revenues and expenditures would be assigned to the location of consumption, yielding the same result as the benefit approach. The economic gain approach would differ only in the case of goods for which the place of consumption may not be the same as the place of production.

Expenditures

Six components of federal government expenditures may be identified: (i) transfers to persons, (ii) transfers to business, (iii) transfers to other governments, (iv) interest on the public debt, (v) fixed investment, and (vi) current purchases of goods and services.

Similar to revenues, a large portion of federal expenditures would be allocated in the same manner under all three approaches to federal balances. The recipients of *federal transfers to persons* are the beneficiaries of those transfers and are identifiable by place of residence. The *governments receiving federal transfers* are identifiable by jurisdiction, and are expected to spend these funds to provide benefits to their residents.

Transfers to business may be viewed as negative taxes and may be allocated in the same manner as corporate income taxes. Their regional allocation would be the same for the benefit and economic gain approach, which would follow the principles of tax incidence. The cash-flow approach would allocate these transfers on the basis of the location of the receiving business.

For fixed investment and current purchases of goods and services, the three approaches to federal balances may yield different allocations. For these two items, there are greater similarities between the cash-flow and the economic gain approach.

Under the cash-flow or the economic gain approach, *federal current purchases of goods and services* may be divided into a wage and a non-wage component. Under both approaches, wages would be allocated to the region where the source of

employment is located, as is done for personal income taxes, which reflect an employee's place of residence. Occasionally, as in the case of Ottawa (Ontario) and Hull (Quebec), the two allocations are inconsistent when the employee works in one region and resides in another region.

The allocation differs between cash-flow and economic gain approaches for the non-wage component of federal current purchases. The former approach may not use a consistent application to this item. Relying largely on records of transactions and government recording practices, it may assign the federal spending to the region where the agency to which the spending is assigned in the budgetary process is located. When the production and consumption of the goods and services takes place in the same region, there is no inconsistency because the consumption-based allocation is the same as the allocation based on the place where income is generated. When the place of consumption is different than the place of production, the cash-flow approach yields a different result than the economic gain approach.

The economic gain approach provides a consistent method for allocating the non-wage spending. If the salary of a federal civil servant residing in a certain region is viewed as an economic contribution to that region, the same treatment should be given to the payment for the services of a consultant who resides in the same region. In practice, detailed information on the residence of those who provide services to the federal government is not available; therefore, one has to resort to an approximation. Since the focus is on payments to factors of production, one may allocate non-wage federal spending in proportion to a region's private sector factor income.

Under the benefit approach, this spending component would be allocated on the basis of which region benefits from the goods and services produced by these employees. The benefit approach follows strictly the distribution principles used in expenditure incidence analysis (Ruggeri 2005), which generally divides the purchases of goods and services into two categories. The first category includes federal spending for programs for which the beneficiaries may be identified. It includes goods and services that could be delivered by the private sector, but are directly provided or financed by the government, either because they generate large positive externalities or to fulfill some chosen equity principles. The main examples of these "private" goods and services are publicly funded health care and education. The second category contains federal spending for programs that do not allow the identification of beneficiaries. It includes goods and services that would not be provided by the private

sector because it would not be possible to sell them separately to individual purchasers. Examples of these “public” goods and services are national defence and other protection of persons and property, including the justice system, and general government.

For “private” goods and services, the three approaches to federal fiscal balances may yield similar results. Let us consider education and assume that the federal government is responsible for its funding over the entire country, but these programs are delivered at the local level. In this case, most of the expenditures would be made in the same region where the benefits would be received. The only portion of federal education spending that would involve different allocations under the three approaches would be the salaries of a federal department of education located in the national capital.

The only category of federal spending with a marked difference among the three approaches to federal balances is the one that includes “public” goods and services. Empirical studies on fiscal redistribution generally use two methods for allocating these goods and services: (a) on an equal per capital basis, or (b) on the basis of some concept of income. The first method is consistent with the treatment of general expenditures as pure public goods indivisible in consumption. The second method is consistent with a principle of insurance where people with higher income receive greater benefits because they have greater assets that are protected by government expenditures. The differences in the regional allocation of general expenditures among the three approaches may be reduced by a finer disaggregation that may help identify beneficiaries on a regional basis.

Similar differences among the three approaches exist for federal spending on *fixed investment*. For the cash flow and economic gain approaches, the magnitude of these differences depends on the type of investment. In some cases, spending on investment may be identified by the location of physical capital, as in the case of a new federal building in a certain region, where only local goods and services are used. The location of the capital good determines the regional allocation of spending under both the cash-flow and economic gain approaches. In other cases, the direct connection to the location of the investment is not possible. Let us consider the installation of a new nuclear generating station built in region A and installed in region B. Under the cash flow approach the entire expenditure would be assigned to region B. Under the economic gain approach, the expenditures for the production of the nuclear generator

would be assigned to region A. Under the benefit approach, neither the location of the investment nor the place of production of a capital good are relevant.

Interest on the federal debt is a federal cash payment to individuals and institutions holding government bonds. It is the price that taxpayers pay collectively for their unwillingness to finance federal spending entirely through domestic revenues. The goods and services provided through deficit financing are allocated among regions in the year the borrowing is incurred. The interest on the accumulated debt continues to be paid in future years through additional taxation. Yet, these payments are neither transfer payments nor payment for goods or services received. Two approaches to the treatment of this item may be used. Under one approach, the interest payments are included in the allocation in order to offset the taxes collected to pay them. Under a second approach, the redistributive effects of these payments are neutralized by excluding them from the calculation and making offsetting reductions on the revenue side.

Under the first approach, one must address two questions: (a) what portion of these interest payments should be allocated to different regions, and (b) how should this amount be allocated?

Government bonds may be held by domestic and foreign individuals and institutions. The interest paid to non-residents imposes a burden on domestic taxpayers because it must be paid through higher domestic taxation, but provides no corresponding income to residents. Therefore, this portion of the payment should be excluded from the calculation of federal balances. The excess of revenues over payments is implicitly allocated according to the regional distribution of federal revenues. The share of payments to non-residents may be approximated by the share of federal securities they hold.

The interest on the federal debt assigned to residents may be allocated in three different ways. It may be treated as a transfer payment and allocated to the recipients of interest income by region. It may be related to the expenditures financed by borrowing and allocated in proportion to the regional distribution of federal program spending. Or it may be allocated in proportion to the regional distribution of federal tax revenues on grounds that borrowing allowed for lower tax rates. In my view, the first approach is more consistent with the treatment of other spending because, in the year when they are made, these payments are income received by the holders of the government bonds. Whichever method of allocation is used, including interest on the debt in the

calculations of federal balances and the revenues to finance it will generate some interregional redistribution determined exclusively by a methodological choice.

The second approach neutralizes this potential redistribution by using the same regional distribution for revenues and expenditures. With the neutralizing procedure, the total amount of interest payments would remain unallocated on the spending side. The selected distribution of the interest payments to residents would then be deducted from the revenue side. This way, the domestic component would be excluded from the calculations in a manner that would affect both revenue and expenditures by the same amount. The interest payments to non-residents would be implicitly allocated according to the regional distribution of federal revenues.

Treatment of surpluses and deficits

Interregional redistribution measures the fiscal resources transferred among regions through federal intermediation. For a consistent measure of interregional redistribution, the allocated federal revenues must equal the allocated expenditures. The likelihood of this equality in a given year is quite low. Therefore, it is necessary to evaluate options for the treatment of excess revenues (surpluses) or excess expenditures (deficits).

Surplus. Governments rarely plan for budget surpluses, which may also result in surpluses on fiscal balances. Thus, one may assume that these surpluses are unplanned excesses of revenues over planned expenditures, caused by unforeseen economic developments affecting federal revenues. This excess revenue is not part of federal fiscal balances, but represents funds collected from all regions and not spent. Yet, it imposes a fiscal burden on all regions. In my view, this excess revenue should be placed in the income or consumption concept used to measure interregional redistribution because the surplus on federal balances reduces the level of income or consumption in each region. Therefore, the appropriate treatment of the surplus is to deduct the value allocated to various regions from the measure of income or consumption. If we treated this surplus as unplanned excess revenue, its regional allocation would be based on the regional distribution of federal tax revenues.

Deficit. Conceptually, a deficit on federal balances is the flip side of a surplus. It should be recorded as an increase in income or potential consumption in the indicators of regional disparities. The main difference from the surplus situation is the method of its regional allocation. Whereas a surplus is usually unintended, deficits are often the result of deliberate plans to finance a portion of government spending with borrowed

funds. Therefore, one can allocate the deficit according to the regional distribution of federal revenues or federal expenditures. Since the deficit-financed goods and services are consumed or used immediately while the additional tax burden is shifted to future generations, the allocation according to federal expenditures may be more appropriate.

Special issues

Before turning to federal fiscal balances, I address briefly the following special issues: (a) the marginal cost of public funds, (b) expenditure externalities and consumption versus investment, (c) the interaction between federal and regional taxes, and (d) exporting of regional taxes.

Marginal cost of public funds. Taxes tend to distort the decisions of private agents. General sales taxes and payroll taxes affect the choice between work and leisure; personal income taxes also affect the choice between work and leisure and additionally influence the choice between current consumption and saving and decisions about human capital acquisition; corporate taxes affect the location of business and investment decisions. If interregional redistribution requires higher levels of taxation, it imposes social costs in excess of the revenue raised, which are not captured by federal fiscal balances. For interregional redistribution, one must ask: does the extra federal taxation result in higher overall tax burdens in all regions? The answer depends on whether overall government spending is higher because of this redistribution.

Expenditures externalities and consumption versus investment. The efficiency effects of taxation are paralleled by externalities on the spending side. There is increasing recognition that government spending generates social benefits in excess of the direct benefits gained by private agents. This is particularly true for government spending on education (Davies 2003), but it also applies to health care. Spending externalities have not received as much attention in the literature as the excess burden of taxation partly because they are viewed as consumption externalities, therefore, not wealth enhancing. This oversight results partly from the continuing practice in official statistics to treat all government expenditures, except fixed capital, as consumption. Yet, social scientists recognize at least five types of capital: physical, natural, human, social and civic (Helliwell 2002).

Extending the concept of public investment beyond the purchase of fixed capital has important implications for the measurement of federal fiscal balances. The calculation of these balances does not distinguish among various components of federal

spending. Yet, a dollar spent on old age pension does not generate the same long-term economic effects as a dollar spent on education. As long as government investment involved only the purchase of physical capital, this approach was justifiable. If all government expenditures are consumption, they can be treated as economically equivalent regardless of where they are directed. When a large portion of government spending is investment, this equivalence can no longer be justified.

Let us consider Canada. As a trade dependent country, Canada must pay attention to international competitiveness in terms of taxation and productivity. The federal government has placed great emphasis on both, by reducing corporate taxes and expanding its involvement in financing human capital and innovation. These measures may potentially widen regional economic disparities because large corporations, universities and research centres are mostly located in the larger and more prosperous provinces. This process is self-feeding through the interaction with provincial fiscal systems. If the economies of the richer provinces grow at a faster rate because of federal investment, their fiscal capacity will expand faster than the national average. The widening of fiscal disparities in combination with the expansion of employment opportunities in the richer provinces will stimulate interregional migration, which is in part fiscally-induced through the original impetus of regional imbalances in federal investment.

If regional economic disparities are widened by federal spending policy, the degree of redistribution needed to maintain existing disparities of living standards will increase automatically, and this increased regional redistribution will be recorded in federal fiscal balances. The factors that caused this increase, however, remain unexposed. The policy discussions will focus on the increased federal transfers and the blame will be placed on the political leaders in the less affluent provinces for their alleged failures to implement growth enhancing policies. Policy prescriptions will likely include calls for changes in federal transfers to reduce the dependency of the less affluent provinces rather than a rebalancing of federal spending policies.

Interaction between federal and regional tax systems. In some federations, federal and regional governments share a variety of tax bases, a situation that facilitates interactions between their respective tax systems. Let us consider provincial payroll taxes that are deductible from federal business income taxes. For the regions that levy those taxes, their deductibility is recorded as a reduction in the contribution made by those provinces to the federal coffers. If the federal government raises its tax rates in

order to replace the lost revenues, this burden will be shared by all regions. The workers in the regions with the deductible payroll taxes will gain because part of their tax burden has been exported to other regions through higher federal taxation. The changes in federal revenues are captured by federal fiscal balances, the changes in economic activity by province are captured by measures of interregional redistribution, but the changes in the revenues raised by the tax-importing regions will remain unaccounted.

Exporting regional taxes. When taxes are shifted backward or forward, part of their burden may fall on economic agents that reside outside the jurisdiction where they are imposed. Tax exporting may be limited when a regional tax is shifted to labour and interregional migration of labour is extremely sensitive to small changes in after-tax wages. Tax exporting is more likely to occur when the tax is shifted backward to capital income or forward to consumers, because in those cases the taxpayers cannot escape the tax burden through migration. Interregional tax exporting is not captured by federal fiscal balances. It could be captured in the measure of income used in the calculation of interregional redistribution, but the effort to include this refinement may not be fruitful for two reasons. First, the magnitude of this effect depends largely on interregional differentials in tax structures and tax levels. Second, it would be very difficult to measure these effects accurately.

There may also be *spillovers of regional expenditures financed partly by federal grants*. In a federation, the high degree of mobility of labour and capital among regions facilitates interregional spillovers of the effects of public spending. Thus, over the long-run, the gains for a region recorded in annual federal fiscal balances may be spread to other regions. In Canada, the less affluent provinces receive equalization payments from the federal government to raise their per capita fiscal capacity. A portion of this unconditional federal transfer is spent on education. Post-secondary education receives an additional federal subsidy in all provinces. Given the different imbalances in provincial labour markets, there is a high degree of interprovincial migration as educated young workers migrate from the less affluent to the more affluent provinces in search of higher wages and better careers. Annual federal fiscal balances include the federal transfers to the less affluent provinces in their entirety. In subsequent years, they include the additional federal revenues from higher economic activity in the more prosperous provinces. The resulting widening of regional economic disparities would be captured by indices of interregional redistribution based on comprehensive income

measures. The increased fiscal capacity in the more prosperous provinces is not recorded in any of these measures.

The special issues identified in this subsection can potentially affect the calculation and interpretation of federal fiscal balances, but their impact is difficult to measure. These issues provide fruitful areas for future research on fiscal federalism and interregional redistribution.

Federal fiscal balances

The difference between federal expenditures allocated to a region and federal revenues assigned to it are called federal fiscal balances and indicate the gain or loss to a region from federal fiscal activity. In a federation, these balances do not measure the gains or losses of being part of a federal system because the federal government can influence the economic conditions in different regions through non-fiscal instruments.

In the presentation of the results, the estimated federal balances may be divided by a region's population to provide a quick comparison of how much the economic position of the average resident was affected by federal spending and revenue-raising activities. Expressed as a percentage of a measure of economic performance, they provide a rough indication of their quantitative significance with respect to a region's economy. Any presentation other than the level of these balances by region is a step towards an interregional redistribution interpretation, a task that requires a more detailed discussion.

3. The income concept

To measure the redistributive impact of the federal fiscal system we need to relate federal fiscal balances to a suitable measure of regional income or consumption. For this measure we need to estimate its actual value and a selected counterfactual value.

The measure of regional economic disparities used for analyzing interregional redistribution must be consistent with the selected approach for measuring federal fiscal balances. For the benefit approach, it is more appropriate to use a consumption measure, as this approach focuses on the federal tax burden borne by individuals in a certain region and the benefits they receive from federal spending. For the economic gain approach, an income measure is more appropriate as it focuses on the federal tax burden borne collectively by the residents of a region and the factor income generated in that

region by federal spending. Although the cash-flow approach is not linked to a specific concept of regional economic disparities, on the spending side it is closer to the economic gain approach. Therefore, an income measure may be more appropriate than a consumption measure.

As shown in Ruggeri (2008) in this volume, a suitable income measure includes three main components. Here I identify its main elements. The first component is the sum of all earnings by private sector agents, which may be called *unadjusted private income*. The second component includes a number of adjustments made primarily because of the backward shifting of certain taxes and the inclusion of private pensions. The third component includes the fiscal balances. In this respect, a choice must be made on which balances to include. If regional redistribution is based on the overall economic position of the average resident in each region, then we need to include the fiscal balances of all governments. If, instead, we focus on the redistribution generated by the federal fiscal activity alone, we need to include only the federal balances. In my view, the second option is preferable for the following reasons. First, it allows comparisons for more than one year that are unaffected by changes in regional and local balances. Second, because of the potential for tax exporting and expenditure spillovers, regional balances, if not local ones, should be calculated by using the same methodology as that for federal balances. This effort may be justified only when existing fiscal arrangements allow for direct redistribution among regions without federal intermediation.

Private income plus federal or total government balances yields the income that is used as the base for the redistributive calculations (*base income*). The counterfactual may be selected by making reference to the approach used in fiscal incidence studies. As suggested by Ruggeri, van Wart and Howard (1997), a meaningful counterfactual is the distribution of income in the presence of government activity that is distributionally neutral. Similarly, for interregional redistribution, the appropriate counterfactual is an inter-regionally neutral federal fiscal system, which occurs when federal revenues and expenditures are allocated among different regions in proportion to their private income. This counterfactual income is called *neutral-fisc income*. When we adjust for surpluses or deficits of allocated balances, the total amount of federal revenues is equal to the total amount of federal expenditures, federal fiscal balances are zero in each region, and neutral-fisc income is equal to private income. Finally, both base income and neutral-fisc income are expressed in per capita values in order to adjust for different population levels among regions. Base income may be estimated for the

entire federal fiscal system or for selected components. To determine the redistributive impact of any selected component, base income is calculated by using the allocated value of that component alone and comparing it to the unchanging neutral-fisc income.

4. Indices of interregional redistribution

The measurement of interregional redistribution differs from the measurement of fiscal redistribution by replacing the average member of an income group with the average member of an entire region. There are two main types of indices of interregional redistribution: (a) indices based exclusively on federal fiscal balances, and (b) indices based on selected measures of income or consumption. For each main type we can distinguish local from global indices.

Indices including only federal fiscal balances

Local Indices. The simplest local index is the per capita value of the federal fiscal balances by region. These values provide an indication of the average gain by the residents of the gaining regions and the average contribution by the residents of the contributing regions. On a graph that lists regions in ascending order of per capita income on the horizontal axis and per capita gains or contributions on the vertical axis, a neutral federal fisc under a balanced budget (zero federal fiscal balances for all regions) would be represented by a horizontal line at the origin. Interregional redistribution would be indicated by per capita gains and contributions lined up along a line sloping downward from left to right. The steeper the slope of this line, the greater would be the degree of redistribution.

Global Indices. A global indicator in this class would be the total gain by all the receiving regions divided by the total population of the contributing provinces. This ratio indicates the burden that the average resident of all contributing regions bears to finance the level of federal interregional redistribution in a given year.

These two indices provide information on which regions gained most and which regions contributed most. They provide no information on the factors determining this outcome. The main determining factor behind interregional redistribution is the existence of regional differences in economic performance and fiscal capacity. Indices that consider these two factors are discussed next.

Indices based on income or consumption

Local Indices. A local indicator of interregional redistribution may be developed by comparing per capita base income and per capita neutral-fisc income, following Bayoumi and Masson [1995] who regressed a region's share of base income against its share of neutral fisc income.

For each region i , this local index (Id) is:

$$(1) Id_i = [(y_{bi}/y_b)/(y_{ni}/y_n)]$$

where y_b is per capita base income, and y_n is per capita neutral-fisc income.

By transposing terms, expression (1) becomes

$$(2) Id_i = [(y_{bi}/y_{ni})/(y_b/y_n)]$$

Since in each ratio the population is the same at the numerator and the denominator, expression (2) can be expressed in aggregate values, indicated by capital letters.

$$(3) Id_i = [(Y_{bi}/Y_{ni})/(Y_b/Y_n)]$$

When allocated federal revenues and expenditures are equal, the disaggregated index is reduced to the first ratio in (3). The numerator and the denominator of this ratio differ by the difference between actual and redistributionally neutral federal balances. This local index, therefore, measure a region's gain or loss from federal fiscal activity as a percent of its own neutral-fisc income.

When federal surpluses or deficits are neutralized and regional plus local balances are excluded, expression (3) is reduced to

$$(4) Id_i = 1 + (B_i/Y_{ni})$$

Mansell and Schlecter (1995) used a variation of this indicator. The relative share of federal fiscal balances assigned to region i is

$$(5) RS_i = [(r_i/r)/[e_i/e)]/(y_{ni}/y_n)]$$

where r and e are per capita federal revenues and expenditures allocated by region.

Since the population levels are the same for each of the regional and national variables, (5) can be expressed in total amounts of allocated federal revenues (R) and expenditures (E), with transposition of terms, as:

$$(6) RS_i = [(R_i/E_i)/(E/R)]/(y_{ni}/y_n)$$

The degree of interregional redistribution may be estimated by comparing the actual RS_i in (6) with their values under a neutral allocation of federal fiscal balances, namely, federal balances allocated in proportion to neutral-fisc income. Ruggeri and Yu [2003] have shown that these neutral-fisc relative shares – $RS_i(N)$ – may be expressed as:

$$(7) RS_i(N) = y/y_i$$

which means that they are the reciprocal of relative regional income disparities.

Ruggeri and Yu (2003) developed separate local indices based on these relative shares to address the following questions: (1) does the current regional distributions of federal revenues and expenditures generate more or less redistribution than the case where revenues are distributionally neutral among provinces and expenditures are allocated on an equal per capita basis (standard redistribution)? (2) What proportion of maximum redistribution, which would equalize post-fisc income in all regions, is generated by the regional distribution of federal revenues and expenditures?

To address these two questions, the authors start with expressions (5) and (6) and develop four sets of relative shares of federal fiscal balances: the actual relative shares – $RS_i(A)$ -, the neutral relative shares – $RS_i(N)$ -, the standard redistribution relative shares – $RS_i(S)$ -, and the maximum redistribution shares – $RS_i(M)$.

The relative share index for the standard interregional redistribution – $RSI_i(S)$ – is:

$$(8) RSI_i(S) = [RS_i(A) - RS_i(N)]/[RS_i(S) - RS_i(N)]$$

which can be transformed into

$$(9) RSI_i(S) = [(R_i - E_i)/E_i]/[(y_i - y)/y]$$

When $RSI_i(S)$ equals 0, there is no interregional redistribution ; when it equals 1, the federal fiscal system generates the standard interregional redistribution; values greater (less) than 1 indicate higher (lower) interregional distribution than the standard case.

The relative share index with respect to maximum redistribution – $RSI_i(M)$ - is:

$$(10) RSI_i(M) = [RS_i(A) - RS_i(N)]/[RS_i(M) - RS_i(N)]$$

The lower and upper limits of this local index are 0 and 1. This means that the estimated value of $RSI_i(M)$ measures the proportion of maximum redistribution (equal after-federal-fisc per capita income in all regions) generated by the current regional distribution of federal revenues and expenditures.

Global indices. These indices present a single indicator of interregional redistribution and are derived by comparing the overall degree of inequality under base income and neutral-fisc income. If we use the Gini coefficient (G) as the aggregate measure of per capita income inequality among regions, we can derive an aggregate index of interregional redistribution as

$$(11) I_a = G_n - G_b$$

where n refers to neutral-fisc income and b to base income.

When federal fiscal activity redistributes income from higher to lower income regions, actual base income is distributed less unequally than neutral-fisc income, G_n is higher than G_b and I_a has a positive value. The higher is this difference, the higher is the degree of interregional redistribution. Cassady, Ruggeri and Van Wart (1996) have shown that this index is equivalent to the index of vertical redistribution for fiscal incidence developed by Reynolds and Smolensky (1977).

For fiscal redistribution, Pechman and Okner (1980) suggested an aggregate index based on the proportional change in the two Gini coefficients. Using this measure yields the aggregate index:

$$(12) I_a^* = (G_n - G_b)/G_n$$

Following Bayoumi and Masson (1995) we can develop a global index by relating the per capita values of base income in each region to the corresponding per capita value of neutral-fisc income

$$(13) y_{bi}/y_b = a + m(y_{ni}/y_n) + u_i$$

where u_i refers to the error term.

The estimate of $(1 - m)$ measures the average proportion of the regional deviation in per capita neutral-fisc income that is offset by federal spending and revenue-raising activities.

Global indices may also be developed for the local relative share indices following the aggregation approach used by Cassady, Ruggeri and Van Wart (1996) in

the development of global indices from the local indices of tax progressivity proposed by Baum (1987). For interregional redistribution, the global indices can be calculated as the weighted average of the local indices where the weights are the regional shares of total neutral-fisc income.

5. Conclusions

This paper discussed the major methodological issues in the measurement of federal fiscal flows in a federation and the estimation of local and global indices of interregional redistribution. It identified three fundamental steps in this process: (a) the assumptions about the regional allocation of federal government revenues and expenditures; (b) the selection of appropriate income or consumption concepts for measuring the redistributive effect of federal fiscal activity; and (c) the selection and application of the appropriate measures of interregional redistribution.

There is little to be debated about the measure of regional economic disparities. The choice between consumption and income measures cannot be arbitrary, but must be consistent with the approach selected to measure federal fiscal balances. There is also little to be debated about the indices of redistribution. They must measure the extent to which federal fiscal activity has reduced the degree of regional disparities in the selected economic indicator. We need to distinguish between local and global indices, but estimates of both should be included in the presentation of the results to determine not only the overall degree of interregional redistribution, but also its interregional equity dimensions.

There is room for debate with respect to the selection of the appropriate approach to the measurement of federal fiscal balances. Even in this area, it must be acknowledged that all three available approaches – cash-flow, benefit, and economic gain – yield the same regional allocation for a large portion of federal revenues (those not subject to shifting) and for a large portion of federal expenditures (transfers to persons and transfers to other governments). It seems to me that developing an approach that would receive broad acceptance should not be a daunting methodological task. The compromise between cash-flow and benefit approaches incorporated into the economic gain approach may be a useful starting point.

There are two potentially more controversial areas that require more research. The first area includes a variety of issues directly related to the calculation and

interpretation of federal fiscal balances. These balances are calculated within a static framework. Yet, it is known that federal fiscal policy may have long term effects on national economic performance and regional economic disparities. These effects are not captured by annual estimates of federal fiscal balances, even when estimates are provided on a frequent basis. To fully understand the regional impacts of federal fiscal policy the analysis must be placed within a dynamic framework, which takes into account the positive and negative effects of federal fiscal actions on regional economic and fiscal disparities. It is also important to investigate the effect of fiscal federalism on overall levels of government spending and taxation, the implications of tax exporting within a country, and the spillovers from spending by regional governments. Also, it may useful to explore whether federal purchases of goods and services have a different effect on a region's economy than transfers to persons.

Finally, it is important to investigate the extent to which non-fiscal actions by the federal government affect regional economic and fiscal disparities. If non-fiscal activity widens regional economic disparities by 10 percent and federal fiscal actions reduce them by 10 percent, no redistribution is generated by the federal government although estimates of federal fiscal balances would indicate some redistribution.

The institutions and instruments of fiscal federalism are affected by both economic and political forces. The quality of the debate on these issues can be improved by developing consistent methodologies and measurement tools that help shift the debate from differences in methods to substantive issues of policy.

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