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**THREE EQUALIZATION ALTERNATIVES:
EVIDENCE FOR CANADA**

by

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Abstract

The Federal Expert Panel will examine the allocation of Equalization payments under the Representative Tax System and alternative approaches to measuring fiscal capacity based on macroeconomic indicators and provincial fiscal needs. This paper analyzes the redistributive properties of the current and alternative systems of fiscal Equalization in Canada. How effective are these programs in providing systematic redistribution of tax revenues from the federal government to the provinces? Empirically, the effectiveness of redistribution is tested using the German model developed by Von Hagen and Hepp. Equalization payments under a macroeconomic approach are calculated using the variation of Courchene's macro formula. Equalization payments under the fiscal need approach are calculated using the variation of the formula introduced by Commonwealth Grants Commission in Australia.

Key words: Fiscal federalism, Fiscal policy, Equalization payments.

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1. Introduction

Equalization is one of the primary fiscal arrangements between the federal government and the provinces. The Equalization program formally began in 1957 and has since been in a state of continuous evolution. The principle of Equalization became enshrined in the Canadian Constitution in 1982. Section 36.2 of the Constitution Act affirms the concept of Equalization specifically that the federal government is responsible for equalizing the ability of provincial governments to ‘provide reasonably comparable levels of government services at reasonably comparable levels of taxation’.

However, the Constitution Act is silent as to how the federal government should fulfill its responsibility in equalizing provincial fiscal capacities. Currently, the provinces’ fiscal capacities are measured using the ‘representative tax system’ (RTS). The RTS includes 33 different provincial/local revenue sources with respect to which revenue-raising potential of each province is calculated. Then, per capita fiscal capacities are compared to a benchmark or standard: if the province in question were below the standard, it would be entitled to Equalization funding. Despite the fact that provincial fiscal capacities are raised to 95% of national average fiscal capacity, some provinces have argued that the current Equalization program does not fulfill its constitutional obligation and treats fiscal disparities inadequately.

To address the issue of adequacy of Equalization payments under the current RTS, legislation passed by the federal government in March 2005 sets the aggregate level of Equalization payments at \$10 billion in 2004-05 and \$10.9 billion in 2005-06, which will continue to grow at 3.5 per cent per year thereafter. The history of Equalization payments is famous for their volatility. Only in the past five years, the gross amount of Equalization varied in the range from as low as \$8.6 billion to as high as \$10.9 billion. Without fundamental modifications to the program, specification of the static Equalization amount has potential to produce stabilized Equalization payments to the provinces in the long run.

Meanwhile, to address allocation issues, the federal government is seeking third-party expert advice on the best way to allocate payments among the provinces and territories in the future. The Federal Expert Panel is mandated to make recommendations on allocations of Equalization payments among the eight recipient provinces (Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba, Quebec, Saskatchewan and British Columbia). Furthermore, the members of the Expert Panel will examine alternative approaches to measuring fiscal capacity including macroeconomic approaches and provincial fiscal needs.

One of the key features of the Equalization program is its redistributive role with respect to both fiscal and economic disparities. Accordingly, this paper attempts to analyze the redistributive effectiveness of the current Equalization program and two alternatives: formulas based on macroeconomic factors and on fiscal needs. The macro approach to Equalization “measures provincial fiscal capacities without reference to the actual tax system of the provinces” but instead, on the basis of macro measures of income or production from which taxes are paid (Courchene, 1982, pp. 215-216). Equalization payments under the macroeconomic approach are calculated using the formula presented by Courchene in his book “Equalization Payments: Past, Present and Future”.

The fiscal needs approach is based upon the Australian Equalization program. The Australian Commonwealth Grants Commission (CGC) calculates Equalization grants by incorporating both standardized revenue capacity and expenditure (fiscal) needs. The formula produced by CGC is modified for calculating Equalization grants for Canada.

Empirically, the effectiveness of the redistribution is tested using the German model developed by von Hagen and Hepp (2000). The parameters of redistributive effectiveness will then be used to assess the efficiency of the proposed mechanisms. The analysis is based on a panel of provincial own source revenues and Equalization payments under the current, macroeconomic and fiscal needs approaches for seven of the Canadian provinces, using the sample of 22 years¹.

The paper is organized as follows. In the next section, previous works are reviewed. The structure of the current Equalization program is presented in Section 3. In Section 4, the empirical model with macroeconomic and fiscal needs formulas will be defined. Empirical results are outlined in Section 5. The paper concludes with a summary of findings and a brief discussion of policy implications.

2. Previous Empirical Literature

There are two threads to the empirical literature: redistributive effects of the Canadian transfer system and theoretical framework of macroeconomic and fiscal needs approaches. The first thread examines the redistributive effects of the Canadian transfers system and includes studies by Bayoumi and Masson (1995, 1998), Fatas (1998), Obstfeld and Peri (1998), Melitz and Zumer (1999, 2001, 2002).

1) During the sample (1981-2002) used in this paper, eight provinces were the recipients of Equalization. However, British Columbia (BC) has been excluded from the analysis because it has become entitled to Equalization receipts only in 2001-02. Including zero Equalization payments for BC prior to 2001-02 might lead to biased results.

The literature that developed around the issue of adequately measuring and minimizing regional disparities found its roots in the works on European Union (EU), when its members raised concerns regarding EU's intergovernmental transfer system. The main concern was whether union countries would possess the necessary fiscal tools, i.e. transfers such as Equalization, to combat regional disparities. Thus, a number of researchers looked to existing federations for some guidance on this issue.

The first time Canada was studied in the context of designing the European Monetary Union (EMU) transfer system, was in the MacDougall Report (1977). According to its estimates, the Canadian transfer system has the ability to reduce a one-dollar income divergence between provinces by 32 cents. However, MacDougal and his colleagues did not explain their results for one to interpret the role of the transfer system as being redistributive or stabilizing. They briefly summarize these terms suggesting that redistribution offsets long-run regional income differentials and stabilization provides short-term cushion against cyclical shocks. Later, von Hagen and Hepp present comprehensive definitional distinctions between redistribution and stabilization. They argue that redistribution occurs when the state governments that exert various efforts to raise their revenues, but manage to collect such revenues below a certain average, obtain a receipt of Equalization. Thus, the purpose of Equalization is to reduce the differences in tax revenues between the regional governments. Stabilization, on the other hand, pertains to income smoothing in the absence of any differences in the expected per capita incomes. Risk-sharing takes place when regional per capita income is volatile relative to aggregate per capita income. In this case, the role of Equalization would be to provide insurance against asymmetric shocks in these regions. Also, within redistribution as one of classifications, authors distinguish between redistribution of personal income and gross state/provincial product.

Appropriately enough, the definition of redistribution and its application to the Canadian fiscal Equalization is of interest for this study. Further works by Bayoumi and Masson (1995) have extended MacDougal's results. Despite differing methodologies, their estimate of the redistributive effect of the Canadian transfer system was 39 cents per dollar.

Later, in the study conducted by Fatas (1998), the redistributive flows offset roughly 17 percent of disparities among Canadian regions. With respect to gross domestic product, Melitz and Zumer (1999) estimated redistribution effects to be in the range of 18-24 percent for Canada. In 2002 Melitz and Zumer provided further empirical evidence for Canada, estimating the redistributive effects on personal income. Their results showed that transfers can potentially redistribute personal income by 16 cents.

Obstfeld and Peri's (1998) redistribution effects were much higher for Canada than those found in previous studies. Based on their assessment, government transfers reduce disparities in per capita personal income by 53 cents. Several reasons serve as explanations for this result. First of all, the variables in Obstfeld and Peri's study are expressed in terms of logarithms, while other authors used the level specification. Secondly, they base their estimation on bivariate vector autoregression model, while two-stage or three-stage least squares estimation is used by others. Finally, Obstfeld and Peri argue in support of their result that Canada has a more decentralized fiscal system and a more extensive system of intergovernmental transfers, which puts more emphasis on transfers to regional governments than any other federation.

The second thread of literature includes such authors as Clark (1969), Courchene (1984), Shah (1994), Boadway (2001), Vaillancourt and Bird (2003), who have attempted to study alternative methodologies to measuring fiscal capacities in Canadian context.

Describing the potential application of a fiscal needs approach, Clark (1969), Shah (1994) and Vaillancourt and Bird (2003) advocate the Australian calculation of 'special grants' that involves the fiscal needs component as an example for Canada. Courchene's (1984) analysis of a fiscal needs approach to Equalization, in comparison to previous works, is much more comprehensive in its definition and presents an extensive potential mathematical application of the new framework.

Courchene has also analyzed variations of macroeconomic approach to Equalization and sees it as a potential replacement of the current RTS. However, he argued that with all its technical simplicity, the macro-approach is data sensitive. Since macroeconomic bases (GDP or personal income) are constantly revised, concerns may arise regarding the validity of the outcome, i.e. newly calculated Equalization payments.

Later, Boadway (2001) also studied advantages and disadvantages of a macro-approach as a potential alternative to the Equalization program. Even though his arguments were simply based on theoretical observations rather than empirical findings, Boadway concluded that an arbitrary standard under the macro approach could run the risk of violating the principles of Section 36.2.

While some authors have reservations of replacing the current program with suggested alternative approaches, the forthcoming empirical analysis tests and compares the effectiveness and efficiency of the current Canadian Equalization program and its possible alternatives.

3. Current Equalization Program in Canada

Canada is a mature federation with a well-developed system of intergovernmental transfers that take the form of unconditional and conditional grants. For the sake of this analysis, unconditional transfers are assumed to be targeted at redistributing regional government revenues. Unconditional grants, i.e. equalization payments, are made to selected provinces to address horizontal fiscal imbalance and comprised about 36 percent of major transfers in 2002-03. Conditional grants, in large part Canada Health Transfer (CHT) and Canada Social Transfer (CST), are made to all provinces to address the vertical fiscal imbalance. Their immediate role pertains to targeting expenditure areas such as health, post-secondary education and social services.

Following the constitutional objective, the Equalization program is a necessary tool for addressing the differences in fiscal positions of Canadian provinces. In other words, not all parts of the country are equally prosperous and not all provincial governments can generate the same revenues in order to finance public services. However, a definition of a less prosperous province also has its boundaries in the Equalization context. A poor province will only qualify for Equalization payments if its per capita fiscal capacity is below the ‘standard’, defined by the average per capita revenues of Ontario, British Columbia, Saskatchewan, Manitoba and Quebec.

Fiscal capacity is the ability of provinces to raise revenues with which to fund public services. The revenue-raising potential of each province is measured using the Representative Tax System (RTS), which includes 33 potential provincial revenue sources. The role of the Equalization program is to use common definitions of what is taxed in order to compare and then evaluate provinces’ fiscal positions relative to each other. For provinces with relatively low revenue-raising potential, equalization payments serve as the tool for bringing them up to the average revenue-raising capacity of the standard provinces. Due to the fact that Canadian Equalization program is a “gross scheme” program, provinces are equalized up to the standard, but transfer payments are not reduced for the provinces above the standard.

Under the rules of the system, eight provinces qualified for equalization receipts during the sample period (from 1981-82 to 2002-03). In mathematical terms, Equalization, denoted as EQ_i , is calculated as follows:

$$EQ_i = P_i * \left\{ \sum_{j=1}^{33} t_j^* (y_{sj} - y_{ij}) \right\} \quad (1)$$

where, i is the index for ten provinces,

j is the index for 33 tax bases,

P_i denotes population of province i ,

t_j denotes the national average tax rate of the corresponding tax base,

y_{sj} denotes the average per capita tax base of standard provinces,

y_{ij} denotes the per capita tax base of province i .

Thus, according to equation (1), Equalization payments of Equalization recipient provinces equal to their population multiplied by the amount by which their per capita fiscal capacity falls short of the standard. Also, if the province has an equal or higher fiscal capacity than the standard, it will not be eligible for Equalization. During the sample period, the provinces that have not qualified for Equalization payments were Ontario, Alberta and British Columbia prior to 2001-02.

Lately, provincial dissatisfaction with the program has pressured the federal government to revisit the underlying concepts of Equalization and its structure. Therefore, it was natural of the federal government to pass legislation on the Equalization reform and seek official advice of the Federal Expert Panel on the allocation of payments under the current system. The task that this paper sets forward is to perform an empirical analysis of the redistributive effectiveness not only of the existing Equalization system but also of its two alternatives – macroeconomic and fiscal needs – which are within the mandate of the Expert Panel. The following section introduces alternative Equalization models and the test for the redistributive impacts of Equalization.

4. The Model

4.1 Alternative Equalization Models

Besides addressing the allocation issues of the current Equalization program, the Federal Expert Panel will examine alternative approaches to measuring fiscal capacity. Two possible alternatives are based on a macroeconomic approach and expenditure needs. The current analysis introduces one version of calculations corresponding to the alternative programs.

Under the macroeconomic approach, Courchene suggests using gross domestic product (GDP) at factor cost and personal income (PI) as macroeconomic bases. GDP at factor cost, and not GDP at market prices, is chosen because it would exclude indirect taxes, such as provincial sales taxes. Personal income could be used directly as reported in the Provincial Economic Accounts. However, Courchene suggests excluding any income sources that are not subject to provincial taxation: provincial-local transfers to persons, Canadian Pension Plan (CPP)/Quebec Pension Plan (QPP) direct taxes, federal income taxes and federal EI contributions. This paper uses the simplest definition of the PI macro base – personal income less provincial transfers to persons.

The second issue is the definition of total revenues to be equalized. Courchene refers to the Department of Finance background paper where ‘a macro-economic system of equalization can be applied to the same set of revenues as the representative tax system’ (Courchene, 1984, pg.219). For the sake of the analysis, the paper defines

total revenues to be equalized as total provincial revenues less equalization receipts and Canada Health and Social Transfer (CHST). Local government revenues are included because, otherwise, provinces could manipulate the program to re-allocate revenues and spending between themselves and the government. In this case the assumption is such that provincial and local government revenues can be reflective of the fiscal capacity, hence using it as the measure of ‘revenues to be equalized’ keeps the principle of Equalization. Quantitatively, equalization payments under the macro approach are expressed in the following manner:

Gross Domestic Product at Factor Cost as Macro Base

$$EQ_MA(GDP)_i = TR_EQ * (Pi/P_n - \{GDP_i/GDP_n\}) \quad (2)$$

Where i is the index for seven receiving provinces,
 TR_EQ_i denotes total revenues to be equalized,
 Pi/P_n denotes the province’s share of population,
 GDP_i/GDP_n denotes province’s share of Gross Domestic Product.

Personal Income as Macro Base

$$EQ_MA(YP)_i = TR_EQ * (Pi/P_n - \{YP_i/YP_n\}) \quad (3)$$

Where i is the index for seven receiving provinces,
 TR_EQ_i denotes total revenues to be equalized,
 Pi/P_n denotes the province’s share of population,
 YP_i/YP_n denotes province’s share of Personal Income.

Under the fiscal needs approach, Equalization payments are calculated using the variation of the formula produced by Commonwealth Grants Commission (CGC) in Australia. Under the Australian system, the Equalization grants that CGC distributes are derived by a system that measures the states’ fiscal capacity and fiscal needs. The Australian Constitution does not provide any guidelines on the allocation of grants or other funds from the Commonwealth; however, Commonwealth Grants Commission has stated its own objective, which indicates that:

“ State governments should receive funding from the Commonwealth such that, if each made the same effort to raise revenue from its own resources and operated at the same level of efficiency, each would have the capacity to provide services at the same standard” (CGC Review Report, 2004, pg. 4).

Thus, Commission’s Equalization model, similar in its objective to the Canadian constitutional principle, is applied to the Canadian data. The mathematical representation of the Australian Equalization model is the following:

$$G_s = B_{av} + E_s - R_s - O_i \quad (4)$$

where G_s denotes the equalizing grant from the Commonwealth;

B_{av} denotes average state budget result;

E_s denotes standardized expense;

R_s denotes standardized revenues;

O_i denotes total Specific Purpose Payments from the Commonwealth.²

The original model calculates Equalization payments as the difference between the sum of the average budget result and standardized expenditures and the sum of standardized revenues and conditional transfers. However, the calculations of standardized expenditures and revenues in the original model were adjusted to the Canadian context. While Australia defines the fiscal need on the basis of eight broad expenditure categories (education, health, transportation, telecommunications, social welfare, police and fire, environmental protection and other services), the modified model includes only health, education, social services and other services where the first three expenditure categories comprise about 61 per cent on average of total program spending in Canada.³

Courchene's mathematical expression of the Representative Expenditure System (RES) is used to calculate provincial standardized expenditures, according to which each expenditure category is demographically adjusted. In order to obtain standardized spending on education, national spending on education is adjusted by the population of the school-aged children from 5 to 19 years of age. A similar principle is applied to deriving standardized spending on social services, as national spending on social services is adjusted by the number of people with low income.⁴ Therefore, it would be logical for the provincial government to target the population in the low-income cut-off with social assistance, which may already include a certain number of the unemployed. Standardized spending on health is calculated by weighting national spending on health according to what is spent on a specific age group. The weights are derived by age group published in the Canadian Institute for Health Information (CIHI) document on public health. Finally, standardized spending on social services is adjusted by the demographic index, which equals one, for computational simplicity. The measure that is chosen to represent standardized revenues in the Canadian context is the yield of 33 tax bases at national average tax rates. The Australian calculation of revenues is based on their 18 revenue categories. The Australian Equalization model, which incorporates both fiscal and revenue needs, has been simplified for the sake of this analysis.

2) Information Paper of Commonwealth Grants Commission, 2002, pp.9-10.

3) The logistics of Australian Equalization model involve greater detail than presented in this paper and hence, the original model is more complex.

4) Due to the fact that the federal government directly supports the unemployed by providing Employment Insurance, using the number of unemployed as the proxy for adjusting the provincial need is not necessary.

$$EQ_FN_i = B_{av} + E_{si} - R_{si} - SPP_i \quad (5)$$

Where i is the index for seven recipient provinces in Canada,

EQ_FN_i denotes Equalization receipts with a fiscal need component for province i ,

$B_{av} = (\sum B_{pc})/10$ denotes the average budget result. For a particular year, the average budget result will be the same for each province;

R_{si} denotes standardized revenues defined in terms of per capita yield of tax bases at national average tax rates for province i ,

E_{si} denotes standardized expenditures defined as the sum of standardized expenditures on education, health, social services and other services.

SPP_i denotes per capita conditional transfers (CHST) for province i . They are subtracted from the formula, because they represent the assessed needs met by these transfers.

Each of the Equalization formulas is incorporated into von Hagen and Hepp's model to test the redistributive effectiveness of corresponding Equalization receipts to provincial governments.

4.2 Tests for the Redistributive Impact of Equalization

The major contribution of this paper to the previous literature is to extend von Hagen and Hepp's methodology to Canadian data in the current context of Equalization and its three possible alternatives. In the paper "Regional Risksharing and Redistribution in the German Federation", von Hagen and Hepp examine how *Finanzausgleich* (FA) affects state budget revenues. The authors describe FA as an arrangement for redistributing personal, business and all other tax revenues among the states. They examined ten regions over the period of 33 years (1961-1994), where the end of the sample period was chosen to match the date of German reunification. Estimates of redistributing impact of Equalization transfers are based on the following model:

$$\frac{x_{i,t} - x_t}{y_t} = \alpha_t + s_i + \gamma * \left[\frac{y_{i,t} - y_t}{y_t} \right] + \varepsilon_t \quad (6)$$

where x_{it} denotes per capita transfers to governments in region i ;
 x_t denotes the seven-province average per capita of Equalization transfers⁵;
 y_{it} denotes per capita own source revenue;
 y_t denotes the seven-province average per capita own source revenue;
 α_t denotes time effects;
 s_t denotes state effects,
and γ (gamma) denotes the estimate of redistribution impact of Equalization.

With this test, the levels of Equalization transfers are regressed on the levels of regional government incomes to get the redistribution effect. Gamma coefficient, denoting the redistributive impact, ‘estimates the response of transfer flows to a [province’s] deviation from the average per capita tax revenues’ (von Hagen and Hepp, 2000, pg. 16). Simply, Equalization payments reduce the differences in per capita tax revenues if gamma is less than zero ($\gamma < 0$).

For Germany, von Hagen and Hepp found that equalization transfers (FA) provide a significant amount of state revenue redistribution – more than 50 percent. Application of von Hagen and Hepps’ methodology to the Canadian context is appropriate based not only on universal similarities, but also on a particular design of tax and transfer systems. In general terms, Germany, like Canada, is decentralized and has a constitutionally mandated set of intergovernmental transfers. Specific compatibility of the two federations pertains to their tax assignment and more importantly, to the principle of Equalization. In both federations, all major taxes are shared by the federal and provincial (state) governments. This defines the formation of Equalization system and its recipients. The constitutional principle of Equalization, ensuring the ability of regional governments to provide comparable public services at comparable levels of taxation, determines the fundamental existence of the program. While the remaining country-specific components of the tax and transfer systems will differ for the two federations, the most crucial aspects are alike.

Therefore, with the combination of Canadian data and von Hagen and Hepp’s methodology, the primary questions of whether equalization transfers in Canada redistribute provincial government revenues and how effective their redistribution is, will hopefully be answered.

5) Using 7-province average vs 10-province average: if x_t is derived on the basis of 10 provinces, then adding ‘have’ provinces would mean adding zeros for Equalization payments. This will lead to a biased estimator. If x_t is derived on the basis of 7 provinces, but y_t is derived on the basis of 10 provinces, it means the ratio will have a greater and inconsistent weight. Therefore, for unbiasedness and consistency purposes, the federal averages of Equalization payments and own source revenues are based on a 7-province average.

5. Empirical Analysis

5.1 Current and Alternative Equalization Payments to the Provinces

The objective of making Equalization payments to less prosperous provinces is simple, but in practical terms, it is necessary to have a comparable measure of provincial fiscal capacity. With the revenue-raising effort and unconditional Equalization payments, the provinces are able to fund the public services according to their own priorities. Under the current Equalization program, the federal government makes payments to the provinces corresponding to the degree their fiscal capacities fall short of the five-province standard. Table 5.1.1 presents Equalization payments per capita under the current Representative Tax System from 1996 to 2002.

Table 5.1.1: Current Per Capita Equalization Payments

year	NFDL	PEI	NS	NB	QC	MB	SK	Average p/c EQ payment among the provinces
1996	1,712	1,379	1,199	1,201	566	958	173	1,027
1997	1,825	1,531	1,378	1,399	581	1,135	8	1,122
1998	2,159	1,977	1,455	1,694	738	802	434	1,323
1999	2,008	1,879	1,312	1,535	599	1,113	534	1,283
2000	2,184	1,988	1,533	1,532	768	1,168	174	1,335
2001	2,227	2,061	1,449	1,762	721	1,216	492	1,418
2002	2,181	1,623	1,203	1,529	714	1,157	0	1,201
Average p/c EQ payment over 1996-2002	2,042	1,777	1,361	1,522	670	1,078	259	
Province's Share of Total EQ	0.11	0.02	0.12	0.11	0.48	0.13	0.03	
Standard Deviation	202	264	129	185	84	146	226	
Coefficient of variation	0.099	0.149	0.095	0.122	0.126	0.136	0.870	

Table 5.1.1 is produced from functioning of Equation 1 for the current system. As described in Section 3, Equalization payments for a province are determined by the size of its fiscal capacity (y_{ij}) relative to the 5-province benchmark (y_{sj}). Ultimately, a 'less prosperous' province will receive a larger payment since its total fiscal yield will be smaller than the 'standard'. For instance, provinces such as Newfoundland and Prince Edward Island receive the largest per capita Equalization payments since

their high unemployment rates, large debts, excessive spending along with other economic and fiscal indicators create barriers for raising their fiscal capacities above the standard. Quebec and Saskatchewan, on the other hand, are wealthier provinces and thus receive smaller Equalization payments. However, due to Quebec's large population base, its aggregate Equalization comprises almost 50 per cent of total payments. Saskatchewan, in particular, is an interesting example since its Equalization payments range from \$534 to zero per capita between 1996 and 2002. Saskatchewan's fiscal capacity is highly dependable on resource revenues, which can be volatile in response to unstable energy prices. In 2002, Saskatchewan's fiscal capacity exceeded that of the 5-province standard. Under the current legislation, provinces whose fiscal capacity is greater than the 'standard', receive an Equalization payment of zero as opposed to contributing the residual amount to the program.

Table 5.1.1 also shows a certain degree of volatility in the payments. In large part, this is due to the fact that under the pre-reform Equalization program, the federal government did not have a fixed aggregate level of Equalization. Coefficients of variation for the current Equalization program indicate the highest year-to-year variation of Equalization payments in Manitoba (0.329) and the lowest year-to-year variation for Nova Scotia (0.095).

Courchene's macroeconomic approach, used in this analysis, consists of two macro bases: GDP at factor cost and personal income. Table 5.1.2 illustrates per capita Equalization payments calculated according to the macro base of GDP at factor cost for seven years.

Table 5.1.2: Per Capita Equalization Payments Based on GDP at Factor Cost

year	NFDL	PEI	NS	NB	QC	MB	SK	Average p/c EQ payment among the provinces
1996	1,929	1,384	1,456	1,208	700	651	0	1,047
1997	1,953	1,640	1,452	1,325	732	638	170	1,130
1998	1,825	1,566	1,402	1,272	717	608	239	1,090
1999	1,840	1,742	1,467	1,310	747	833	356	1,185
2000	1,668	2,006	1,691	1,621	968	1,079	219	1,322
2001	1,531	1,874	1,457	1,497	903	985	402	1,235
2002	793	1,682	1,406	1,589	818	955	299	1,077
Average p/c EQ payment over 1996-2002	1,648	1,699	1,476	1,403	798	821	241	
Province's Share of Total EQ Amount	0.08	0.02	0.13	0.10	0.55	0.09	0.02	
Standard Deviation	405	203	98	164	103	191	133	
Coefficient of variation	0.246	0.119	0.067	0.117	0.129	0.233	0.553	

Table 5.1.2 illustrates Equalization payments under the GDP macro approach calculated according to Equation 2 in Section 4. Under a similar principle as the current program, GDP-based Equalization payments are allocated to a province if the difference between its population share and the share of the macro base ($(P_i/P_n - \{GDP_i/GDP_n\})$) is positive. Equation 2 produces seven Equalization recipients during 1996 and 2002. Once again, Saskatchewan joins the non-recipient status in 1996 since its share of GDP is greater than its share of population. In 1996, Saskatchewan's growth in GDP at factor cost of 9 per cent was the highest among the recipient provinces, also exceeding national growth of 3 per cent, primarily because of stronger oil royalties and other resource revenues. This result is in line with a relatively small Equalization payment under the current program for that year.

Another interesting factor that pertains to the functioning of the macroeconomic formula is the sensitivity to changes in GDP and/or population. The major Canadian data source, Statistics Canada, tends to revise its economic and demographic indicators every 4 years. GDP at factor cost follows this tendency and the final numbers are published in the fifth year. Population numbers may or may not be revised during the 4-year period; however, upon the release of the Census, which occurs every 5 years, population data are final. Such revisions may have positive as well as negative effects on the size of Equalization payments under this scenario. In particular, Equalization receipts, marked in italics, for Newfoundland (2002), Prince Edward Island (2000) and Manitoba (2000) are the distinct consequences that resulted from unusual changes in GDP and/or population. For Newfoundland, a decrease in the population share relative to an increase in the GDP share led to a smaller difference, therefore, to a smaller Equalization receipt in 2002. For Prince Edward Island, a magnitude of the decrease in the GDP share relative to a decrease in population was smaller, making their difference and, hence, the Equalization payment larger in 2000.

This further explains why standard deviations corresponding to GDP-macro approach range from as high as 405 for Newfoundland to as low as 98 in Nova Scotia. Coefficients of variation indicate the presence of a higher degree of volatility of Equalization payments under the GDP-macro approach than under the current system. Only for provinces such as Nova Scotia and Saskatchewan the variation of payment is somewhat lower.

The logic of the GDP approach applies to personal income mechanism for computing Equalization payments, since the GDP-macro formula replaces its current base $\{GDP_i/GDP_n\}$ with the variable corresponding to the personal income base $\{YP_i/YP_n\}$. Population shares (P_i/P_n) and total revenues to be equalized (TR_{EQ}) are unchanged. Therefore, the same principles will carry into the personal income mechanism.

Table 5.1.3 shows per capita Equalization payments determined from the macro base of personal income for seven years.

Table 5.1.3: Per Capita Equalization Payments based on Personal Income

year	NFDL	PEI	NS	NB	QC	MB	SK	Average p/c EQ payment among the provinces
1996	1,809	1,310	959	1,071	464	516	725	979
1997	1,881	1,451	980	1,163	506	590	1,032	1,086
1998	1,884	1,461	930	1,150	539	601	1,065	1,090
1999	1,888	1,541	914	1,157	581	733	1,164	1,140
2000	2,059	1,683	1,082	1,352	597	894	1,372	1,291
2001	1,869	1,694	997	1,348	565	835	1,310	1,231
2002	1,819	1,524	950	1,326	540	818	1,265	1,177
Average p/c EQ payment over 1996-2002	1,887	1,523	973	1,224	542	712	1,133	
Province's Share of Total EQ	0.11	0.02	0.10	0.10	0.44	0.09	0.13	
Standard Deviation	82	135	55	115	46	144	219	
Coefficient of variation	0.044	0.089	0.057	0.094	0.084	0.203	0.193	

Equalization payments, produced by Equation 4, are presented in Table 5.1.3. While they are consistently smaller on average relative to the current program, they tend to be similar to Equalization payments under the GDP-macro approach. However, Equalization payments under the PI-macro approach tend to be much more stable than under any other system. Even though personal income faces a similar set of revisions compared to GDP at factor cost during the 4-year period, the magnitude of these revisions may be smaller. While GDP and personal income are both sensitive to economic shocks, a combination of revisions to personal income and population appeared to produce lower standard deviations and hence, indicate a lesser degree of volatility of Equalization payments. The table displays only two distinct outliers within the seven-year sample, which are Equalization receipts for Newfoundland (2000) and Nova Scotia (2000). For both provinces, the share of personal income decreased by a greater magnitude than their share of population, reducing the difference between the two shares, and thus increasing the final Equalization payments in 2000 relative to other years. Coefficients of variation, ranging from 0.044 to 0.09 support the argument of more stable Equalization payments for all the provinces except Manitoba and Saskatchewan.

Finally, Table 5.1.4 presents Equalization payments per capita calculated under the fiscal needs approach.

Table 5.1.4: Per Capita Equalization Payments Under the Fiscal Needs Approach

year	NFDL	PEI	NS	NB	QC	MB	SK	Average p/c EQ payment among the provinces
1996	1,832	1,485	1,319	1,275	911	1,177	0	1,143
1997	1,896	1,627	1,402	1,377	1,033	1,146	0	1,212
1998	2,179	1,810	1,537	1,543	1,219	1,329	443	1,437
1999	2,108	1,739	1,176	1,337	958	1,145	0	1,209
2000	2,434	2,198	1,699	1,755	1,364	1,614	490	1,651
2001	1,842	1,761	1,327	1,477	1,143	1,452	422	1,346
2002	1,694	1,622	1,273	1,478	980	1,436	279	1,252
Average p/c EQ payment over 1996-2002	1,998	1,749	1,390	1,463	1,087	1,328	233	
Province's Share of Total EQ Amount	0.11	0.03	0.11	0.10	0.58	0.07	0.0058	
Standard Deviation	255	226	176	158	163	182	133	
Coefficient of variation	0.128	0.129	0.127	0.108	0.150	0.137	0.553	

Equalization payments in Table 5.1.4 are derived, using the concept of equalizing both fiscal revenues and fiscal needs mathematically expressed in Equation 5 of Section 4. Its structure can be modified to determine Equalization recipients by the sign of the formula. In this case, Equalization payments can be computed as the difference between the sum of the budget result and standardized expenditures ($B_{av} + E_{Sij}$) and the sum of standardized revenues and conditional transfers ($R_{Si} + SPP_i$). Positive results indicate province's eligibility for an Equalization receipt. During the seven year period, six provinces qualify for the payment under the fiscal needs scenario on a regular basis. Saskatchewan, on the other hand, switches from a recipient to a non-recipient status in three of the seven years. Furthermore, during its receiving years, the size of the transfer per capita is relatively large and averages \$400 per capita. With regards to the overall size of Equalization receipts with the fiscal needs component, they appear to be distinctly larger than current Equalization payments.

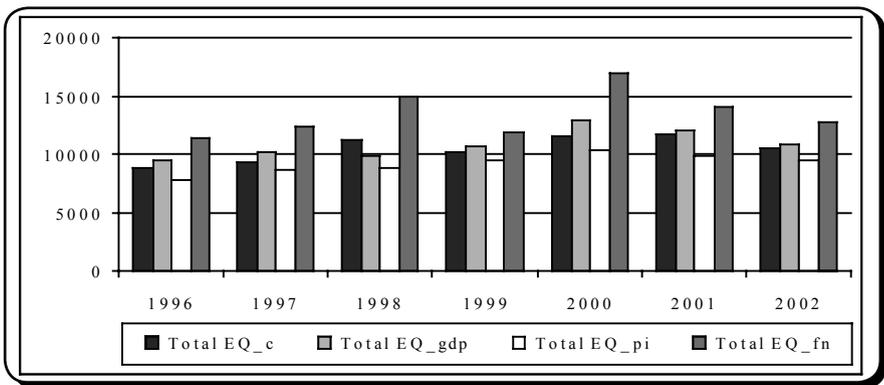
Another difference between the current system and the fiscal need approach appears in the degree of volatility in the payments. High standard deviations reaffirm the presence of variability of Equalization payments; however, they are of the similar magnitude across the provinces. Coefficients of variation tend to be in some cases

larger than under the RTS, but mostly stable throughout the recipient provinces with Saskatchewan as an exception.

Further analysis identifies the proxy for the cost of providing services. For computational simplicity, standardized expenditures are adjusted by the ratio of the province’s average weekly earnings to the national average weekly earnings. As a result, Ontario appears to receive Equalization payments on the regular basis while Saskatchewan does not. However, exclusion of the cost of providing services from the formula results in Equalization payments corresponding to the current Equalization, where Ontario is a ‘have’ province and Saskatchewan is a ‘have-not’ province⁶. Difficulty in determining the measure that can serve as a reasonable proxy for the cost of providing services in the province is a potential disadvantage of the fiscal needs approach.

The above four tables display what Equalization payments are under the current program and what they could be under the given versions of macroeconomic and fiscal needs alternatives. Indeed, levels of the current Equalization payments are mostly higher relative to the macroeconomic approach and lower relative to the fiscal needs approach. However, Equalization payments under all four approaches tend to be fairly volatile throughout the years. Chart 5.1 serves as a good demonstration of the variations of the total Equalization pot under the four programs for the seven-year sample (1996-2002).

Chart 5.1: Total Equalization Pot (\$Millions)



6) Ontario has a higher cost of providing services than the rest of the provinces, therefore resulting in a greater fiscal need.

The diagram illustrates a distinct year-to-year variation of Equalization payments under the fiscal needs approach surging to a total high of just over \$16 billion in 2002. Equalization pots corresponding to GDP- and PI-macro approaches have a smaller degree of volatility. Currently, each of the programs allows their Equalization pots to vary, however, once Equalization allotment is fixed, variation will disappear. However, a consequent issue of the fixed aggregate Equalization amount might be variability of payments to individual provinces.

Another interesting factor is that the total amount of Equalization under GDP-macro approach appears to be higher than the total pot of Equalization under the current system for six out of seven years presented in the diagram. Given this information, the empirical analysis is conducted to test the effectiveness of redistribution under current program and its alternatives in the next section.

5.2 Redistributive Effects of the Current Equalization Program and its Alternatives

The estimation of redistributive effects of the current Equalization program and its alternatives uses the methodological foundation of von Hagen and Hepp and appropriate Canadian data. In their model specification for Germany, authors include time effects, that way accounting for specific years of importance (e.g. 1994 represents the year of German reunification); state effects, that way acknowledging for heterogeneities present between the states (e.g. population, tax systems) and an independent variable represented by regional government revenues. The above three components comprise the right hand side (RHS) of the equation. The left hand side (LHS) of the equation is defined by a dependent variable in the form of equalization transfers.

For Canada, the test is performed regressing four sets of Equalization payments on own source revenues (*osr_res* – own source revenues for redistribution). Time effects based on 22 years and province specific effects for Equalization recipients are also included in the regression analysis.

The empirical analysis begins with the presentation of results. Table 5.2.1 reports the estimates of redistribution according to equation (5), which are significantly negative in the four models. The negative sign of the gamma coefficient indicates that each of the four sets of Equalization payments perform the redistributive role to some extent.

Table 5.2.1 – Redistribution Effects for Current Equalization, Fiscal Needs, GDP-Macro and PI-Macro Models

Model	Variable	Gamma-coefficient	Wald Statistic	Buse R-squared
<i>Current Equalization Model</i>	osr_res	-0.22	24.2	0.8563
<i>GDP-Macro Model</i>	osr_res	-0.18	19.1	0.7338
<i>PI-Macro Model</i>	osr_res	-0.12	10.9	0.8500
<i>Fiscal Needs Model</i>	osr_res	-0.28	26.6	0.9023

All coefficients are significant at 5% level of significance.

The current Equalization program compensates the province with per capita own source revenues of \$100 below the national average with an Equalization payment of \$22. Considering the imperfections of the current program, the estimate of the redistributive property of regional government revenues is moderate but promising. One of the improvements that has recently taken place was setting in legislation the annual Equalization allotment that may potentially reduce volatility. Consequently, the redistributive effectiveness of the current Equalization program can hypothetically be improved due to a larger Equalization pot. However, the practicality of such hypothesis remains to be tested in a different study as more data on the post-reform Equalization payments become available.

Redistribution under the macroeconomic approach appears to be less effective relative to the current Equalization program. Equalization payments derived according to GDP macro base reduce the differences in per capita own source revenues for a province by \$18. Interestingly, current Equalization payments are higher on average than Equalization payments under the GDP macro approach. Furthermore, the effectiveness of redistribution under the current model as opposed to the GDP macro approach is of a greater magnitude. A similar tendency is observed for the PI macro model relative to the current model. The PI macro approach would compensate the province with per capita own source revenues of \$100 below the national average with a corresponding Equalization payment of only \$12. Referring to section 5.1, the level of current Equalization payments was constantly higher than the level of receipts derived according to the PI macro base.

The final test of redistributive effectiveness is based on Equalization payments with a fiscal needs component. Calculation of Equalization payments is dependent on the two driving measures: standardized expenditures and standardized revenues. Standardized expenditures, measuring the fiscal needs, are derived on the basis of the three demographically adjusted expenditure categories – health, education and social services - which comprise close to 61% on average of total program spending. Standardized revenues, measuring the fiscal capacity, are the per capita yield of tax bases at national average tax rates. Table 5.2.1 demonstrates that redistribution of Equalization measuring fiscal capacity and fiscal needs is the most effective. Such

Equalization program responds to a province's \$100 deviation from the average per capita own source revenues with a payment of \$28. The first conclusion that springs from this results is that among the four models, the fiscal needs model has fully addressed the main principle of providing comparable levels of government services at reasonably comparable levels of taxation. In addition, measuring fiscal needs and fiscal capacity lead to a better fulfillment of the redistribution role. Secondly, Equalization payments per capita under the fiscal needs approach were constantly higher than the current Equalization transfers, hence, the effectiveness of redistribution depends on the total amount of Equalization. However, whether fiscal needs alternative is affordable for the federal government is another issue. Finally, incorporating the fiscal needs component into the Equalization calculation simply makes the system more complete and correspondent to the constitutional objective.

5.3 Extension and Caveats

The presentation of the analysis on redistributive effectiveness raises the following question. How efficient are the current and the proposed Equalization mechanisms, given their redistributive effectiveness? While this aspect sets grounds for further and more comprehensive research, a derivation of efficiency in the context of Equalization is briefly summarized in this section.

An efficient program can be defined as the one fulfilling its objectives at the minimal cost. The current Equalization program functions under the principle that should enable provincial governments to 'provide reasonably comparable levels of government services at reasonably comparable levels of taxation'. Provincial governments also recognize the affordability concern of the federal government; therefore, the legislated amount should potentially correspond to the notion of 'minimal cost'. However, the recipients of the program complain and critics argue that the current program no longer delivers its constitutional principle and thus requires a substantial reformation. May the alternative Equalization approaches be more reflective of the efficiency notion?

From a purely econometric perspective, Equalization program is efficient, if the degree of volatility in the payments is the smallest. Descriptive statistics in Section 5 show that the lowest coefficients of variation belong to a macro alternative with personal income (PI) as its base. Therefore, the PI-macro approach can be considered the most efficient as it fully fits within the econometric description. Also, the total cost of Equalization under the PI-macro approach is the lowest relative to its counterparts, which satisfies the 'minimal cost' definition. However, it remains unknown whether this mechanism addresses the underlying objectives of the Equalization program. In order to capture the complexity of the efficiency definition outlined in this section, an econometric approach should be used with an attempt to provide some clarification to

the existing uncertainty. The measure of redistributive effectiveness, defined through a profound empirical analysis, to a certain extent assesses the functionality of each Equalization alternative. In particular, it evaluates the effectiveness of each program within their existing objectives. Thus, the efficiency index should be determined as the ratio of the redistributive index and the average total cost of Equalization borne by the federal government between 1981/82 and 2002/03 (Table 5.3.1).

$$EI = \gamma / EQ_{ave(81/82-02/03)} \quad (7)$$

Where E_1 denotes the efficiency index;

γ denotes the absolute value of the redistributive index derived in Table 5.2.1;

$EQ_{ave(81/82-02/03)}$ denotes the average national Equalization amount transferred to the provinces between 1981/82 and 2002/03.

Table 5.3.1: Efficiency Indices for the Current Equalization Program and its Alternatives

Equalization Systems	Efficiency Index
<i>Current RTS</i>	2.73
<i>GDP-Macro</i>	2.20
<i>Personal Income-Macro</i>	1.62
<i>Fiscal Needs</i>	2.19

The results in Table 5.3.1 are somewhat surprising. One would predict that either PI-macro approach or the fiscal needs alternative would be efficient. The PI-macro approach with the lowest cost to the federal government had the smallest degree of volatility, while the fiscal needs alternative, measuring both fiscal needs and fiscal capacity, had the most effective redistribution. The union of these two Equalization alternatives would have fully addressed the definitional aspects of efficiency. However, the calculations show that the most efficient Equalization program is the current Representative Tax System (RTS), with the efficiency index of 2.73.

From an empirical standpoint, one can oppose the validity of the efficiency index, arguing about the nature of its calculations. Nevertheless, several factors can support the high efficiency outcome for the current program. First of all, the total Equalization amount under the current system is only somewhat higher than under the PI-macro approach, indicating that the ‘minimal cost’ requirement can potentially be fulfilled. Secondly, coefficients of variations are noticeably different from the PI-

macro approach only for Saskatchewan and Prince Edward Island. Manitoba's degree of volatility is, in fact, lower under the current approach, with minor discrepancies for other provinces. Finally, according to the redistributive effectiveness parameter that measures how well the province is compensated when its own source revenues fall \$100 below the national average, current transfers would offset such a decline by only \$6 less than transfers under the fiscal needs system.

The efficiency analysis proposed in this section is preliminary and requires extensive observation, methodological enhancement and adjustment for post-reform objectives. Indeed, improvements will serve to remove the existing bias and ultimately, purify formed theoretical conclusions and policy implications. For example, one of the goals of the Equalization reform is the fixation of the Equalization pot. This, ideally, should reduce the degree of volatility in Equalization payments, consequently making a program more efficient and, hopefully, more effective.

6. Concluding Remarks and Policy Implications

The paper analyzes Equalization under the current and two alternative frameworks. The analysis has proved to be a useful tool, which in turn has shed light on the effectiveness of the current Equalization program and two alternatives using von Hagen and Hepp's test as an empirical instrument. The study is also accompanied by a preliminary efficiency analysis of the current program and its two alternatives.

The existing literature has placed a great value on using the federal transfers for redistributing personal income and gross domestic product. Amongst the literature, some works have described various alternatives to the current Equalization program, such as the fiscal needs or macro approaches. However, neither theoretical nor empirical studies have been performed to test the redistributive impact of Equalization flows on regional government revenues in Canada. Moreover, none of the previous studies have attempted to conduct this test for alternative approaches to Equalization. This has set an incentive to examine the redistributive effectiveness of the current Equalization program and the potential for the alternative applications from the practical standpoint.

The empirical analysis in this paper uses data from 1981 to 2002 on regional government revenues in the form of own source revenues and on four sets of Equalization payments. The results of the study are easily summarized.

The analysis shows that redistributive properties are embodied into the current Equalization transfers and Equalization receipts corresponding to macroeconomic and fiscal needs approaches. The least effective redistribution (\$12) is associated with Equalization payments derived from personal income macro base. The most effective redistribution (\$28) corresponds to Equalization transfers with a fiscal needs component. The redistributive role of current Equalization transfers is relatively modest as they reduce the differences in per capita tax revenues by \$22, if the province is \$100 below the national average. Interestingly, the magnitudes of these results seem to be associated with whether the levels of alternative payments are above or below the levels of current Equalization transfers. For instance, Equalization payments under the macro approach are smaller than the receipts under the current program, and the estimates of the redistributive effectiveness under the macro approach with both the personal income and GDP macro bases are smaller. On the contrary, Equalization payments under the fiscal needs alternative are higher than the current payments and the fiscal needs coefficient on redistributive impact is also higher than the current. Thus, the results show that whenever the overall Equalization amount is higher, redistribution is more effective. Furthermore, according to the recent legislation which has set a larger aggregate level of Equalization, arriving at a more effective redistribution as more data become available should be in the future perspective.

Does effectiveness imply efficiency in the Equalization context? The answer was attempted in a preliminary derivation of the efficiency indices for the three mechanisms of Equalization. The current RTS appears to be the most efficient, while it is not the most effective in performing the redistributive role. Fiscal needs alternative, on the other hand, is the most effective in redistribution, but its efficiency index is one of the lowest. The results may strike as controversial; however, they are easily explained by the fact that effectiveness is directly related to the size of the program. Efficiency, on the contrary, pertains more to the fulfillment of objectives outlined by the program subject to an affordable budget constraint of the federal government.

In concluding this study, a number of policy implications can be derived from its findings. While Canadian unconditional transfers are designed to play the distribution role, the results of this paper show that current transfers are not particularly effective in redistributing provincial government revenues. On the other hand, the less effective Equalization mechanisms appear to be more efficient. Since greater redistributive effectiveness of the program depends on its absolute size, the program may be perceived by provincial recipients as attractive and necessary. However, greater size does not guarantee quality, which is expressed through efficiency.

That is why the members of the Federal Expert Panel are meeting to fully examine the existing Equalization system and its alternatives. Indeed, “[t]he notion that equalization could play [a dominant] role in terms of balancing the provinces’ expenditure needs and revenue means” should be given some thought. However, the quality of the program should not be compromised by its mere size.

7) Courchene, (1984), pg.273

Appendix I: Data

The main focus of this paper is on the seven provinces that have consistently received equalization: Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Manitoba and Saskatchewan. In 2002, the provinces' populations ranged from less than 140,000 in Prince Edward Island to more than 7 million in Quebec. On average in 2002 fiscal year, provincial revenues comprised 71 percent from own sources and 16 percent from equalization payments. Own source revenues made up 59 percent in Newfoundland of total provincial revenues and 84 percent in Quebec⁸.

Annual data on Equalization payments were obtained from the Canada Department of Finance for the years from 1981-82 and 2002-03. Annual data on conditional (SPPs) transfers were obtained from the Financial Management Systems for the same years as Equalization payments. Estimation of redistributing effect on government revenues was carried out using the sample of 22 years (1981-82 to 2002-03). Data on GDP at factor cost and personal income were obtained from the Provincial Economic Accounts. Data on population came from the estimates of population by age and sex in Canada, provinces and the territories, while data on average weekly earning were obtained from Survey of Labour and Income Dynamics. Data on total revenues, total expenditures and expenditures on health, education, social services, as well as provincial surpluses/deficits were obtained from Financial Management Systems.

A balanced panel was used for estimation, with seven cross-sectional units and 22 years for each unit employed when estimating the redistributing effect of Equalization payments under the current, macro and fiscal needs approaches on provincial government revenues.

8) Quebec's own source revenues are higher because of special arrangement between Quebec and the federal government.

Appendix II: Derivation of Standardized Expenditures for a Fiscal Need Alternative

$E_{si} = (\text{Standardized Expenditures on Education} + \text{Standardized Expenditure on Social Services} + \text{Standardized Expenditures on Health} + \text{Standardized Expenditures on Other Services})_i$

1. Standardized Expenditures on Education =

$$TE_e/P_n * \{(School\ Age_i/P_i)/(School\ Age_n/P_n)\}$$

Where i is the index for ten provinces,

TE_e denotes national spending on education;

P_n denotes national population;

School Age $_i$ denotes population of school-aged children from 5 to 19 years of ages for province i ;

P_i denotes total population for province i ,

School Age $_n$ denotes national population of school-aged children from 5 to 19 years of ages.

2. Standardized Expenditures on Social Services =

$$TE_{ss}/P_n * \{(LY_i/P_i)/(LY_n/P_n)\}$$

Where i is the index for ten provinces,

TE_{ss} denotes national spending on social services;

LY_i denotes number of persons in low income in province i ,

UE_n denotes the total number of persons with low income (national figure).

3. Standardized Expenditures on Health = $TE_h/P_n * \square$

$$\square = \frac{\{(2033 * P(0-4)_i + 336 * P(5-19)_i + 1576 * P(20-64)_i + 8507 * P(65+)_i) / P_i\}}{\{(2033 * P(0-4)_n + 336 * P(5-19)_n + 1576 * P(20-64)_n + 8507 * P(65+)_n) / P_n\}}$$

Where i is the index for ten provinces,

TE_h denotes national spending on health,

\square denotes the weighted average of a demographic adjustment,

2033, 336, 1576 and 8507 are the weights for each population category determined according to how much is spent on each population category;

$P(0-4)$ denotes population for ages from 0 to 4;

$P(5-19)$ denotes population for ages from 5 to 19;

$P(20-64)$ denotes population for ages from 20 to 64;

And $P(65+)$ denotes population for ages of 65 and over.

4. Standardized Expenditures on Other Services = $TE_{ot} / P_n * I$

Where TE_{ot} denotes the national spending on other services (transportation and communication, environmental protection, recreation and culture, resource reservation and industrial development, protection of persons and property)

And I denotes the demographic adjustment.

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