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Canadian Challenge to the Volatility of Equalization Payments by the Simplest Calculation Formula during 1957–2012

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Abstract

This paper explores the volatility of Equalization payments in Canada with three tentative theories as follows. First of all, most of Canadians have a perception that Ontario is a non-receiving province. This perception can be regarded as the hidden and essential constraint of the formula for Equalization to extent of reforming the standard from the 10-province to the 5-province. Second, when this perception collapsed, Ontario changed to a receiving province in 2009-10 because the disparity of fiscal capacity across provinces has been improved as well as the interstate disparity in Germany. Although the per capita fiscal capacity is increasing in the provinces with higher populations, this increasing tendency toward urbanization has been removed due to slow economic growth. Third, Ontario's depression rapidly reduced the total entitlements of Equalization as a percentage of GDP from 1.11% in 1999-00 to 0.72% in 2003-04. This rapid decline was able to be explained by the time series regressions using the Ontario-Quebec model.

1. INTRODUCTION

The Equalization payments in Canada have been calculated using the simplest formula when compared to the fiscal arrangement systems in the other developed countries. The Equalization is a simple 'revenue' arrangement system as well as the interstates arrangements in Germany. On the other hand, the 'fiscal' arrangement systems, based on the 'gap-filling' principle, has taken into account the difference between the expenditure needs and the means for revenue like TFF (Territory Formula Financing) in Canada. Therefore, the calculation formula of the 'revenue' arrangement system is simpler than that of the 'fiscal' arrangement systems like the Japanese Local Allocation Tax, British Revenue Support Grants and Australian GST (Goods and Serves Tax) Grants (Nakai 1988, Nakai 1997, Boadway and Shah 2009).

Furthermore, the calculation formula of Equalization in Canada is simpler than that of the interstates arrangements in Germany. The German interstates arrangements have three steps which are re-allocation of state taxes, minimum assurance of fiscal capacity compensated by federal sales tax, and the interstates arrangements from 'having' states to 'not-having' states (Nakai, Ito and Saito 2009). This total 3-step grants as a percentage of Gross Domestic Products (GDP) is 1.27 % in 2005-06. The total amounts of Equalization as a percentage of GDP in Canada is also around 1%. This is done by using only the one step arrangement, taking into account only the difference between standard per capita average and the provincial fiscal capacity based on the national average tax rates.

However, the volatility of Equalization payments is inevitable using this simplest formula or the one step arrangement. There are two types in volatility of Equalization payments. The Equalization has had a destabilizing effect on the total fiscal resources including Equalization of each receiving province (Boothe 2002, Boadway and Hayashi 2004, Smart 2004). On the other hand, the total amount of Equalization as a percentage of GDP has fluctuated between 0.72% and 1.40% during the period, FY1967–2012 (Dahlby 2008, Smart 2009). However, based on our research up to now, the cause of this fluctuation or the latter volatility has not been theoretically and empirically clarified.

Then this paper proceeds as follows. In the second section, we discuss that most of Canadians have a perception that Ontario is a non-receiving province. This 'perception' of Ontario as a non-receiving province is able to regard as the hidden and essential constraint of the formula for Equalization to extent of reforming the standard from the 10-province to the 5-province. Then we research the institutional origin of the perception in 1957-58. The theoretical foundation of the perception is due to the increasing tendency of provincial fiscal capacity by urbanization that the per capita fiscal capacity is increasing in the province with higher populations. However, it is clarified that the perception collapses under Canada's steady state of economic growth. In the third section, note that the data are 'entitlements' rather than 'payments' —that is, ceiling and floor provisions are ignored—and are based on final calculations, rather than the various interim estimates (Smart 2004,198). We prove by the data that the volatility of Equalization as a percentage of GDP is not

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caused by this simplest formula, but by fewer average samples of the 5-province standard and by Canadian features of the two large provinces, Ontario and Quebec. Finally, we offer some conclusions.

2. Perception of Ontario as a Non-receiving Province and the Collapse

(1) Canadian Perception as the Hidden Constraint

Ontario with the largest population had never received Equalization payments from 1957-58 to 2008-09 (FY1957-2008 or 1957-2008) because of having high per capita fiscal capacity (Perry, 1997). Traditionally, most of Canadians have a perception that Ontario is a non-receiving or 'have' province, as "few people share any perception of Ontario as 'have-not' province, and most find the idea of equalization payments to Ontario more than somewhat farfetched" in the Parliamentary Task Force (1981, 37).

First, the Canadian perception of Ontario as a non-receiving province originated during the top-two province standard of Ontario and British Columbia (BC) under the standard tax systems basen on the standard rates. Only Ontario did not receive Equalization payments because the per capita fiscal capacity 39.8 dollars was higher than the standard 38.8 dollars in 1957-58. Formally legislated stabilization provisions as Section 5 of the 1957 Act was indispensable for the top-two province standard to control the volatility on the calculated entitlements of Equalization due to the least samples of average standards during $1957-1966^{-1}$.

Second, although Ontario's revenue-raising capacity was shown to be above 10-province standard under the representative tax system using the national average tax rate since 1967-68. Ontario became entitled to Equalization payments as of 1977-78. To maintain the 10-province standard and prevent Ontario from becoming eligible for Equalization, the federal government tried to reform the program in 1977-78 restricting natural resources revenue coverage in the wake of the major oil price shock of the early 1970s (Expert Panel, 2006,84). To eliminate this eventuality, a special provision in 1981-82 was introduced in Parliament that had the effect of excluding Ontario from receiving Equalization (Parliamentary Task Force, 1981, 36). According to this overriding clause, The federal government did not pay Ontario's entitlements for the Final Calculation during $1977-1981^2$.

Third, Ontario's per capita fiscal capacity was 2,491 dollars less than 10-province standard 2,602 dollars and more than the 5-province standard 2,368 dollars in 1982-83 as shown Figure 1. Then the 5-province standard replaced the 10-province standard to maintain the perception. The federal government considered the 5-province standard more stable, because it did not include Alberta's fiscal capacity which was volatile due to its high resource revenues (Expert Panel, 2006, 84). However, the calculated entitlements based on the 5-province standard was more volatile because of fewer average samples than those of the 10-province standard. The New Formula 1982 required special provisions for the floor (Minimum payments) and the cap (ceiling or Maximum payment)

respectively in Section 4.(6) and 4.(9) of the 1977 Act³. As the result, Equalization payments in many cases were finally arranged using the floor, the cap and transitional provisions (Boadway and Hobson, 1993, 58). And Equalization payments for the 22 fiscal years during 1982–2003 were finally determined by the calculated entitlements in just the 7 fiscal years (FY1985, 1986, 1991, 1995, 1987, 1988 and 2003).

(2) The Three Features of Canadian Provinces

In this paper, we will explain the three features in Canadian provinces. First, natural resource revenues of Alberta caused fluctuation in the Equalization program during the 1970s. The per capita resource revenues 1,922 dollars occupied 35 % of Alberta's fiscal capacity using the national average tax rates in 1982-83. The four tax revenues, income tax, corporation tax, sales tax and property tax according to the New Formula 2007 totaled per capita 3,568 dollars of Alberta in 1982-83, more than the 5-province standard as the vertical axis shown in Figure 1⁴.

Second, Canadian federal system were formed by two large population provinces of Ontario and Quebec, respectively 35.5% and 26.4% of the total population. On the other hand, the population weight of the four Atlantic Provinces, Prince Edward Island (PE), New-found-land and Labrador (NL), New Brunswick (NB) and Nova Scotia (NS) was no more than the weight 9% of Alberta as the horizontal axis shown in Figure 1.

Third, the calculated entitlements of Equalization to Quebec will be able to be shown the highlighted square in Figure 1, if the horizontal axis indicates the weight of each provincial population. The Quebec's entitlements 2,400,406 thousand dollars occupied 57.7% of total entitlements 4,161,635 thousand dollars in 1982-83. And the moving average was 50.3% of total entitlements for the 43 fiscal years during 1967–2012 excluding the period $2004-2006^{5}$. This is because Quebec had the fifth lowest fiscal capacity and the second largest population across all the provinces.

(3) The Collapse of the Perception and Improved Disparity

The per capita provincial fiscal capacity tends to increase due to urbanization. This is because the collection of the four taxes, mentioned before, is concentrated in urban areas rather than rural areas. The per capita 318 dollars of Ontario's four taxes was actually 1.9 times 167 dollars of the smallest population province of PE in 1967-68, as shown by the plot (+67) in Figure 2.

First, as to the disparity of the per capita four taxes across all the provinces, the per capita four taxes which was log transformed, excluding Ontario, Quebec and PE, is able to be explained by the size of the population which was log transformed, as shown in Table 1. The coefficient 0.519 for the 5 fiscal years during 1967-1971 denotes the increasing tendency by urbanization. In other words, the slop 0.519 of the straight line represents the provincial disparity of the per capita four taxes and

the higher slop means the wider disparity.

Second, the per capita four taxes 167 dollars (logarithm 2.22) of PE with the smallest population of 110,000 (logarithm 5.04) is estimated at 158 dollars (logarithm 2.2=1.83+0.37) to be higher by 90 dollars, the coefficient 0.370 of the dummy variable [Dum(PE)], than 68 dollars (logarithm $1.83=0.519\times5.04-0.787$) of the dotted line which lengthened the solid line of Figure 2.

Third, the per capita fiscal capacity 251 dollars (logarithm 2.4) of Quebec (QC) and 316 dollars (logarithm 2.5) of Ontario (ON) with the largest population of around 10 million (logarithm 7.0) are respectively estimated to be lower by the coefficient-0.388 of Dum (QC) and -0.303 of Dum (ON) than the levels of the dotted line which lengthened the solid line of Figure 2.

Therefore, although the solid line with the slop 0.519 in this period expresses the degree of disparities of the four tax revenues across seven provinces, the feature for the increasing tendency by urbanization in Canada is based on the structure where PE and QC or ON are respectively located above and below the straight line. And the natural resource revenues were represented by the difference between fiscal capacity (\bigcirc) and the four taxes (+) as shown in Figure 2.

On the changing pattern for the structure of the increasing tendency by urbanization, the degree of disparities of the four tax revenues represented by the slop 0.519 positively correlates with the increasing rate 5.16% of the tax revenue in each fiscal year during 1967-1971 as shown in Table 1. The increasing rate can be checked in the estimated results of Table 1 by the statistically significant coefficient 0.0516 of a dummy variable Dum (FY) which takes 1 on the value in 1967-68 and 2 on the value in 1968-69 and so on, 44 on the value in 2010-11. The degree of disparities and the increasing rate of the four tax revenue in each fiscal year are respectively estimated 0.428 and 6.96 % during 1972-1976, 0.399 and 4.62% during 1977-1981, 0.301 and 3.05% during 1982-1986, 0.269 and 2.55% during 1987-1991, 0.234 and 1.45% during 1992-1998, 0.148 and 0.465% during 1999-2003, 0.204 and 1.27% during 2004-2010 as shown in Table 1. The correlation coefficient between the degree of disparities and the increasing rate of 0.456% was felt during the economic depression period of FY1999-2003, the degree of disparity also decreased to the slop 0.148 of the solid line '1999-99' which lengthened including Ontario in Figure. 2

The degree of provincial disparities has been improved by the low increasing rate of the four tax revenues. The current degree of provincial disparities has reached a steady state that reflects the industrial structure of the regions (Coulombe, 1999). The slop has recovered to 0.204 with an increasing rate 1.27% of the four tax revenues during 2004–2010. Actually, the per capita 7,215 dollars of Ontario's four taxes was 1.5 times 4,674 dollars of PE in 2007-08, contrary to 1.9 times in 1967-68, as shown by the plot (+07) in Figure 2. Even in Germany, the state of Nordrhein-Westphalia with the largest population and the greatest industrial area shifted from 'having' state to 'not-having' state in the 1980's (Nakai, Ito and Saito, 2009). Thus, the perception of

Ontario as non-receiving province collapsed due to the improvement of provincial disparities under a steady state of economic growth and the sharp deterioration in the Ontario's government finances (Smart, 2004,195).

3 The Volatility of Equalization as a Percentage of GDP

(1) The Calculated Entitlements of Ontario-Quebec Model

Contrary to Equalization payments ($E_{\rm j}$, the suffix j means the j-th receiving provinces) after the floor or the cap, the entitlements of Quebec ($G_{\rm Qc}$) is the amount based on the formula of multiplying the population ($P_{\rm Qc}$) by the difference between the 10-province (or 5-province) standard (\bar{t}) and the per-capita fiscal capacity ($t_{\rm Qc}$) of Quebec, as follows.

 $G_{\text{QC}} = P_{\text{QC}}(\overline{t} - t_{\text{QC}}), \qquad (1)$ where $\overline{t} = (P_{\text{ON}}/\Sigma P_{\text{i}}) t_{\text{ON}} + (P_{\text{QC}}/\Sigma P_{\text{i}}) t_{\text{QC}} + \cdots + (P_{\text{PE}}/\Sigma P_{\text{i}}) t_{\text{PE}} \text{ and } \Sigma P_{\text{i}} \text{ is the total population in Canada (i=10 or i=5), and the suffix i means the i-th province.}$

First, the weight of Ontario's (P_{ON}) and Quebec's population (P_{QC}) to the total population [($P_{ON}+P_{QC}$)/ ΣP_i)] was totally 63% under the 10-province standard (i=10) during 1967—1981, and 76% under the 5-province standard (i=5) during 1982—2006. The weight of Alberta's population to the total population ($P_{AB}/\Sigma P_i$) and the BC's weight ($P_{BC}/\Sigma P_i$), the other provinces' weight [($P_{NL} + P_{PE} + P_{NS} + P_{NB} + P_{MB} + P_{SK}$)/ ΣP_i] are respectively around 10% during 1967—2012. For this reason, if the total weight 30% of those provinces other than Ontario and Quebec is assumed zero as residual errors, the calculated entitlement of Quebec is almost determined by the Ontario - Quebec (ON-QC) model, as follows.

$$G_{\text{QC}} \stackrel{:}{\Rightarrow} P_{\text{QC}}(t_2 - t_{\text{QC}}) = P_{\text{QC}}[(T_{\text{ON}} + T_{\text{QC}})/\Sigma P_2 - t_{\text{QC}})$$
$$= P_{\text{QC}}[(T_{\text{ON}}/\Sigma P_2 - (1 - P_{\text{QC}}/\Sigma P_2)t_{\text{QC}}], \qquad (2)$$

where t = 1 is 2-province standard just as in this model, Ontario's T_{ON} and Quebec's T_{QC} are their fiscal capacity based on the national average tax rates and ΣP_2 is their total population.

Second, it is reduced in this ON-QC model that the calculated entitlements of Quebec as a percentage of GDP (Y) is a function of the magnification $\{T \text{ on}/T \text{ qc}\}$ of Ontario's T_{ON} to Quebec's T_{QC} , dividing both sides by Y, as follows.

$$(G_{QC}/Y) \doteq (P_{QC}/\Sigma P_2) (T_{QC}/Y) \{T_{ON}/T_{QC}\} - (1 - P_{QC}/\Sigma P_2) (T_{QC}/Y)$$
(3)

Third, the calculated entitlements of Quebec roughly shared half of total entitlements of Equalization ($\Sigma G_{j} \rightleftharpoons 2 \times G_{QC}$) for the 43 fiscal years during 1967–2003 and 2007–2012 as shown in Table 2. It is reduced to be the ON-QC model for the total entitlements as a percentage of GDP ($\Sigma G_{j}/Y$), as follows.

$$(\Sigma G_{j}/Y) \doteq 2[(P_{QC}/\Sigma P_{2})(T_{QC}/Y)] \{T_{ON}/T_{QC}\} - 2(1-P_{QC}/\Sigma P_{2})(T_{QC}/Y)$$

$$(4)$$

(2) Basic Structure of Regression Model

The equation to estimate the ON-QC model fundamentally consists of the constant term $\alpha = 2(1 - P_{QC}/\Sigma P_2) (T_{QC}/Y) <0$ and the magnification $\{T_{ON}/T_{QC}\}$ of Ontario's T_{ON} to Quebec's T_{QC} as to explaining variable which has the coefficient $\beta = 2(P_{QC}/\Sigma P_2) (T_{QC}/Y) >0$, as follows.

 $(\Sigma G_j/Y) = \alpha + \beta \{T_{ON}/T_{QC}\} + \gamma (T_{AB}/Y) + \delta (G_{QC}/\Sigma G_j) + u,$ (5) where the explaining variable (T_{AB}/Y) is the fiscal capacity of Alberta as a percentage of GDP, and the explaining variable $(G_{QC}/\Sigma G_j)$ is Quebec's share of the total entitlements. The former (T_{AB}/Y) is the so called the Alberta effect. The parameter γ will be positive, because the national resource revenues of Alberta raised the per-capita average during the period of the 10-province standard. As the increase (decrease) of Quebec's share $(G_{QC}/\Sigma G_j)$ especially goes up (down) the total entitlements during the period of the 5-province standard, the parameter δ will be positive. Finally, u is the error term.

The estimated coefficient 3.225 of the magnification variable {T ox/T qc} during the period of the 5-provinces standard is 2.5 times the estimated coefficient 1.260 during the period of the 10-province standard⁵.

where the Dum (73-81) to represent the oil price shock was a dummy variable, which takes on the value one during 1973 - 1981 and zero in the other fiscal years, and the t-values are in parentheses ().

The dummy variables of Dum (99-03) and Dum (07-08) seem respectively to represent time series shocks due to the institutional changes of the Amendment Act (1999, c.11. s.1) and the Act of the New Formula (2007, c.29, s.62). And the effect of Ontario becoming eligible for Equalization during 2009-2012 on the total entitlements as a percentage of GDP is reflected in the coefficient – 0.431of Dum (09-12) more than -0.581 of Dum (07-08)⁷.

(3) The Synchronized Effects of Ontario's Depression

Under the 10-province standard during 1967–1981 and 2007–2012, if the magnification {T on/Toc} rise (decline), the total entitlements as a percentage of GDP ($\Sigma G_{j}/Y$) will go up (down) according to the slop 1.260 of the magnification, as shown by the dashed line in Figure 3.

First, for the Alberta effect, the fiscal capacities of Alberta as a percentage of GDP (T_{AB}/Y) went

up from the 0.011% in 1972-73 to 0.028% in 1977-78 by radical increase of the natural resource revenues due to the oil price shock in 1973-74, even when the Alberta's fiscal capacity was institutionally pulled down by excluding 50% of natural resource revenues during $1977-1981^8$. This coefficient 14.56 of the ratio (T_{AB}/Y) as the Alberta effect carried out the dashed line (\circ) during 1967-1972 to the upward shift of the plots (+) during 1973-1976 and the plots (•) during 1977-1981, as shown by the dashed line in Figure 3.

Second, the increase of Quebec's share of total entitlements ($G_{\rm QC} / \Sigma G_{\rm j}$) went up the total entitlements as a percentage of the GDP ($\Sigma G_{\rm j}/Y$) at the ratio of the coefficient 2.446 during 1982–2003 of the 5-province standard. Since the Quebec's entitlements occupied 55% of total entitlements during 1982–1984, the total entitlements as a percentage of GDP led to the upward shift (1.1%) of the plots (\diamond 82, \diamond 83, \diamond 84), regardless of the lower magnification { $T_{\rm ON}/T_{\rm QC}$ } 1.7, above the solid line of the slop 3.225 during 1986–1996 of Figure 3. Moreover, under the Quebec's share 50% for the ten fiscal years during 1986–1996, the increase of magnification from 1.75 to 1.85 made go up the total 'entitlements' of the final calculation of the formula as a percentage of GDP ($\Sigma G_{\rm j}/Y$) to the peak of 1.40% in 1989-90. This peak of 1.40% was limited to 1.28 %, which was the total 'payments' ($E_{\rm j}$) as a percentage of GDP ($\Sigma E_{\rm j}/Y$), by the ceiling in section 4.(9) "Maximum payments to all provinces" based on the 1982 Act (1980-81-82-83, c.13, s.2933), as shown in Table 2.

Third, however, when the fiscal capacity of Ontario makes little increase from 72,900 million dollars in 1999-2000 to 77,700 million dollars in 2003-04 under the 5-province standard, the magnification $\{T \text{ on}/T \text{ qc}\}$ was reduced by 0.06 points from 1.98 to 1.92. This reduction of magnification reduced the total entitlements as a percentage of GDP by 0.19% points (=0.06× 3.225). Simultaneously, Ontario's depression caused Quebec's share of total entitlements ($G_{\text{Qc}}/\Sigma G_{j}$) to decrease by 6.5% points from 49.8% to 43.3% and reduced the total entitlements as a percentage of GDP by 0.16% points (=0.065×2.446). As the result, under the 5-province standard, Ontario's depression pulled down the total entitlements as a percentage of GDP by 0.35% points (=0.19+0.16), due to the synchronized effects of the decline in the magnification with the higher coefficient of 3.225 and the decrease of Quebec's share of total entitlements.

In fact, the total entitlements as a percentage of GDP decreased by 0.37% points from 1.11% in 1999-2000 to 0.72% in 2003-04. This volatility of the total entitlements as a percentage of GDP was due to fewer average samples taken by the 5-province standard than them of the 10-province standard. Then the federal government set the funding level of the total payments at around 11 billion dollars in each fiscal year during 2004-2006 and fundamentally introduced the New Formula 2007 with more average samples taken by the 10-province standard than them of the 5-province standard, according to the recommendation of the Expert Panel (2006).

After this reform, the fiscal capacity of Ontario based on the New Formula 2007 made little increase from 89,800 million dollars in 2010-11 to 89,600 million dollars in 2012-13. The

magnification { $T_{\text{ON}}/T_{\text{QC}}$ } was reduced by 0.09 point from 1.98 to 1.89 during 2010-2012, as shown by the plots (2010*, 12*) in Figure 3. This reduction of 0.09 point was more than that of 0.06 points during 1999-2003. However, the total entitlements as a percentage of GDP was estimated to be still only reduced by 0.11% point (=0.09×1.260) on the dashed line with slope of 1.260 under the 10-province standard. In fact, the total entitlements as a percentage of GDP decreased by 0.19% point from 1.23% to 1.04% during 2010-2012, contrary to 0.37% point decreasing during 1999-2003. This is because the influence of Ontario's depression on the total entitlements as a percentage of GDP under the New Formula 2007 was caused by the reduction of the magnification and the lower coefficient of 1.260 than that of 3.225 under the 5-province standard.

Concluding Remarks

First of all, the volatility of Equalization entitlements as a percentage of GDP was caused by the rapid growth of Albert's natural resource revenues with the oil price shock of the early 1970s. Under the perception of Ontario as non-receiving province (Parliamentary Task Force 1981), the federal government was inevitable to reform the standard from 10-province average to 5-province average in 1982-83 to exclude Albert's fiscal capacity. As the calculated entitlements based on the formula of the 5-province standard were more volatile due to Ontario's business cycle, the Equalization program formally (or legitimately) needed the special provisions of the floor and the cap. Contrary to these formal constraints to the formula, the perception of Ontario as non-receiving province [$(t - t_{ON}) < 0$] was able to regard as the informal (or hidden) and essential constraint to the formula to extent of reforming the standard (t) from 10-province to 5-province [e.g. $\Sigma G_{j} = \Sigma P_{j} (t - t_{j})$ subject to ($t - t_{ON} > 0$].

Second, the perception of Ontario as non-receiving province has been supported by the tendency that the per capita provincial fiscal capacity is increasing in the province with higher populations. As the disparity of fiscal capacity across all provinces had been removed over the past 40 years (Coulombe 1999, 22), the perception was gradually diminishing in the 1990s. Due to Ontario's depression, the calculated entitlements as a percentage of GDP declined to 0.72% in 2003-04. And Ontario changed to a receiving province in 2009-10 under the 10-province standard of the New Formula 2007.

Third, the time series regression of Ontario-Quebec model during 1967-2012 is able to estimate that the calculated entitlements of Equalization as a percentage of GDP will respectively increase (decrease) by 0.1260% and 0.3225% under the 10-province and the 5-province standard, if the magnification of Ontario's fiscal capacity to Quebec's rise (decline) by 0.1 point. In other words, the calculated entitlements as a percentage of GDP under the 5-province standard (minimum 0.72% and maximum 1.40%) were more volatile than under the 10-province standard (minimum 0.93% excluding 0.79% in 1967-68, and maximum 1.23%). Ontario's depression also produced a rapid

decline in the calculated entitlements as a percentage of GDP from 1.11% in 1999-2000 to 0.72 % in 2003-04. This was the so-called "the trap of the 5-province standard".

Finally, the dummy variables of Dum (97-98) and Dum (87, 95-96) in the regression equation to estimate the Ontario-Quebec model seem to represent the eventual shocks in the time series other than Quebec's share of entitlements. The fact findings of those dummy variables as well as the difference between the one year moving average of current years during 1967-1981 and the three-year weighted moving average lagged two years during 2007-2012 remain as the interesting topics to examine in future research. Consequently, the New Formula of 2007 returned to the 10-province standard, according to the recommendation of Boadway and Hayashi (2004), Smart (2004) and the Expert Panel (2006). As the result, the calculated entitlements as 1.04% of the GDP in 2012-13 was still only the reduction of 0.11% point, although the magnification declined by 0.09 point during 2010-2012 as well as the radical decline during 1999-2003. As for Ontario of the largest province becoming eligible for Equalization in 2009-10, there needed to be a cap on the total payments as a special provision. Thus the federal government has the challenge to stabilize the total amounts of Equalization payments using the simplest revenue arrangement system.

Notes

This article is a substantially revised version of one part of Nakai and Saito(2014), which was reported at the 22nd Congress of the Japan Association of Local Public Finance in May 2014 and at a workshop (the chairman; Isao Horiba of Aoyama Gakuin University) of Japanese Ministry of Internal Affairs and Communications in February 2013. We would like to thank Masayoshi Hayashi of Tokyo University and Marcie Doran of the Federal Department of Finance Canada for access to data of the Final Calculation and advice on the Equalization program.

¹See Federal-Provincial Tax Sharing Arrangements Act, 1956, c.29, s.1, 127-34.

² This legislation was passed in 1981 that excluded any province with a personal income tax capacity exceeding the national average. Ontario's entitlements was 112,695 thousand dollars in 1977-78 and 296,173 thousand dollars in 1978-79, 488,070 thousand dollars in 1979-80, 552,729 thousand dollars in 1980-81, 415,825 thousand dollars in 1981-82. See the Act to Amend the Federal-Provincial Fiscal Arrangements and Established Programs Financing Act 1977, 1980-81-82-83, c.46, s.1, 1163.

³ See the Act to Amend the Federal-Provincial Fiscal Arrangements and Established Programs Financing Act 1977, 1980-81-82-83, c.13, s.2933-47.

⁴ The 33 revenue sources during 1982–2006 were aggregated to the four taxes and natural resource revenues in section 3.5(1) of the 2007 Act. See Federal-Provincial Fiscal Arrangements Act 2007, c.29,s.62 (2009, c.2,s.383).

⁵ The federal government set the funding level of the total payments at around 11 billion dollars in each fiscal year during 2004-2006.

⁶ Using the moving average of each variable, the coefficient β is $1.383[=2(P_{QC}/\Sigma P_{10})(T_{QC}/Y)=2 \times 26\% \times 0.0266]$ during the period of the 10-province standard, and $2.356[=2(P_{QC}/\Sigma P_5)(T_{QC}/Y)=2 \times 31\% \times 0.0380]$ during the period of the 5-province standard.

⁷ The data during 1999–2002 was that of the Final Calculation A (new) rather than the Final Calculation B (See Department of Finance, *Provincial Fiscal Equalization; Final Calculations*). And the data of 81,537,765 thousand dollars (T on) and 40,529,294 thousand dollars (T oc) in the New Formula 2007 were the three-year weighted moving average for the sum of four taxes and 50% of natural resource revenues in 2003-4, 2004-05 and 2005-06 of two lagged years (See Department of Finance, *Calculation of Equalization Payments for 2007-08 According to Budget 2007 Proposal*). The magnification {T on/T oc} was 2.01(=81,537,765/40,529,294). The Dum (87, 95-96) takes on the value one in 1987-88 and during 1995–1996, and zero during the other fiscal years. Especially Quebec's share to total entitlements was the minimum value of 43.3% in 1987-88 as well as in 2003-04. The Dum (97-98) seems to reflect the shift of the magnification {T on/T oc} from 1.80 in 1995-96 to 1.90 in 1997-98.

⁸ See the section 4.(2) in the Act to Amend the Federal-Provincial Fiscal Arrangements and Established Programs Financing Act 1977, 1980-81-82-83, c.46, s.1, 1163.

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log(Taxes)	log(POP)	Dum(FY)	Dum(PE)	Dum(QC)	Dum(ON)	Dum(SK)	Dum(AB)	Const. adj	$\frac{R^2}{N}$
1967-71	0.519	0.0516	0.370	-0.388	- 0.303			-0.787	0.961
	(22.7)	(19.3)	(14.8)	(-17.5)	(-12.7)			(-5.76)	50
1972-76	0.428	0.0696	0.263	-0.327	-0.258			-0.320	0.907
	(11.9)	(15.5)	(6.53)	(-9.23)	(-6.88)			(-1.47)	50
1977-81	0.399	0.0462	0.251	-0.280	-0.253	0.0799	0.123	0.0541	0.979
	(23.9)	(24.1)	(14.1)	(-17.0)	(-13.8)	(8.50)	(11.4)	(0.52)	50
1982-86	0.301	0.0305	0.193	-0.214	-0.153	0.0639	0.129	0.985	0.961
	(16.5)	(13.8)	(9.75)	(-11.7)	(-7.50)	(5.91)	(10.1)	(8.48)	50
1987-91	0.269	0.0225	0.176	-0.173	-0.109		0.0630	1.384	0.951
	(16.5)	(10.8)	(9.83)	(-10.4)	(-5.81)		(5.36)	(12.8)	50
1992-98	0.234	0.0145	0.164	-0.151	-0.108		0.0754	1.771	0.971
	(27.0)	(16.9)	(16.8)	(-16.3)	(-10.3)		(11.0)	(30.9)	70
1999-03	0.148	0.00465	0.0935	-0.0615		0.0280	0.141	2.596	0.961
	(23.3)	(2.83)	(8.93)	(-6.89)		(3.49)	(17.4)	(37.3)	50
2004-10	0.204	0.0127	0.125	-0.134	-0.0997	0.0807	0.159	1.962	0.942
-	(13.5)	(8.95)	(6.91)	(-8.88)	(-5.62)	(7.90)	(13.6)	(18.2)	70

 Table 1
 Relationship between Per Capita Four Taxes and Population in Provinces

Notes: 'Taxes' and 'POP', 'FY' respectively mean the four taxes and provincial population, fiscal years. The t-values are in parentheses () and N is the number of observations.

Source: Department of Finance, Provincial Fiscal Equalization; Adjustment to Final Calculations in 1967–2010.

	Observations	Average	Minimum	Maximum	Standard Errors
$(\Sigma E_j/Y)$	46	1.0383	0.716	1.280,	0.1474
$(\Sigma G_j/Y)$	43	1.0640	0.716	1.403	0.1397
$\{T \text{ on}/T \text{ qc}\}$	43	1.7828	1.5772	2.0118	0.1307
(T_{AB}/Y)	21	0.01954	0.009551	0.02908	0.00713
$(G_{\rm QC}/\Sigma G_{\rm i})$) 43	50.3%	43.3%	57.7%	3.79

Table 2Descriptive Statistics: 1967-2012

Notes: $(\Sigma E_j/Y)$ and $(\Sigma G_j/Y)$, $\{T \text{ on}/T \text{ qc}\}$, (T_{AB}/Y) , $(G_{QC}/\Sigma G_j)$ respectively mean the Equalization payments as a percentage of GDP and the total entitlements as a percentage of GDP, the magnification of Ontario's fiscal capacity to Quebec's fiscal capacity, the fiscal capacity of Alberta as a percentage of GDP, Quebec's share of the total entitlements.

Source: Department of Finance, Provincial Fiscal Equalization; Adjustment to Final Calculations in 1967–2012.



Source: Department of Finance, Provincial Fiscal Equalization; Adjustment to Final Calculations in 1982-83.

Figure 2 Disparity of Per Capita Provincial Fiscal Capacity in 1967–2010 log(per capita fiscal capacity)



Source: Department of Finance, Provincial Fiscal Equalization; Adjustment to Final Calculations in 1967-2010.



Source: Department of Finance, Provincial Fiscal Equalization; Adjustment to Final Calculations in 1967-2012.