Ontario, Oil & Unreliable Data

The Complex Problems Confronting Equalization and Simple Solutions to Address Them

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Contents

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EXECUTIVE SUMMARY

A fundamental principle of Canada's national identity is that all Canadians should have access to similar levels of public services, regardless of which province they live in. The federal Equalization program is Canada's most important tool for ensuring this equity among provinces, given that provinces differ in their ability to generate revenues to pay for the services they are each responsible to provide.

Over the past decade, several factors have challenged the program's ability to achieve this goal. The three most important factors have been federal fiscal restraint, Ontario's qualification for payments, and the role of natural resources, particularly oil. Successive federal governments have introduced and upheld measures to address these challenges. But these measures have themselves created additional problems, particularly for Equalization-receiving provinces. Furthermore, the data used for calculating entitlements may be mis-measuring the differences between provinces that the program is supposed to equalize.

Looking forward, these challenges will persist if unaddressed. Ontario may drop in and out of Equalization-receiving status creating unpredictability for the province and potentially for other provinces and the federal government as well. Natural resources will be a continued source of volatility and unequalized fiscal capacity, contributing to a divergence in levels of service between provinces – precisely the outcome the Equalization program was designed to prevent.

Unaddressed, these challenges could further derail one of Canada's most important programs, undermining an important and fundamental Canadian principle. And trying to address them piece-meal will only continue to muddle the situation, as previous ad-hoc solutions have done.

The upcoming five-year legislative renewal of the program is the best time to address these issues in a more systematic manner. A set of interconnected reforms, targeting the three challenges noted above and thinking through the potential side effects of their complex interactions is the order of the day.

Such reforms should be designed such that they will increase predictability for provinces and the federal government while enhancing the accuracy of the data upon which equalization decisions are made. These changes would benefit the fiscal planning efforts of provinces and the federal government alike. The problematic issue of resource revenue inclusion should also be addressed by including in Equalization calculations only the proportion of provincial resource revenue that gives rise to differences in spending levels among provinces. Lastly, Canada lacks a program to effectively protect provincial revenues from idiosyncratic economic shocks. Improvements to the federal Fiscal Stabilization program should be undertaken to better share fiscal risks across the federation. We propose a set of simple solutions to achieve these goals.

1 INTRODUCTION

The Equalization program plays an important role in the fiscal arrangements that underpin Canada's federal system. For some provinces it is a significant source of revenue – representing, for example, over 20 per cent Prince Edward Island's total revenues. It is also instrumental in giving effect to comparability in government programs across the country. The redistribution of funds it engenders helps to ensure that all Canadians have access to quality provincial programs regardless of where they live.

The program is, and will continue to be, beset by problems. This report examines two key problems. First, significant amounts of provincial revenues are still left unequalized due to both federal cost-containment measures and compromises in the design of the program over time (see Section 6). Caps introduced to make Equalization more affordable for the federal government have divorced the size of the program from the differences in provincial revenue-raising capacity that it is intended to address. The issue of unequalized fiscal capacity, however, will persist even if the caps on the program are removed, due to the unique treatment of resource revenues. Allowing this to persist could lead to unsustainable divergences in the levels of service across provinces, undermining the constitutional mandate of the Equalization program.

Second, the unpredictable nature of Equalization revenues makes budgetary planning in affected provinces difficult (see Section 7). Unpredictability in the transfer whose main purpose is to enable the delivery of comparable services is at best unnecessary and at worst potentially harmful. Provincial governments are the sole clients of Equalization. The program can and should work better for them.

Broadly, the challenges of unpredictability and unequalized fiscal capacity have three root causes: Ontario, oil and unreliable data. Ontario's receipt of Equalization payments is a relatively recent phenomenon. It represents not only a significant cost for the federal government, but also a gravitational shift in Canada's economic centre, challenging the federal government's ability to finance the program. Ontario's return to economic prominence, coupled with recent economic challenges in resource-rich provinces, could see Ontario's return to "have" status. However, the province's potential exit from Equalization-recipient status would create its own challenges with respect to unpredictability, for the federal government, for other provinces and for Ontario itself.

Oil, or resource revenues more broadly, has been problematic for Equalization for almost the entirety of the program's existence. Natural resources are simultaneously a volatile source of revenue and politically fraught with respect to questions of ownership. They also represent significant unevenness in the distribution of wealth across the country. Provinces with access to more resource wealth have historically been able to offer more services at lower tax rates.

Lastly, the quality and reliability of data used for calculating fiscal capacity gives rise to questions about how accurately the Equalization program measures what it is attempting to equalize. This can lead to significant mis-measurement of the actual fiscal disparities between provinces. Failing to accurately measure and equalize the differences between provinces can lead to either "over- or under-equalization." Given the amount of money involved in Equalization, it is important to get it right.

While addressing these complex issues would involve some trade-offs, the fixes are relatively simple. Programmatic changes focused on the Equalization program's role as a vehicle for long-term redistribution in Canada's federal fiscal system would address the problems of unpredictability and unequalized fiscal capacity while continuing to meet the goals of the program.
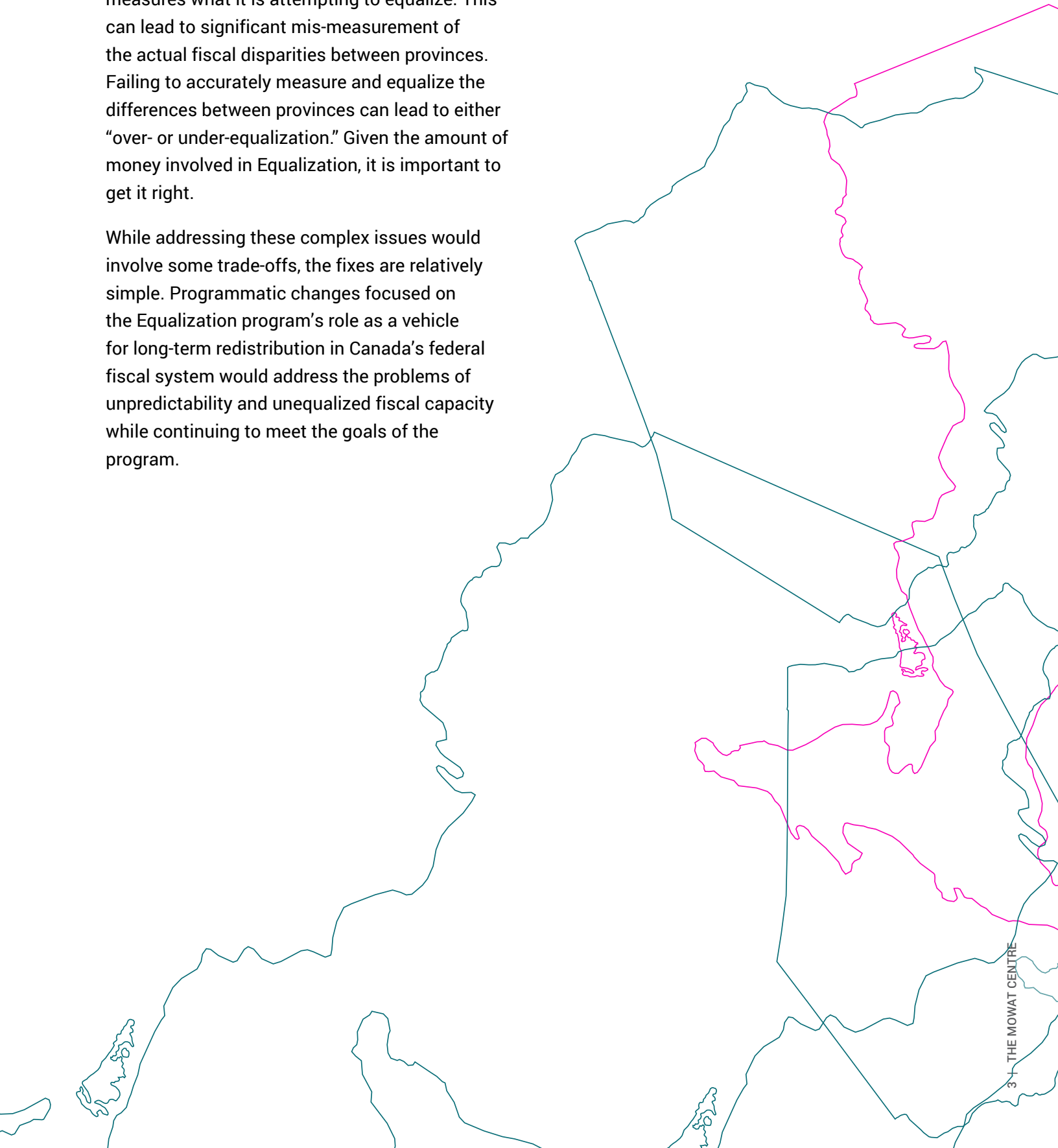
2 PURPOSE AND MAIN FEATURES OF THE EQUALIZATION PROGRAM

The purpose of the Equalization program is reasonably straightforward. Canada is a highly decentralized federation in which provinces are responsible for delivering important yet costly programs such as health care, education and social services.

Fiscally speaking, however, not all provinces are created equal. There is considerable variation between the provinces in their ability to raise revenues used to fund provincial programs. A province that has a larger proportion of high-income earners than its peers, for example, will be able to raise more revenue from its personal income tax. Similarly, per capita incomes also vary by province due to such factors

as resource endowments, occupational and industrial mixes, degrees of urbanization, or ease of access to major markets.[1] Equalization is meant to smooth out some of these differences such that all provinces are able to provide reasonably comparable services.

The principle that Canadians should have access to public services of comparable quality no matter where they live is an important one. So much so that it has been enshrined in Section 36(2) of the Canadian Constitution:

"Parliament and the government of Canada are committed to the principle of making equalization payments to ensure that provincial governments have sufficient revenues to provide reasonably comparable levels of public services at reasonably comparable levels of taxation."

The Equalization program operationalizes this principle, and as such is tied to Canadian citizenship, national integration and unity.[2] The redistribution of wealth entailed by Equalization thus facilitates more decentralization of services to provinces than would be possible without it.[3]

Equalization takes the form of a transfer from the federal government to eligible provinces. The funds are transferred unconditionally – that is, receiving provinces can spend the funds to address their own priorities in whatever manner they see fit. The program is governed by federal legislation (*the Federal-Provincial Fiscal Arrangements Act*) and can be changed on a unilateral basis by the federal government. All provinces have received payments at some time since the program was established in 1957. Five provinces – Manitoba, New Brunswick, Nova Scotia, Prince Edward Island and Quebec – have qualified for payments every year since the inception of the program.

1 Canada. 1985. "Report of the Royal Commission on the Economic Union and Development Prospects for Canada." *Supply and Services Canada.*

2 Béland, Daniel and André Lecours. 2012. "Equalization at Arm's Length." *Mowat Centre.*

3 Courchene, Thomas J. 2006. "Energy Prices, Equalization and Canadian Federalism: Comparing Canada's Energy Price Shocks." *Queen's Law Journal*, Volume 31, Issue 2, p. 644.

3 MECHANICS OF THE EQUALIZATION PROGRAM

In theory, both eligibility for Equalization payments and the size of those payments are determined by a data-driven formula. In practice, however, a set of caps and ceilings have been imposed on the formula to achieve specific outcomes such as fairness and affordability for the federal government. Those constraints somewhat complicate the formula. Their mechanics and the circumstances that gave rise to them will be outlined in Sections 4 and 5 to follow. Notwithstanding those divergences between theory and practice, in the simplest possible terms, the Equalization formula follows three broad steps.

Step One: Measure Fiscal Capacity of All Provinces

The process for determining eligibility for payments begins with the measurement of a province's per-capita "fiscal capacity," its ability to raise revenue. To arrive at its measurement of fiscal capacity, the federal government measures each province's ability to raise revenues if it were to tax at national average tax rates. This methodology is applied to five revenue sources:

1] Personal Income Taxes

2] Business Income Taxes

3] Consumption Taxes

4] Property Taxes and Miscellaneous Revenue

5] Natural Resources

This represents a fairly comprehensive measure of all provincial municipal revenue-raising practices, with the notable exceptions of user fees, investment income and the inclusion of only 50 per cent of natural resource revenues. Issues surrounding natural resource revenues and their treatment in the Equalization program will be discussed at length in Section 6 to follow.

Step Two: Establish a Standard

The establishment of a standard is an important consideration in determining both the size of, and eligibility for, payments. Currently, the federal government uses the all-province weighted average of per capita fiscal capacity, known as the "ten-province standard," to inform both of those decisions.

Step Three: Fill the Gap

Finally, provinces with per capita fiscal capacities below the standard are entitled to Equalization payments. Provinces above the standard do not receive payments. The size of a province's entitlement is largely determined by the size of gap between a province's own-source fiscal capacity and the standard in per capita terms. That gap is subsequently multiplied by the province's population to determine the final dollar amount of the entitlement. Consider the following fictional example of Province A:

FIGURES 1-3

Step One: Measure Fiscal Capacity of All Provinces

Own-Source Fiscal Capacity »

Chart with y-axis from 5,000 to 13,000. Provinces on x-axis: NL, PE, NS, NB, QC, ON, MB, SK, AB, BC

Step Two: Establish a Standard

Own-Source Fiscal Capacity »

Standard »

Chart with y-axis from 5,000 to 14,000. Provinces on x-axis: NL, PE, NS, NB, QC, ON, MB, SK, AB, BC

Step Three: Fill the Gap

Own-Source Fiscal Capacity »

Equalization Payments »

Standard »

Chart with y-axis from 5,000 to 14,000. Provinces on x-axis: NL, PE, NS, NB, QC, ON, MB, SK, AB, BC

Source: Mowat calculations based on Finance Canada data
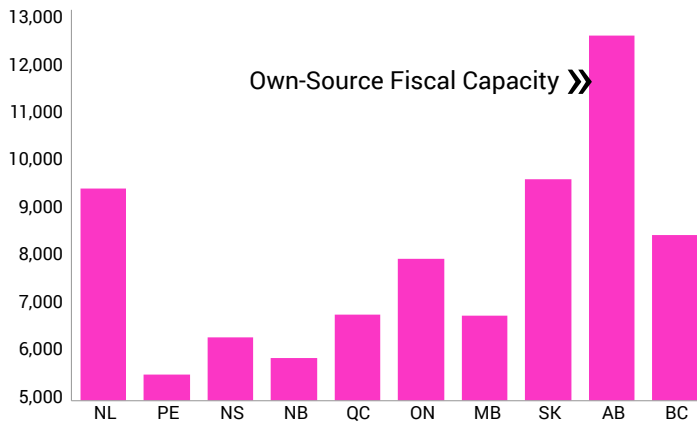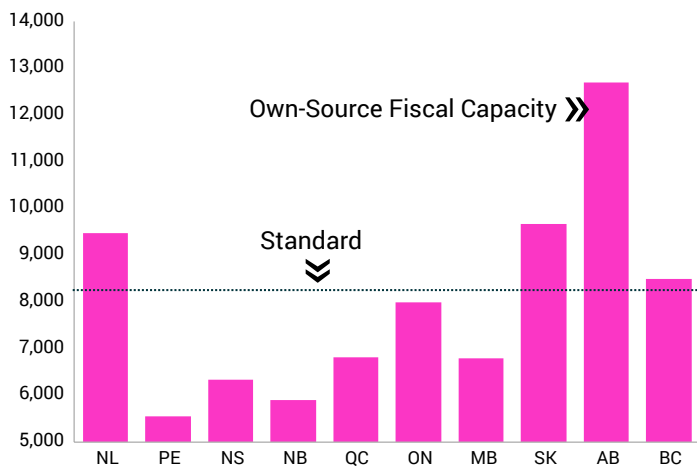
Province A per capita fiscal capacity: $7,900
Standard: $8,000
Province A population: 1 million

The difference between Province A's per capita fiscal capacity and the standard in this example is $100 ($8,000 - $7,900 = $100). Its population of 1 million means it would be entitled to a $100 million Equalization payment ($100 x 1,000,000 = $100 million).

For 2016-17, but for the caps and ceilings mentioned above, these three steps would have led to Equalization payments of over $21 billion – translating to 7.3 per cent of federal revenue or program spending, or just over 1.0 per cent of GDP. For 2017-18, the same formula would have produced payments of just under $21 billion.
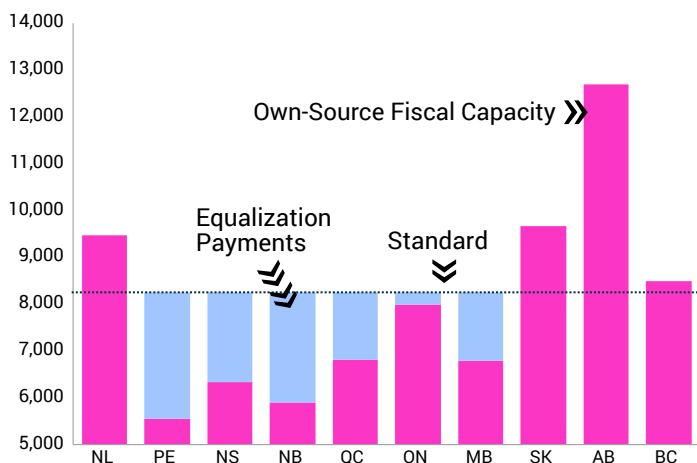
In broad strokes, these three steps encompass the approach to Equalization recommended by the 2006 Expert Panel on Equalization chaired by Al O'Brien (henceforth referred to as the O'Brien Report)[4] and subsequently adopted by the federal government starting in 2007-08. This framework, however, was only allowed to run unaltered for two years (2007-08 to 2008-09) until challenges – some which highlighted structural issues with Canada's system of fiscal federalism – made the program fiscally unsustainable in the eyes of the federal government.

4 Prior to the adoption of the recommendations of the O'Brien Report, the Equalization program operated under a fixed envelope framework (2005-06 to 2006-07), which was preceded by the use of a five-province standard (1982-83 to 2004-05). For further reading, Annex 2 of the O'Brien Report contains a helpful summary of the various Equalization standards used since 1957. See Canada. 2006. "Achieving a National Purpose: Putting Equalization Back on Track, Report by the Expert Panel on Equalization and Territorial Formula Financing." Department of Finance Canada.

Relevant Recommendations of the O'Brien Report

The Expert Panel on Equalization, chaired by Mr. Al O'Brien, was struck in 2005 to advise the federal government on a formula to allocate Equalization payments within the "fixed-envelope framework" announced in 2004. Under the fixed-envelope framework, overall total amounts and individual provincial allocations were determined independently, with the overall pot scheduled to grow by 3.5 per cent per year over 10 years.

The recommendations of the O'Brien Report deviated significantly from that mandate, arguing instead for "a clear set of principles" for Equalization, starting with the use of a formula to determine both the size of the Equalization pool and the allocation to individual provinces. Other recommendations relevant for the purposes of this paper included:

» The adoption of a ten-province standard.

» The inclusion of 50 per cent of provincial resource revenues in determining the overall size of the Equalization pool, recognizing that resource revenues should provide a net fiscal benefit to provinces that own them.

» The use of actual resource revenues to measure fiscal capacity in that base.

» The implementation of a fiscal capacity cap to ensure that, as a result of Equalization, no receiving province ends up with a fiscal capacity higher than that of the lowest non-receiving province.

» The adoption of a one-estimate, one-payment approach.

» The use of three-year moving averages combined with the use of two-year lagged data to smooth out the impact of year-over-year changes.

In its 2007 budget, the federal government announced the adoption of the O'Brien Report's recommendations, beginning in the 2007-08 fiscal year.

Lagged and Smoothed Data

A key programmatic feature of the O'Brien Report's recommendations that should be further elaborated upon for the purposes of this report was the move to a one-payment, one-estimate system using lagged data. The previous formula used a complex payment re-estimation system, known as the eight-estimate system, under which Equalization entitlements were continually re-estimated for accuracy for a period of for three-and-a-half years after the first estimate.[5] Data revisions could result in entitlements being significantly revised upward or downward for years after the first estimate. These ongoing revisions to entitlements made year-over-year payments unstable and very difficult for provinces to predict. These revisions were particularly problematic for provincial budgeting purposes when overpayments were subject to large recoveries.

The move to a one-payment, one-estimate system eliminated the subsequent adjustments and revisions of entitlements. The use of lagged data was seen as a necessary trade-off to ensure a greater degree of reliability of entitlement estimates that would have otherwise been foregone in a one-estimate system. The first estimates of the data inputs used in the multi-estimate system were inherently unreliable, but estimates generally became more accurate midway through the re-estimation process.[6] As such, the O'Brien Report recommended data inputs be lagged for two years, and subject to a three-year smoothing to ensure more accurate data were ultimately incorporated into the estimates (see Figure 4).[7] This framework was a key element in improving the predictability of payments for provinces compared to the multi-estimate system that preceded it.

FIGURE 4
Illustrative Example of the Use of Lagged and Weighted Data Inputs for the Calculation of Equalization

5 For example, under the multi-estimate system, data for 2016-17 entitlements would not have been finalized until 2019-20.
6 See Annex 8 of the O'Brien Report for a full discussion of the re-estimation process.
7 The 50-per cent weighting for the first year of data was meant to compensate for the slight loss in responsiveness that may have potentially been created by the use of lagged data.

4 THE CHALLENGES FACING EQUALIZATION IN 2008

During the autumn of 2008, in the lead-up to the release of Equalization entitlements for the 2009-10 fiscal year, the federal government found itself confronted with challenges that would begin to undermine the recently-adopted framework for the Equalization program.

The most obvious of these were the economic and concomitant fiscal developments that were beginning to unfold at the tail-end of 2008. Although neither the full extent nor the depth of the economic contraction were fully understood at the time decisions around Equalization were being made, governments were beginning to come to terms with the fiscal risks the recession would present.

Two other factors would affect Equalization specifically at that time. First, for the first time in the program's history, Ontario was to receive[8] Equalization payment in the 2009-10 fiscal year, putting additional fiscal pressure on the program. Secondly, rapidly increasing natural resource prices strained the role of the program as an agent of interregional redistribution in Canada.

Ontario and Equalization

Ontario's qualification for Equalization presented the federal government with several problems. First and foremost was cost. In simple terms, Ontario is very expensive to equalize. As discussed in the previous section, a province's Equalization entitlement is determined by its deviation from the Equalization standard in per capita terms. That deviation is subsequently multiplied by the province's population to determine the size of the entitlement in dollar terms. Because Ontario has such a large population relative to the other provinces – roughly 14.0 million people at the time of writing – each dollar below which Ontario falls below the Equalization standard costs the federal government more than the same deviation would cost in another province. Sometimes orders of magnitude more.

Consider the following thought experiment. If the current slate of Equalization-receiving provinces were to all to deviate from the standard by only one dollar in per capita terms, the cost to the federal government to equalize them to the standard would vary considerably from province to province. In the case of Prince Edward Island, such a proposition would cost a mere $149,000, whereas for Ontario, the same deviation would cost $14.0 million to equalize, or almost 100 times more (see Figure 5).

8 Ontario qualified for but did not receive Equalization payments in the late-1970s and early 1980s.

FIGURE 5
Thought Experiment: The Relative Costs of Equalizing a One-Dollar Deviation from the Standard ($ per capita)

$1 per capita of Equalization costs:

$149K $949K $757K $8.3M $14.0M $1.3M

NL   PE   NS   NB   QC   ON   MB   SK   AB   BC

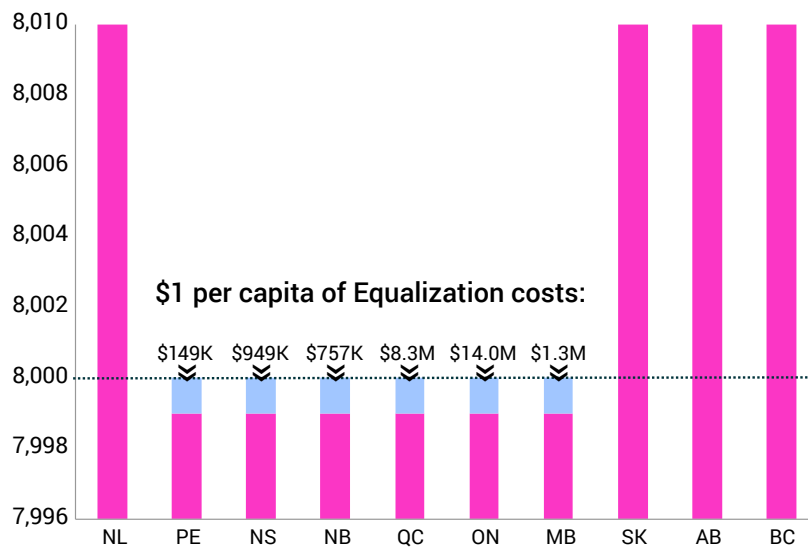## FIGURE 6
Ontarians' Contribution to Federal Revenue Compared to Ontario's Share of National GDP and Population

— Ontarians' Contribution to Federal Revenue
— Ontario's Share of GDP
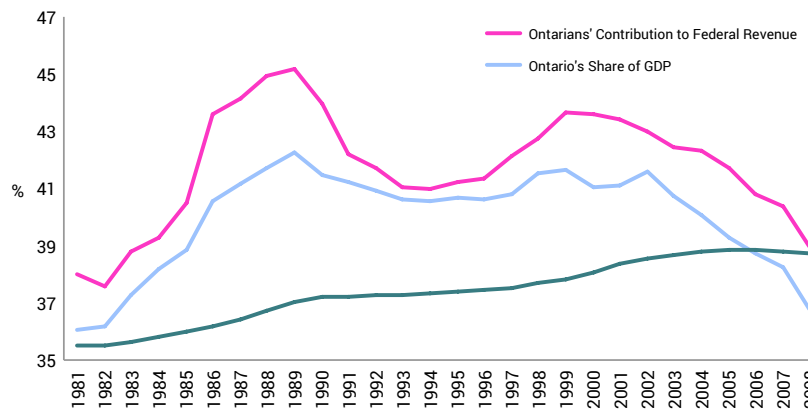
Sources: Ontarians' Contribution to Federal Revenue: Statistics Canada, Provincial and Territorial Economic Accounts: Data Tables, catalogue number 13-018-X (Note: total federal revenue has been adjusted to account for the Quebec Abatement); GDP. Statistics Canada, Table 384-0037 Gross domestic product, income-based, provincial and territorial, annual (dollars x 1,000,000); Population: Statistics Canada, Table 051-0001 Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual (persons)

It can be safely inferred that the prospect of Ontario qualifying for Equalization – and likely remaining a recipient for at least the foreseeable future – would have been cause for some consternation in the halls of the Finance Canada building at the time.

In addition to the cost it represented, the qualification of Ontario for Equalization payments was doubly problematic for the federal government as the province has traditionally been the source of a large and disproportionate share of its revenues. For example, in 2002, the share of federal revenues derived from Ontario was 43 per cent, despite the province only representing about 39 per cent of Canada's population. By 2008, Ontario's contribution to federal revenues had fallen to be roughly in line with its share of the population. The size of Ontario's relative economic footprint in Canada shrunk in lockstep (see Figure 6), and by 2008 had dipped below its population share to 36.8 per cent. As the fiscal well dried up in Ontario, it strained the federal government's ability to finance many of its commitments including the recently enacted enhancements to Equalization.

Resources and Equalization

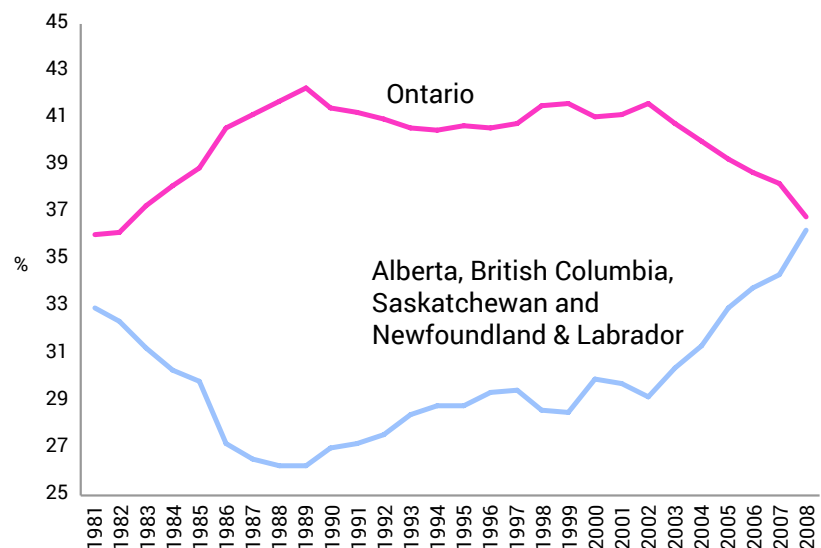At the same time that Ontario's economy was in relative decline, the economic prominence of Canada's "resource-rich provinces" (Alberta, British Columbia, Saskatchewan and Newfoundland & Labrador) was growing. By 2008, the combined economic weight of the resource-rich provinces (36.3 per cent of national GDP) nearly matched that of Ontario (see Figure 7) despite representing only 29 per cent of the national population (to Ontario's 39 per cent). This was also up considerably from their collective economic footprint of only a few years prior, when in 2002 the four provinces combined to represent 29.2 per cent of national GDP.

The growth in the economies of the resource-rich provinces over that period was attributable largely due to the sustained increase in commodity prices, especially oil. While constantly subject to price volatility, a barrel of oil was still relatively cheap at the close of 2001 at $20US/bbl. However, by the middle of 2007 a tripling of the real price of oil would occur, followed by a further sharp steepening, sending the nominal price to an all-time high of $US145/bbl on July 3, 2008.[9] While this increase was to be followed by an equally spectacular price collapse later in 2008, the Equalization program's vulnerability to fluctuations in resource provinces would once again be clearly demonstrated.

FIGURE 7

Share of National GDP: Ontario Compared to Resource-Rich Provinces (per cent of GDP)

Source: Table 384-0037 Gross domestic product, income-based, provincial and territorial, annual.

The rapid increase in commodity prices had a direct impact on the Equalization program in that it led to significant increases in fiscal capacity in the resource-rich provinces. Between 2003-04 and 2008-09, the combined fiscal capacity of the resource-rich provinces grew by 59.4 per cent, significantly faster than 17.7 per cent growth experienced in the rest of Canada over that period (see Figures 8 & 9). Perhaps most striking were Newfoundland & Labrador and Saskatchewan, which experienced growth in per capita resource-based fiscal capacity of 982 per cent and 268 per cent respectively over that period.
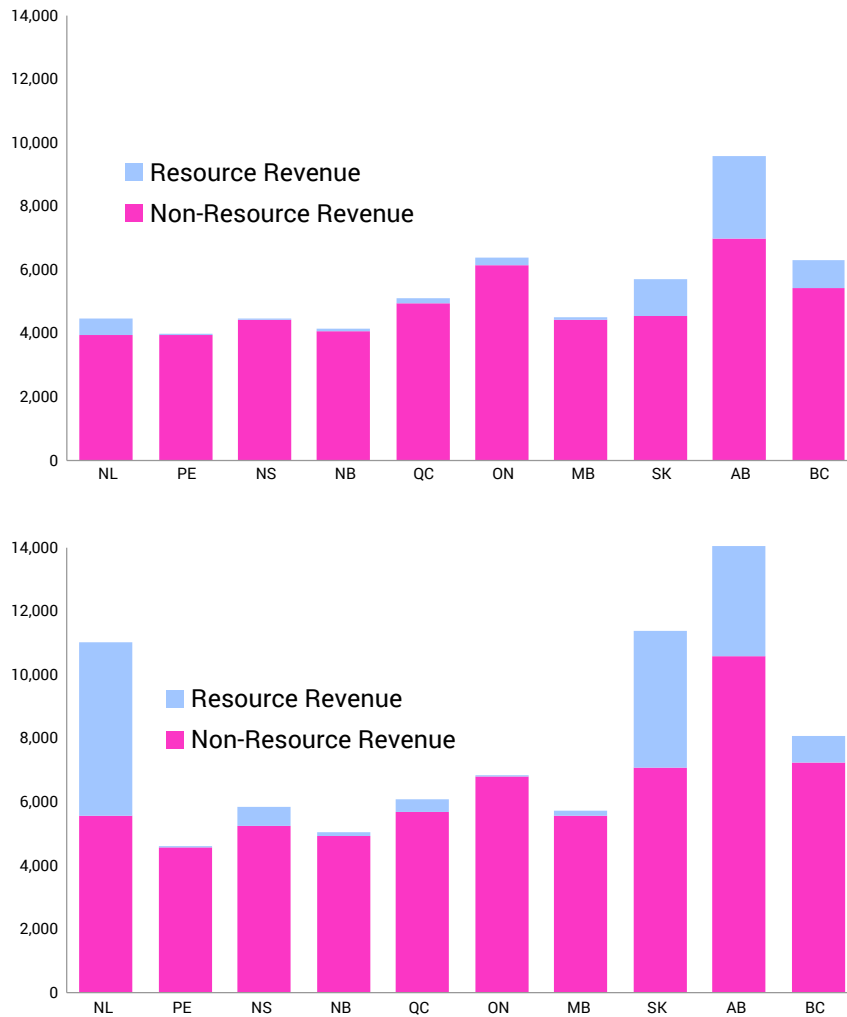
9 Hamilton, James D. 2009. "Causes and Consequences of the Oil Shock of 2007-08." *National Bureau of Economics*. NBER Working Paper No. 15002. Issued in May 2009.

FIGURES 8 & 9
Per Capita Fiscal Capacity Resource and Non-Resource Revenues by Province, 2003-04 and 2008-09 ($ per capita)

Source: Finance Canada

Note: Fiscal capacity for resources is presented at 100 per cent inclusion and only for the fiscal year presented, not the rolling average used to calculate entitlements for that year.

As this growth in resource wealth was limited to only a few provinces, the greater concentration of fiscal capacity in those provinces led to greater variances between all provinces writ large. Greater variance between provinces generally creates the need for more Equalization.

Figures 8 and 9: The growth in the fiscal capacity of the resource-rich provinces was further magnified by the adoption of the ten-province standard for the determination of the size of the Equalization pot (Step Two from above), as recommended by the O'Brien Report. Although the O'Brien Report recommended including only 50 per cent of resource revenues in the calculation of Equalization, the ten-province standard had the effect of including a portion of Alberta's resource wealth in the determination of the standard. Between 1982 and 2004, the five-province standard that was used for Equalization had deliberately omitted Alberta's fiscal capacity from the calculation of the standard to contain the cost of the program. The adoption of the ten-province standard starting in 2007-08 made Equalization far more expensive.

Arguably, it would have been difficult for the members of the Expert Panel on Equalization to foresee just how high the price of oil would climb, especially in such short order after the release of their report. Over the course of the consultation period of the report (March 2005 to May 2006), the price of oil had averaged just over $US60/bbl (see Figure 10). Previous experience would have suggested that a more-than-doubling of the price of oil only two short years later was not particularly likely. Nevertheless, the move to a ten-province standard opened up the Equalization program to this key vulnerability to fluctuations in the price of oil, namely the potential for rapid increases in cost.

FIGURE 10
Average Monthly Price of Oil, West Texas Intermediate ($US/bbl)

June 2008 average:
« $134.02 $US/bbl

Average price of oil over Expert Panel
on Equalization's consulation period
(March 2005-May 2006):
$61.02 $US/bbl »
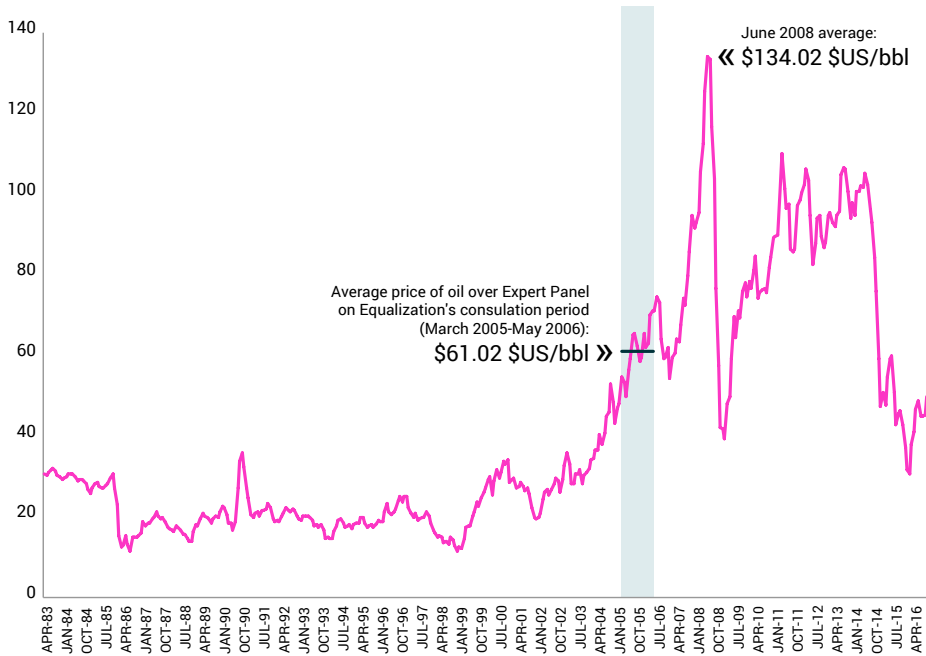
Source: U.S. Energy Information Administration. Downloaded from http://economicdashboard.
alberta.ca/OilPrice on 2017-01-05.

FIGURE 11
Ten-Province Standard v. Five-Province Standard in 2008-09 ($ per capita)

Difference:
$3.4 Billion

Ten-Province Standard:
$6,731

⬆ $329

Five-Province Standard:
$6,402
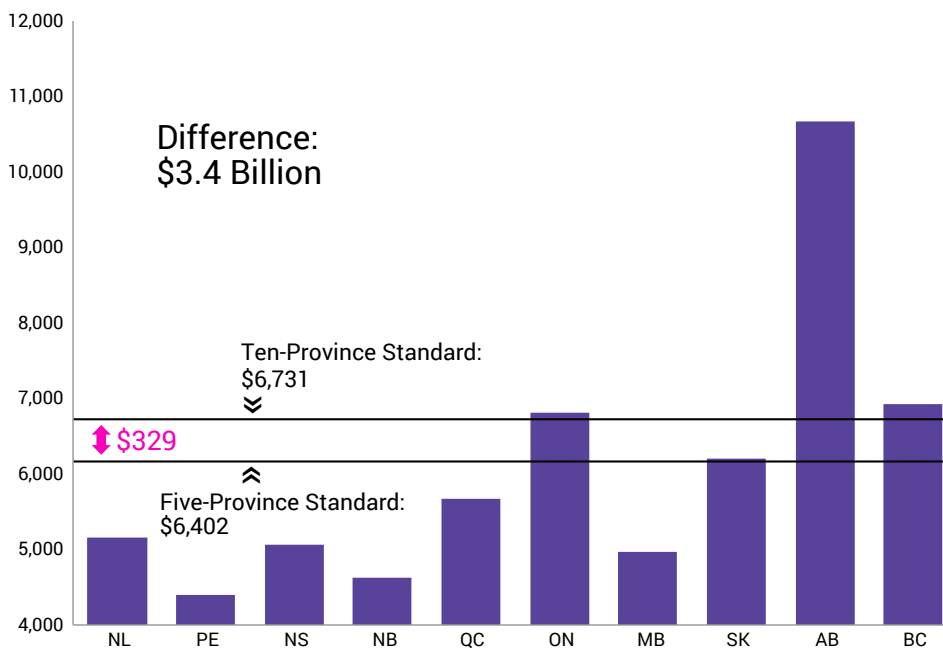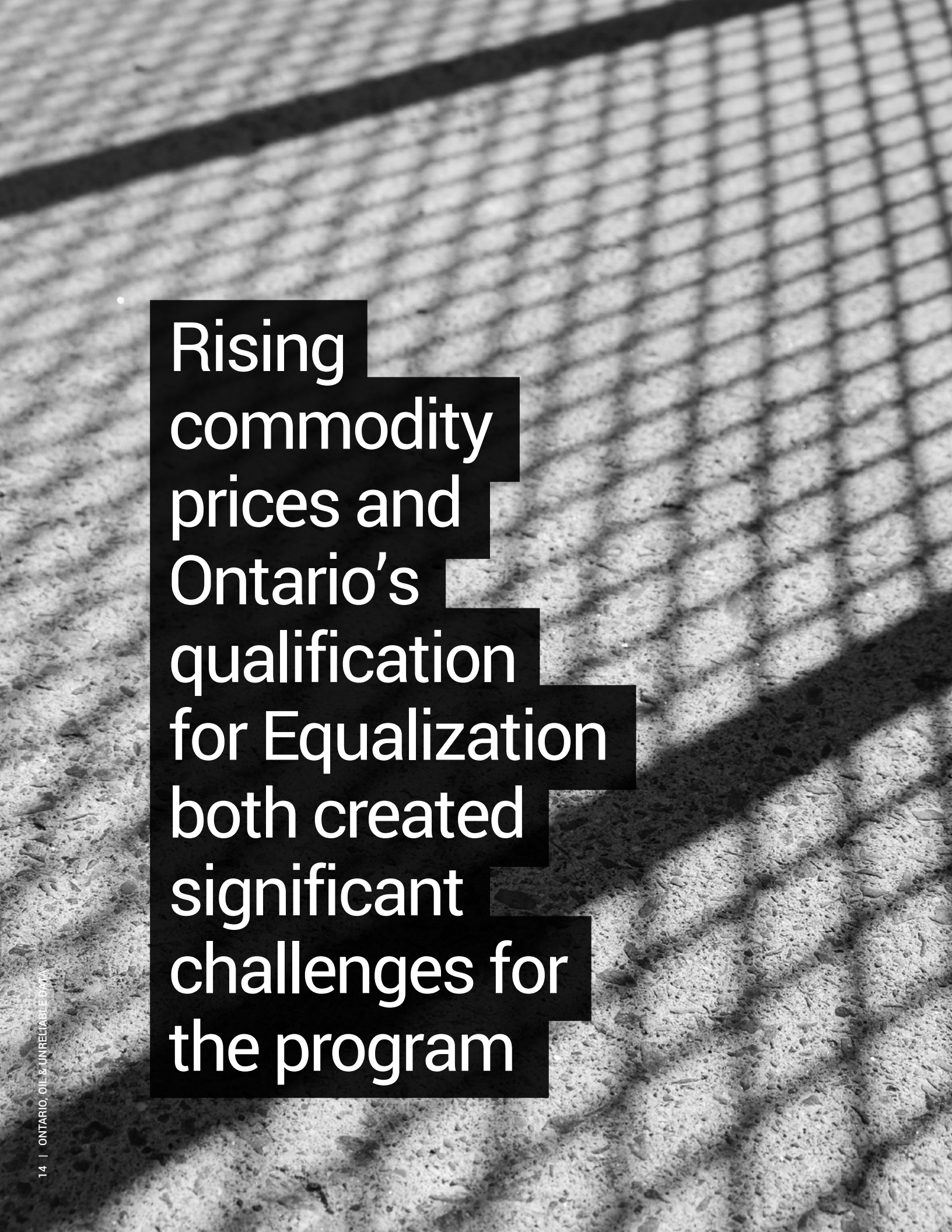
Source: Mowat calculation based on Finance Canada data.

To illustrate the added expense a ten-province standard can entail, take the example of 2008-09, the last year an unconstrained Equalization program determined by ten-province standard was in operation. Had a five-province standard been in effect in that year rather than a ten-province standard, total Equalization payments would have been $10.4 billion, or $3.4 billion lower in that year (see Figure 11).[10]

Rising commodity prices and Ontario's qualification for Equalization both created significant challenges for the program. These two factors made the framework introduced in response to the recommendations of the O'Brien Report fiscally unsustainable from the perspective of the federal government.

10 The $329 per capita reduction of the standard entailed by a five-province standard on its own leads to a $4 billion reduction in Equalization payments. However, the fiscal capacity cap (as designed at the time) would have been less binding under a five-province standard, and as such total Equalization payments would only have been reduced by $3.4 billion.

Rising commodity prices and Ontario's qualification for Equalization both created significant challenges for the program

5 THE FEDERAL RESPONSE TO THE CHALLENGES OF 2008

In November 2008, the federal government introduced two key changes to the Equalization program. These changes – which would take effect in the upcoming 2009-10 fiscal year – were designed to contain the costs of the program in light of challenges posed by rising commodity prices and Ontario's qualification for payments.

The first and most fundamental change was to cap the total size of the program to a fixed envelope. As discussed in Steps One through Three above, the framework in place for 2007-08 and 2008-09 used the ten-province standard to determine both the size and allocation of Equalization entitlements. Starting in 2009-10, year-over-year growth in the program would instead be limited to a three-year moving average of GDP growth. For example, the growth in overall entitlements for 2009-10 was based on the average of GDP growth in 2007, 2008 and 2009. This had the effect of limiting the growth in the program to 4.5 per cent, from $13.6 billion in 2008-09 to $14.2 billion in 2009-10. Without the introduction of the GDP ceiling in that year, total Equalization in 2009-10 would have instead been $16.1 billion, or 18.6 per cent higher than the previous year.

The second change was to alter the way the Fiscal Capacity Cap (FCC) was applied. For 2007-08 and 2008-09, the FCC was put in place to ensure that no receiving province would have a greater post-Equalization fiscal capacity than a non-receiving province, on a per capita basis. In addition to Equalization payments, the measure of post-Equalization fiscal capacity included 100 per cent of resource revenues (in contrast to the 50 per cent included for the purposes of calculating pre-FCC entitlements) and revenues from Newfoundland & Labrador's and Nova Scotia's Offshore Accords. Any amount above the per capita fiscal capacity of the lowest non-receiving province – Ontario for both 2007-08 and 2008-09 – was clawed back from Equalization payments (see Figure 12). In those two years, the FCC had the effect of either partially reducing[11] or completely clawing back[12] payments from a number of provinces with relatively high resource wealth.[13]

11 Newfoundland & Labrador in both years; Saskatchewan in 2007-08; and Nova Scotia in 2008-09.
12 Saskatchewan in 2008-09.
13 Measuring the impact of the application of the FCC was further complicated due to two provisos also introduced in the 2007 federal budget. First, all provinces were entitled to receive the greater of the Equalization entitlements under the formula based on a 50-per-cent re-source exclusion rate, and the amounts they would receive under the same formula based on full exclusion of all natural resource revenues. Second, to respect the Offshore Accords, Nova Scotia and Newfoundland & Labrador had the option to continue to operate under the previ-ous Equalization system (the fixed envelope framework that preceded the adoption of the recommendations of the O'Brien Report) until their existing offshore agreements expired.

FIGURE 12

Illustration of the Application of the Fiscal Capacity Cap Prior to 2009-10
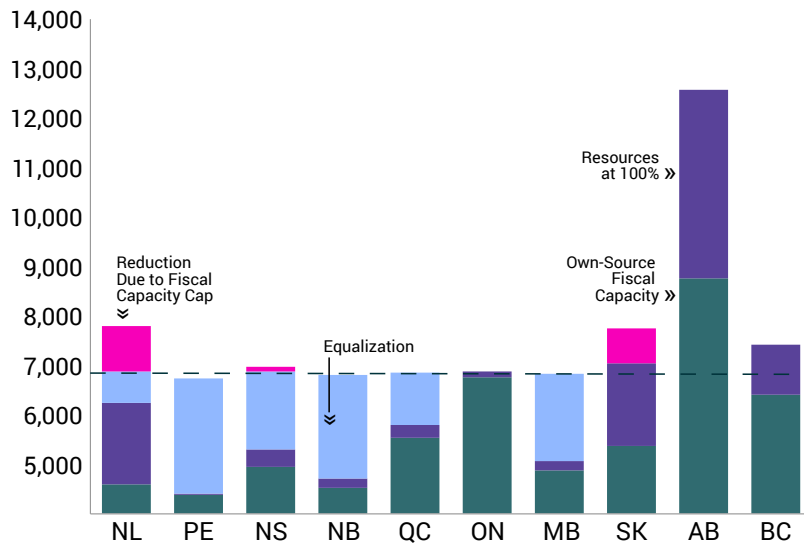
Source: Mowat calculation based on Finance Canada data.

Coinciding with the introduction of the GDP ceiling, the FCC was changed such that it would no longer be set at the fiscal capacity of the lowest non-receiving province, but instead would be set at the *average* post-Equalization fiscal capacity of those provinces receiving Equalization. Had this change not been introduced, Ontario's 2009-10 Equalization entitlement would have been entirely clawed back by the application of the GDP ceiling. To unpack that last sentence, the updated mechanics of the Equalization program in the context of the new FCC and GDP ceiling must be borne out.

Recall the discussion of the three-step mechanics of the Equalization program discussed in Section 3. Those three steps are still applied. However, the FCC and the GDP ceiling represent Steps Four and Five respectively in the determination of Equalization, and are used to reduce provinces' entitlements to fit within the fixed envelope of funding.[14]

14 As noted above, a version of a Fiscal Capacity Cap was already in place prior to 2009-10, but was omitted from the three-step dis-cussion of the mechanics of the Equalization program in Section 3 for the sake of simplicity.

Step Four: Application of the Fiscal Capacity Cap

Once the gap between the ten-province standard is filled (Steps Two and Three) the initial reduction of entitlements comes via the application of the FCC. The FCC is measured as the average post-Equalization fiscal capacity of the Equalization-receiving provinces and amounts above that the FCC are clawed back (see Figure 13). As before, this measurement includes 100 per cent of resource revenues and the Offshore Accords. Since 2009-10, the FCC has affected all receiving provinces except Ontario and PEI, and has notionally clawed back amounts from Newfoundland & Labrador and Saskatchewan on multiple occasions as well.

Step Five: Application of the GDP Ceiling

After they have been clawed back as a result of the FCC, entitlements are further clawed back from all receiving provinces on an equal per capita basis. This is done until the pot has been sufficiently reduced to fit within the fixed envelope as determined by the GDP ceiling (see Figure 14).

FIGURES 13 & 14

Step Four: Application of the Fiscal Capacity Cap

Resources at 100%

Equalization Payments Pre-Ceiling

Reduction Due to Fiscal Capacity Cap

Step Five: Application of the GDP Ceiling

Resources at 100%

Equalization Payments Post-Ceiling

Reduction Due to Fiscal Capacity Cap
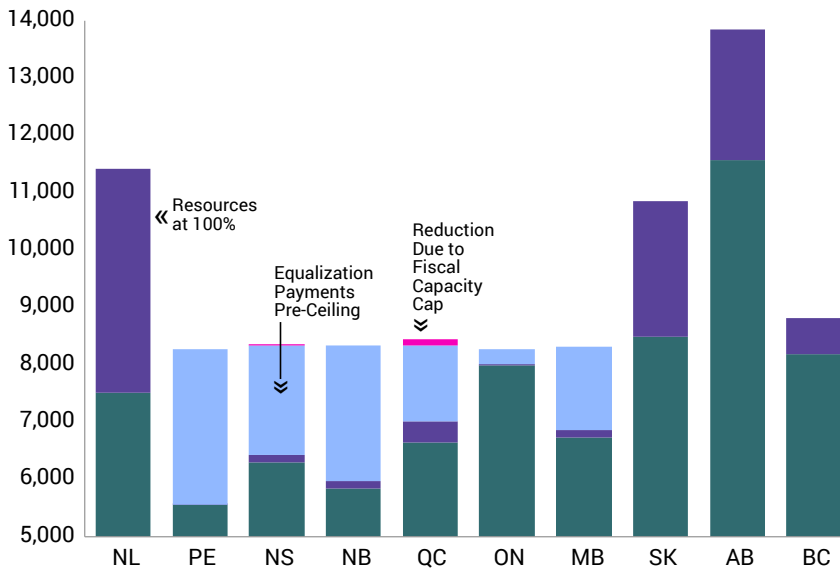
Impact of GDP Ceiling
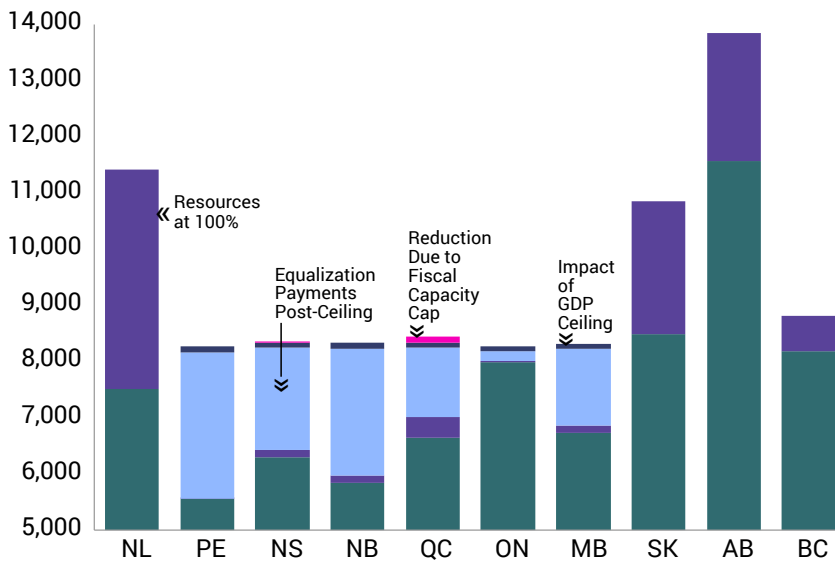
Source: Mowat calculation based on Finance Canada data

Returning to the argument that the change to the FCC was necessary to prevent Ontario's Equalization entitlement from being entirely clawed back by the application of the GDP ceiling, it is worth remembering, Ontario is very expensive to equalize. To meet the $1.9 billion claw-back required to reduce Equalization entitlements from $16.1 billion (the uncapped amount for 2009-10) to $14.2 billion (the amount set by the GDP ceiling for 2009-10) required a reduction of roughly $80 per capita from all receiving provinces. Ontario's entitlement before the application of the GDP ceiling in that year, however, was only $77 per capita, and as such would have been entirely clawed back by the GDP ceiling.

The combination of the change to the FCC and the introduction of the GDP ceiling allowed for Ontario to qualify for Equalization payments while containing the costs of the program. While not their stated policy goal, the changes to the FCC have been a robust solution to keeping Ontario in the program as the province has qualified for Equalization every year between 2009-10 and 2017-18.

The addition of these two extra steps (over and above those discussed in Section 3) continues to produce significant cost savings for the federal government. For 2016-17, the FCC and GDP ceiling reduced what would have been over $21 billion in Equalization payments (as outlined in Section 3) to $17.9 billion, a one-year savings of $3.3 billion or 15.5 per cent. For 2017-18, savings of $2.5 billion or 11.9 per cent were realized.
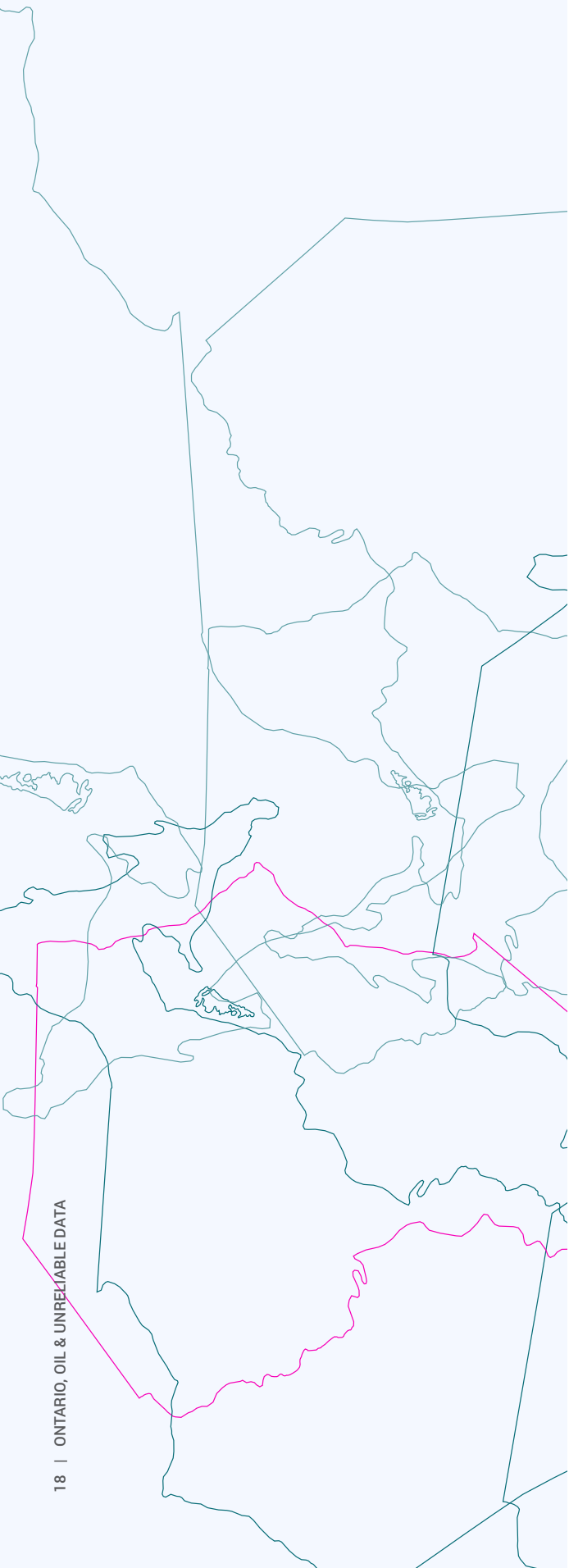
FIGURE 15
Costs of a Capped Equalization Program Compared to an Uncapped Program
($ billions)

Cumulative Difference: $26.5 billion

Uncapped Program
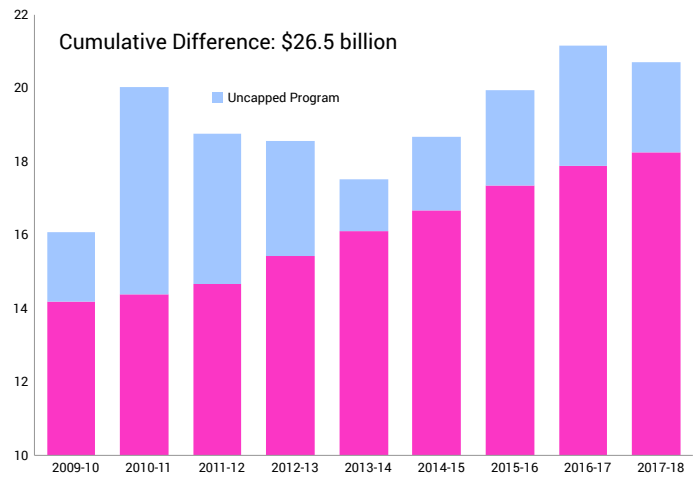
Source: Mowat calculation based on Finance Canada data

The largest single-year savings resulting from the fixed-envelope framework came in 2010-11. Total payments were reduced by $5.7 billion or 28.2 per cent in that year. The smallest impact those two measures have had came in 2013-14, when entitlements were reduced by $1.4 billion or 8.0 per cent. Since 2009-10, the federal government has saved a cumulative $26.5 billion from the application of a fixed envelope, compared to what the uncapped program would have generated in its place (see Figure 15).

What can also be seen from Figure 15 is that the size of the uncapped program would have been far more volatile than what took its place, creating significant unpredictability for the federal government in terms of cost. Much of this volatility over the last decade would have stemmed from resources. However, the tendency for resource revenues to create issues for the Equalization program is not solely a recent trend. The problems that natural resources create for the Equalization program are largely structural in nature and have dogged the program almost since its inception.

6 THE PROBLEM WITH NATURAL RESOURCES

There is no consensus on how to reconcile natural resource wealth and the Equalization program. As the O'Brien Report succinctly put it, "No issue in the entire Equalization program is more contentious than how to deal with resource revenues."[15] The crux of the issue is that while natural resources give rise to disparities in revenue-raising capacity between provinces, there is little agreement as to exactly how much of those disparities ought to be equalized. Furthermore, the federal government has only limited direct access to resource revenues.[16] This curbs its ability to finance the increases in Equalization that greater disparities in resource revenues create.

Natural resource revenues have been treated differently from other revenues for most of the history of the Equalization program.[17] The differences in treatment manifest themselves primarily in varying rates of revenue inclusion in the Equalization formula, and changes to the Equalization standard and/or size of the program.[18]

The rate of inclusion of natural resource revenues has varied over time from outright exclusion to 100 per cent inclusion and multiple points in between.[19] In arriving at its recommendation to include only 50 per cent of resource revenues, the Expert Panel on Equalization sought to "strike a balance" between arguments for full inclusion and full exclusion. While the Panel could not support full exclusion, since resource revenues do contribute substantially to a province's fiscal capacity, it also weighed arguments for less than full inclusion. Arguments for some degree of exclusion of resource revenues typically include:

» Resources are Constitutionally-speaking owned by provinces and should primarily, if not exclusively, benefit their owners.

» Resource revenues are often not fully spent by provinces, and are instead saved or used to reduce taxes.

15 Canada. 2006. "Achieving a National Purpose: Putting Equalization Back on Track, Report by the Expert Panel on Equalization and Territorial Formula Financing." *Department of Finance Canada*.

16 Revenues from lands, mines, minerals and royalties belong to provinces, according to Section 109 of the Constitution Acts, 1867 to 1982. However, the federal government accrues significant income, consumption and other tax revenues from the economic activity associated with resource development. For an example of such an analysis see: Murphy, Robert and Brian Lee Crowley. 2013. "Equalization Reform: Promoting Equity and Wise Stewardship." *Macdonald-Laurier Institute*.

17 Feehan, James P. 2005. "Equalization and the Provinces' Natural Resource Revenues: Partial Equalization Can Work Better." In Lazar, Harvey. Canadian Fiscal Arrangements: *What Works, What Might Work Better*. Institute of Intergovernmental Relations, pp. 185-208.

18 Resource revenues have also been subject to different measurement regimes over time (actual province resource revenues versus the use of the Representative Tax System to measure potential resource fiscal capacity). The amount of distinct tax bases to measure resource revenues has also varied considerably. Resource revenues have been lagged at various points in time where other revenues have not. Annex 7 of the O'Brien Report contains a comprehensive list of the varying treatments of resource revenues over time.

19 Bernard, Jean-Thomas. 2012. "The Canadian Equalization Program: Main Elements, Achievements, and Challenges." *The Federal Idea*.

» Resources are assets, not revenues, and resource extraction represents conversion of one type of asset into another.

» Inclusion of resources can create incentives for provinces to misprice or under-develop resources.

Because Equalization is paid for through federal general revenues, greater inclusion rates require more funding from federal taxpayers, some of which would not necessarily benefit from resources or Equalization themselves.

The Expert Panel decided that both extremes of the inclusion/exclusion debate were "untenable in the Canadian context" and essentially split the difference at 50 per cent.

The choice of an Equalization standard – along with other mechanisms for determining the overall size of the program – is the federal government's other primary tool for managing its exposure to the fiscal risks caused by resource prices. As outlined in Section 4, the Panel's recommendation to move to a ten-province standard opened up the Equalization program to rapid increases in cost. The federal government's current solution to both containing the cost and overall volatility of the program is the GDP ceiling. Constraining the program to a fixed envelope has the effect of divorcing the Equalization standard from the determination of the total size of the program. By tying growth in the program to growth in national GDP, the federal government has more-or-less perfect certainty regarding the size of the Equalization program from year to year.

The other effect the fixed envelope has, however, is that it creates a zero-sum game between provinces with respect to the allocation of funds. As a result, the two factors that caused the federal government to make the 2008 changes

to Equalization in the first place – Ontario's qualification for payments and natural resource prices – continue to create volatility and unpredictability in the program. However, the volatility and unpredictability in the program is experienced not by the federal government, but by the receiving provinces.

7 VOLATILITY IN PAYMENTS

The volatility and unpredictability experienced by the Equalization-receiving provinces in the capped-program era that has prevailed since the 2009-10 fiscal year can be divided into two distinct phases.

Between 2009-10 and 2012-13, it is largely the story of the growth in Ontario's entitlement. Ontario's share of total Equalization payments grew from 2.4 per cent of the pot in 2009-10 to 21.1 per cent in 2012-13 (see Figure 16). In a fixed-envelope environment, this necessarily involved the crowding out of the entitlements of the rest of the receiving provinces. In fact, Ontario was the only province to have a larger entitlement in 2012-13 than in 2009-10.

After Ontario's entitlement had hit its peak of $3.3 billion in 2012-13, large year-over-year swings in entitlements were experienced by all provinces. The greatest swings in this period, however, were experienced by Ontario, with year-over-year declines approaching 40 per cent twice (see Figure 17). The variability and unpredictability of individual provinces' entitlements contrasts starkly to the federal governments' experience of stable and predictable growth in this period.[20]

FIGURE 16
Ontario's Share of Total Equalization Entitlements, 2009-10 to 2012-13
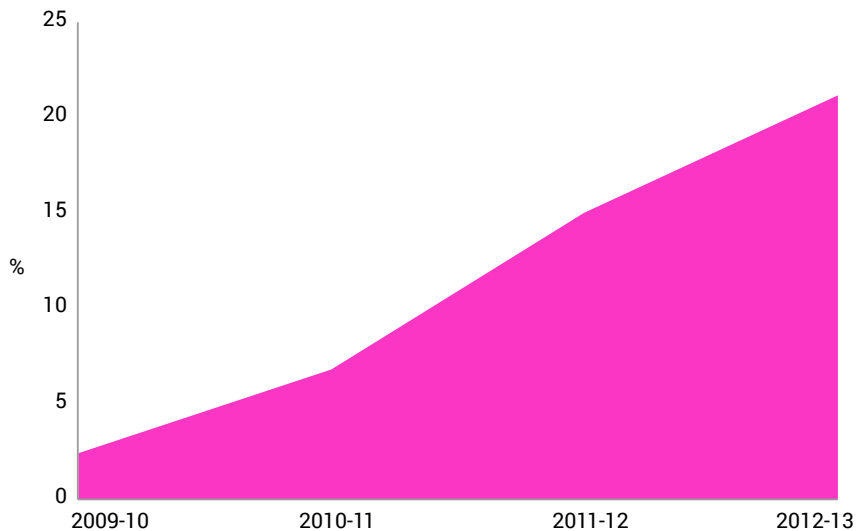
Source: Mowat calculation based on Finance Canada data

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20 The federal government did provide provinces with some protection from year-over-year swings through Equalization transition payments in 2009-10 and Total Transfer Protection (TTP) between 2010-11 and 2013-14. Neither of those practices was continued beyond 2013-14. The federal decision to end TTP lead to a $640 million year-over-year reduction in Ontario's total major transfers from 2013-14 to 2014-15.

FIGURE 17
**Year-Over-Year Changes in Equalization Entitlements by Province,
2013-14 to 2017-18**
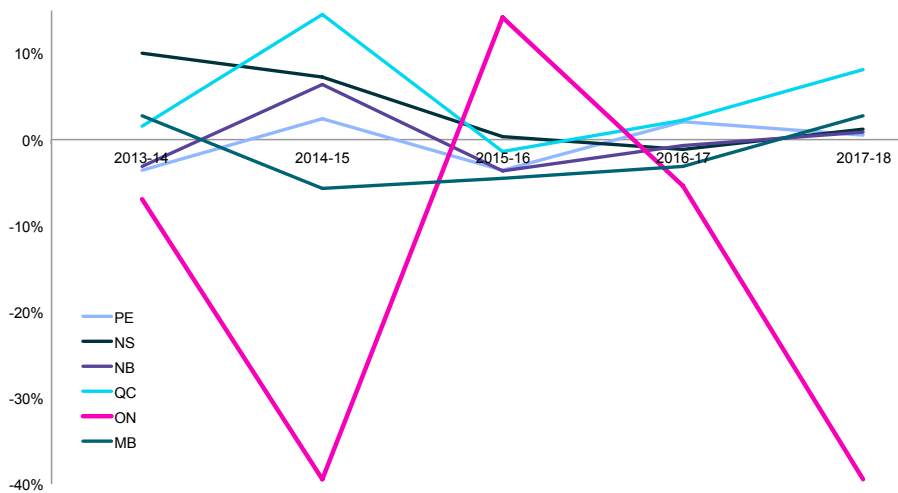
Source: Mowat calculation based on Finance Canada data

The volatility and unpredictability in the allocation of Equalization payments is further complicated by the reliability of the data inputs used in the formula. The program's use of lagged and smoothed data, combined with a one-estimate system (see Side Panel: Lagged and Smoothed Data) has decreased the volatility and improved the predictability of payments compared to the eight-estimate system that preceded it. However, the current approach to the use of data inputs still results in a considerable amount of volatility and unpredictability, stemming from two main factors.

The first is the data re-estimation process. The calculation of provincial fiscal capacity is done using a three-year rolling average of data. For each of the three times the data for a fiscal year enters the formula, it is revised for increased accuracy. These revisions can result in large and unpredictable swings in the calculation of fiscal capacity (see Figures 18 and 19) making individual provinces' Equalization entitlements very difficult to forecast. Natural resource revenues are particularly susceptible to large re-estimations (see Figure 19).

The second factor contributing to the volatility and unpredictability of payments for individual provinces is the delayed availability of new data inputs for the calculation of entitlements. Equalization entitlements for a fiscal year are typically released in mid- to late-December in the previous year. For example, the 2017-18 entitlements were communicated to provinces mid-December 2016. The first time provinces would see data for the 2015-16 input year – contained in the Fiscal Arrangements Certificates produced by Statistics Canada – is the week prior to the release of entitlements. The lack of reliable data prior to the release of these certificates is a significant contributor to the difficulty in forecasting individual provinces' Equalization entitlements. Furthermore, data for the t-minus 2 fiscal year (2015-16 for the 2017-18 entitlement year) is weighted at 50 per cent according to the formula, resulting in the least predictable and least accurate data receiving the highest weight (see Side Panel: Lagged and Smoothed Data).

FIGURE 18
Variance of First and Second Estimates of Non-Resource Fiscal Capacity to Final, All Provinces, 2007-08 to 2013-14 (% Variance from Final)
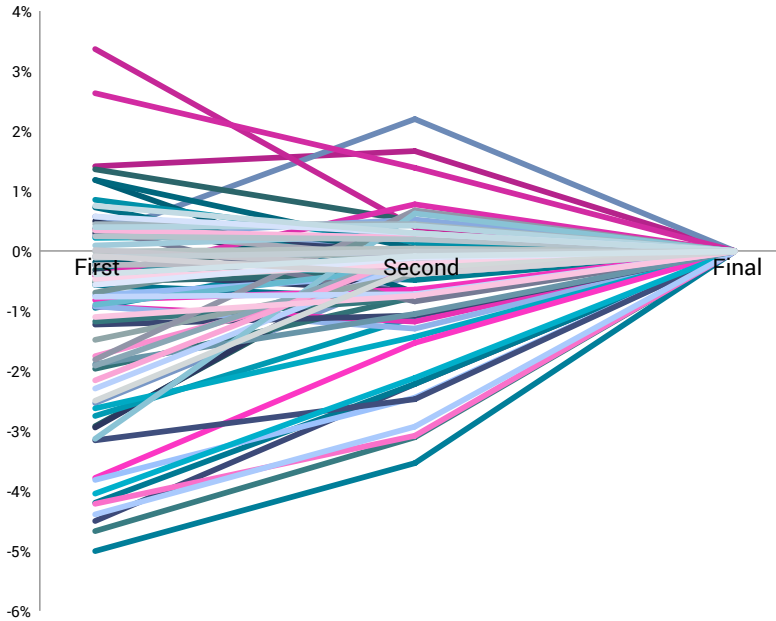
Source: Mowat calculation based on Finance Canada data

FIGURE 19
Variance of First and Second Estimates of Resource Fiscal Capacity to Final, All Provinces, 2007-08 to 2013-14 (% Variance from Final)
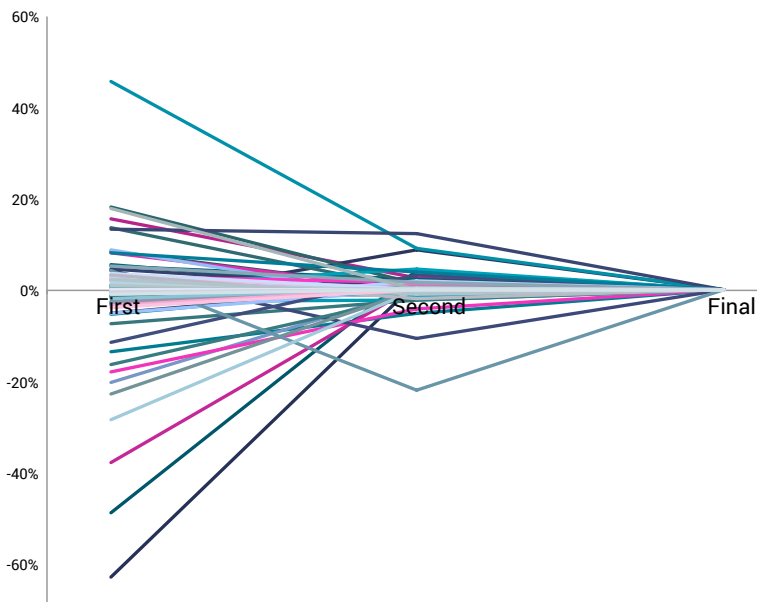
Source: Mowat calculation based on Finance Canada data

Note: Data for PEI omitted from 2007-08 to 2011-12 due to skewed results

This unpredictability makes provincial budgetary planning more difficult. Most if not all provinces would be in the middle of their budget process in mid-December. Unpredictable year-over-year variance in Equalization payments can put a province in a difficult fiscal position that adds uncertainty to fiscal planning, especially for provinces that rely heavily on Equalization as a percentage of revenue. While any budget process is subject to unpredictability on a number of fronts, unpredictability in the transfer whose main purpose is to enable the delivery of comparable services is at best unnecessary. At worst, this unpredictability can harmfully lead to inefficient spending, revenue and borrowing decisions on the part of the provinces.

Barring programmatic changes, both volatility and unpredictability in provinces' Equalization entitlements are likely to persist going forward. The key contributors will once again be Ontario's role in the program, natural resources and the reliability of data. However, the Equalization program is scheduled to undergo its routine five-year legislative renewal to be implemented following the 2018-19 fiscal year. This renewal cycle provides the federal government with an opportunity to deal with the sources of volatility and unpredictability. The problematic issue of resource revenue inclusion should also be addressed.

8 SIMPLE SOLUTIONS TO COMPLEX PROBLEMS

Ontario's Fiscal Capacity Is Likely to Stay Close to the National Average

Ontario's unforeseen qualification for Equalization nearly a decade ago caused ripples that the federal government deemed necessary to address through constraining the cost of the program. The province's potential exit from receiving status may prove similarly disruptive.

According to the latest available data, Ontario's fiscal capacity is very close to the national average. Indeed, for the 2015-16 fiscal year – the most recent data-input year used for the lagged calculation of 2017-18 fiscal capacity – Ontario's fiscal capacity was 99.9 per cent of the average (see Figure 20). The Conference Board of Canada projects this upward trend to continue, raising Ontario's lagged and weighted fiscal capacity above the national average for the calculation of 2018-19 Equalization entitlements.[21]

FIGURE 20

Ontario's Per Capita Fiscal Capacity as a Percentage of the Weighted All-Province Average

Years used for 2009-10 entitlement calculation

99.9%
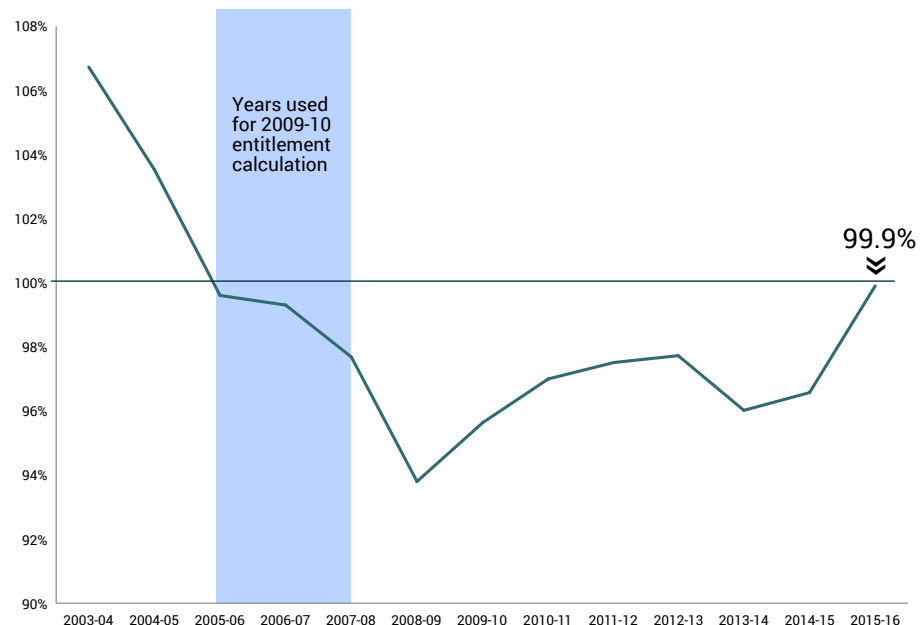
Source: Mowat calculation based on Finance Canada data

Notes: Calculation of fiscal capacity is for individual years, not lagged and weighted for calculation of entitlement year. Includes 50 per cent of resource revenues. Does not include impact of caps or ceilings.

21 Fields, Daniel. 2016. "Ontario's Equalization Revenues: To 'Have' or to 'Have Not.'" *Conference Board of Canada.*

If Ontario's fiscal capacity in fact does exceed the national average for the calculation of 2018-19 Equalization entitlements, that will not necessarily mean that it would no longer qualify for Equalization. The flip side of the provision that gives effect to the GDP ceiling is that, under the right conditions, it converts to a floor. If after employing Steps One through Three – discussed in Section 3 – the amount of Equalization required is *less than* the total amount as determined for the fixed envelope in that year, then the amount of funding remaining is allocated as a top-up (see Figure 21). This eventuality is fairly likely in the scenario that Ontario's fiscal capacity exceeds the national average and could, perhaps counter-intuitively, result in Ontario receiving an Equalization top-up in 2018-19.

Beyond 2018-19, it is even less clear what exactly will happen. As discussed in Section 7 above, Equalization is notoriously difficult to forecast. It is entirely possible that Ontario's fiscal capacity will continue to hover near the national average, giving rise to a situation where Ontario seesaws between recipient and non-recipient status from year to year. The issues of both cost and uncertainty that this would cause would mirror the experience of 2008 when Ontario first received Equalization payments.

Maintaining the current "fixed-envelope" approach would continue to provide the federal government with cost-certainty. Total Equalization payments would be predictable for the federal government and would provide it with a form of "insurance" to manage a situation in which Ontario drops in and out of recipient-status. Such an option, however, would be expensive as it would effectively require the federal government to equalize above the standard – analogous to the likely scenario for 2018-19 – for a prolonged period in order for the program to be large enough to accommodate Ontario's potential re-entry into the program. This approach would also likely result in charges of "over-equalization" which may not be desirable in the federal government's current fiscal situation. A fixed envelope could also lead to the same problem of Ontario "crowding out" the entitlements of other provinces as it dropped into the program.

FIGURE 21

Illustrative Example of Conversion of GDP Ceiling to GDP Floor ($ per capita)
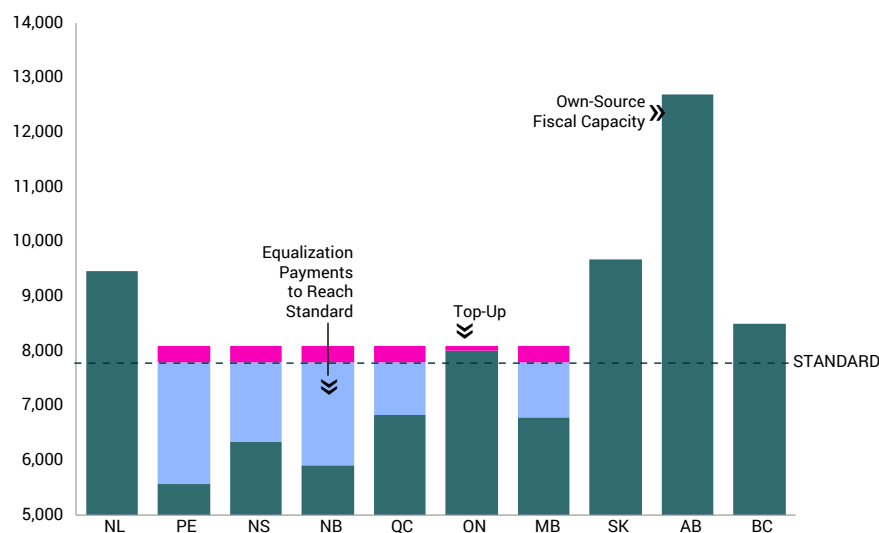
Source: Mowat calculation based on Finance Canada data
Note: The impact of the Fiscal Capacity Cap is omitted for simplicity.

Returning to a system that attaches the size of the program to variance in fiscal capacity between provinces is a more principled approach. While in the past, this approach has led to increases in both cost and unpredictability for the federal government, there are policy remedies available to militate against those issues which will be discussed below. With the next five-year renewal of the Equalization program looming, the federal government has an opportunity to reform the program with increased predictability for both provinces and the federal government figuring heavily in its design.

RECOMMENDATION #1

To give provinces a degree of predictability for 2018-19 payments, make no changes to the legislation governing the Equalization program until expiration of the current renewal cycle.

RECOMMENDATION #2

Starting in 2019-20, return to the use of a single formula to determine both the size of the Equalization pool and the allocation to individual provinces, as recommended by the Expert Panel on Equalization. That is, uncap the program.

RECOMMENDATION #3

Recommendation #3: upon release of Equalization payments for 2018-19, the federal government should lay out its vision for the future of the Equalization program, making predictability a key program design feature.

Resources Revenues Are Likely to Remain Problematic

Addressing the volatility of natural resource revenues is a key element in increasing the predictability of Equalization payments. Natural resource revenues are volatile, which can contribute significantly to unpredictability in Equalization payments. Compared to non-resource fiscal capacity, resource revenues are subject to much larger year-over-over swings on average (see Figure 22). The range of year-over-year changes in resource revenues are even more pronounced (see Figure 23).

Resource revenues are certain to be a continued source of volatility for Equalization payments in the future. Part of the solution is to introduce further smoothing to natural resource revenues data in the calculation of fiscal capacity. Smoothing mechanisms such as moving averages over a number of years help even out fluctuations in payments, reduce variability in year-over-year entitlements and provide greater predictability and stability because entitlements are adjusted gradually with changes in economic circumstances and

FIGURE 22
Average Year-Over-Year Changes in Resource and Non-Resource Fiscal Capacity, 2004-05 to 2015-16

Year-Over-Year Changes in Weighted Average of:
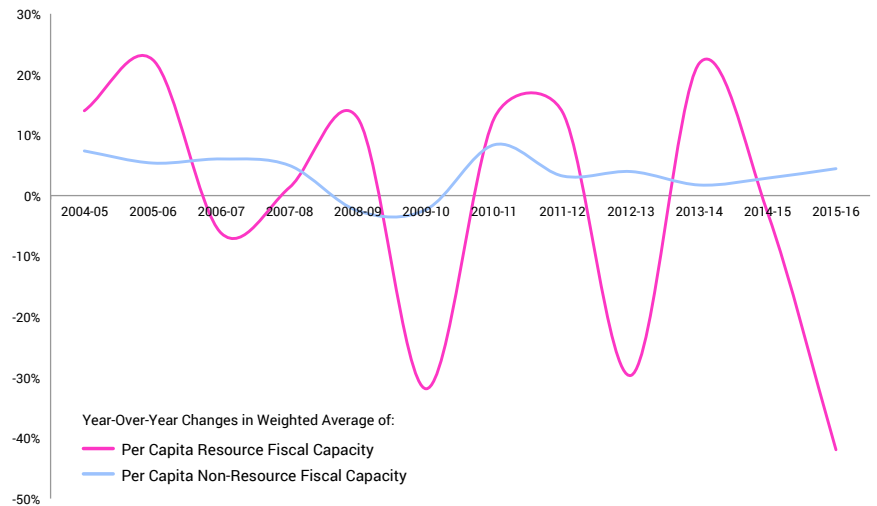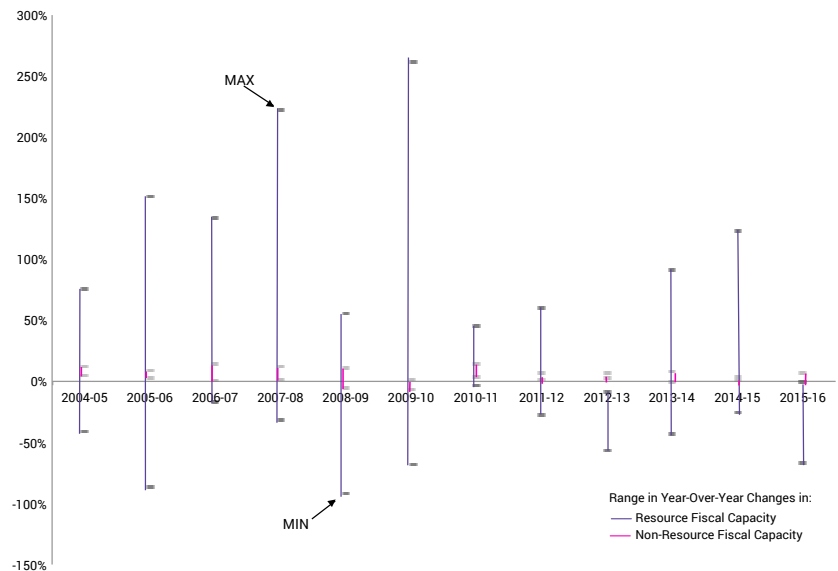— Per Capita Resource Fiscal Capacity
— Per Capita Non-Resource Fiscal Capacity

FIGURE 23
Range of Year-Over-Year Changes in Resource and Non-Resource Fiscal Capacity, 2004-05 to 2015-16

Range in Year-Over-Year Changes in:
— Resource Fiscal Capacity
— Non-Resource Fiscal Capacity

Source: Mowat calculation based on Finance Canada data

new data.[22] Currently, both resource and non-resource revenues are subject to the same three-year smoothing mechanism. Further smoothing of resource revenues, however, would mitigate the impact of their greater volatility and would allow weighting of data at a substantially lower ratio.

The 50 per cent weight currently allotted to the first year of input data allows temporary fluctuations in resource revenues, either positive or negative, to create volatile and unpredictable increases or decreases in Equalization payments. Equal weighting over three years, rather than the front-end loaded weighting in the current system would reduce volatility. However, an extended smoothing mechanism, for example one that spanned over five years, would allow for a 20 per cent weighting across all five years and would enable for reductions in volatility not possible with a three-year mechanism. In an open-ended system, the reduction in volatility would be particularly appealing for the federal government in the event of a sudden commodity price spike. Conversely, in the event of a sudden and precipitous drop in commodity prices, receiving provinces would be afforded more protection from sharp year-over-year declines in payments. In both instances, the reduction in volatility would provide more predictability for fiscal planning purposes.

RECOMMENDATION #4

Subject resource revenues to a five-year smoothing mechanism, equally weighted across all five years.

Resource-rich provinces themselves recognize the volatility in their own resource revenues and tend to adjust their behaviour accordingly. In this way, resource-rich governments can be compared to individuals. According to economic theory, while individuals' incomes fluctuate, their consumption patterns are generally much smoother.[23] Individuals tend to choose their consumption levels based on their expectation of lifetime income. Permanent changes in income, such as long-term illness or occupational shifts, have a strong impact on consumption. However, transitional factors, such as a strike or small bonus, would have a small impact on consumption as gains or losses are mitigated by saving or borrowing – thus smoothing consumption patterns.

Similarly, resource-rich provinces do not immediately convert all of their volatile resource revenues into permanent program spending obligations. The first thing they do is wait. While increased revenues from taxes – which are more stable and permanent in nature – lead to more immediate increases in program spending, decisions to spend revenue from natural resources are more lagged. According to statistical analysis, changes in taxation revenue in the resource-rich provinces have a statistically significant impact on program spending after a one-year lag, while for natural resource revenues, the impact appears after a two-year lag (see Appendix for detailed analysis).

Resource revenues do create fiscal capacity for the provinces that own them, however they do not necessarily lead to increased levels of service, at least not right away. Resource-rich provinces tend to wait longer to see if the changes in resource revenues they are experiencing are of a transitory or permanent nature before converting

22 Canada. 2006. "Achieving a National Purpose: Putting Equalization Back on Track, Report by the Expert Panel on Equalization and Territorial Formula Financing." *Department of Finance Canada*.

23 Jappelli, Tullio and Luigi Pistaferri. 2010. "The Consumption Response to Income Changes." *National Bureau of Economic Research*.

them to program spending. Equalization is not meant to equalize fiscal disparities in revenue-raising capacity for their own sake. It equalizes revenue disparities because those disparities lead to divergences in service levels between provinces. Since resource-rich provinces are generally lagging their decisions to spend resource revenues, the interprovincial divergences in services levels they give rise to are lagged as well. This tendency should be mirrored in the Equalization program.

RECOMMENDATION #5

Lag resource revenues one year further than non-resource revenues.

The nexus between resource revenues and variances in program spending they give rise to also informs the debate surrounding the inclusion rate for resources. While there is no consensus regarding the appropriate level of resource inclusion (see Section 6), many have argued that only the resource revenues that are part of current government budgets should be subject to equalization.[24]

Equalization corrects for variances in provincial fiscal capacity because those variances lead to differences in the levels of service provinces can provide. At the risk of being repetitive, the explicit purpose of the program is to ensure that provincial governments have sufficient revenues to provide "reasonably comparable levels of public services at reasonably comparable levels

24 For example, Canada. 1981. "Fiscal Federalism in Canada: The Report of the Parliamentary Task Force on Federal-Provincial Fiscal Arrangements." *Supply and Services Canada; Economic Council of Canada.* 1982. "Financing Confederation: Today and Tomorrow." Supply and Services Canada; Hobson, Paul A.R. 2002. "Equalization and The Treatment of Non-Renewable Resources." Prepared for the conference on "Equalization: Welfare Trap or Helping Hand?" Sponsored by the Atlantic Institute for Market Studies, the Montreal Economic Institute and the Frontier Centre for Public Policy, Montreal, October 25, 2001.

of taxation." That being the case, the degree to which resource revenues – or any revenues for that matter – give rise to differences in program spending should be the over-riding factor in determining the degree to which resource revenues should be included in the Equalization formula. To determine the appropriate inclusion rate for resources, the strength of the relationship between resource revenues and the program spending resulting from them must be tested statistically.

A useful metric to test this relationship is the marginal propensity to consume. For the purposes of this analysis, it will be used to correlate the magnitude of the impact of resource revenues on program spending in resource-rich provinces. Using this metric indicates that about 70 cents of permanent increases in program spending can be explained by a $1 increase in resource revenues (see Appendix for detailed analysis). The marginal propensity to consume explainable by increases in taxation revenue, meanwhile, is almost dollar for dollar.

As outlined in Section 6, the current 50 per cent resource inclusion was justified as "striking a balance" between the extremes of full inclusion and exclusion. The more appropriate problem the federal government should seek to solve with the inclusion rate, however, is to include the amount of natural resource revenues that gives rise to interprovincial disparities in spending. The 70 cent relationship between resource revenues and program spending in resource-rich provinces suggests that a 70 per cent resource inclusion is more defensible.

RECOMMENDATION #6

Include 70 per cent of natural resource revenues in the calculation of fiscal capacity.

If only 70 per cent of resource revenues goes towards program spending, what happens to the other 30 per cent? One available option is to use the remaining revenues to reduce taxes. In that instance, the resulting changes – as far as Equalization is concerned – are reflected in the measurement of the fiscal capacity of the province reducing its taxes.

Another option is to use the resource revenues to reduce debt. Alberta, for example, was able to eliminate its debt at the beginning of the 2000s. At the time its 2015-16 books closed, the province's total financial assets still exceeded its total liabilities.[25] Related to the option of debt reduction is to use the remaining portion of resource revenues to create a financial asset, or put more simply, save the money and spend it later.

Alberta's Heritage Fund a well-known Canadian example of a resource-rich province deferring resource revenues to fund future consumption. The value of the fund stood at $17.7 billion as of the end of 2015-16. While some of the investment income the fund generates is retained for "inflation-proofing" purposes, the fund also returns income to the province's General Revenue Fund which is used for program spending. In the 2015-16 fiscal year, the Heritage Fund returned over $1 billion to fund program spending.[26] Since its inception, the Heritage Fund has cumulatively transferred almost $40 billion to Alberta's general revenues.[27] Currently, neither the investment income generated by these funds, nor draw-downs of the principal, is subject to Equalization.

Discussions about redistribution of resource wealth in Canada can be contentious at the best of times and more fraught when the resource-rich provinces are dealing with severe economic challenges. It may perhaps be better to illustrate the point about the equalization of revenue from reserve funds with a thought experiment: what if Norway were to join the Canadian federation?

Norway has significant offshore oil deposits. Over the years it has sequestered the vast majority of the revenue generated by its offshore oil into a sovereign wealth fund called the Government Pension Fund. The value of that fund as of January 1, 2017 was nearly $1.2 trillion in Canadian dollars.[28] According to the rules governing the fund, 4 per cent of the total – the expected real return of the fund – can be spent in a given year. For Norway's over 5 million people, that represents almost $9,000 per capita. That amount alone is greater than the entire post-Equalization fiscal capacity of every province except Alberta, Saskatchewan and Newfoundland & Labrador in 2017-18. It is doubtful that this level of disparity would be tolerated for long in the Canadian context without being equalized.

In the short term, there is probably no danger of provincial reserve funds creating the level of disparity that a hypothetical federation with Norway would. But over time, growth in these funds could create a growing source of unequalized fiscal capacity that in turn would lead to potentially unsustainable differences in levels of services between provinces.

RECOMMENDATION #7

Include investment income and draw-downs from reserve funds in the measurement of provincial fiscal capacity.

25 Given its recent economic and fiscal predicament, however, the province is forecast to slip back into net debt starting in 2016-17.
26 Alberta. 2016. "Alberta Heritage Savings Trust Fund: Annual Report 2015–2016." *Alberta Treasury Board and Finance*.
27 Alberta. 2016. "Alberta Heritage Savings Trust Fund: Annual Report 2015–2016." *Alberta Treasury Board and Finance*.

28 Value of the fund taken from https://www.nbim.no/en/the-fund/market-value/forecast-for-the-size-of-thefund-/. Exchange rate assumed to be 6.34NOK:$CDN as of February 16, 2016.

FIGURE 24
Summary of Resource Revenue Recommendations

		2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	2012-13	2011-12
Current										
	Entitlement Year									
	Resource Fiscal Capacity @ 50%			50%	25%	25%				
		two-year lag		three-year weighted average						
Proposed										
	Resource Fiscal Capacity @ 70%					20%	20%	20%	20%	20%
		four-year lag				five-year weighted average				

Taken together, the recommendations concerning resource revenues outlined in this section would result in the framework depicted in Figure 24. It is also recommended that lag for resource revenues be extended from two to four years. The lag for resource revenues would be one year longer than the proposed three-year lag for non-resource revenues that will be discussed in the following section.

In total, these recommendations would significantly enhance the predictability of Equalization payments for provinces. They would also address the problematic issue of unequalized fiscal capacity that could erode comparability of services across provinces.

Unreliable Data

As discussed in Section 7, the unreliability of some data inputs used in the Equalization formula contributes to the volatility and unpredictability of payments. Under the fixed-envelope system, the problem of volatility and unpredictability of payments was borne almost exclusively by the provinces. However, if following the 2018-19 renewal of the program, Equalization returns to a formula-driven determination of the envelope (per Recommendation #2), this unpredictability could be visited upon the federal government as well. The federal government will have a much greater incentive to introduce measures that would increase the predictability of payments for both itself and the provinces.

In addition to the issue of predictability, the quality and reliability of data used for calculating fiscal capacity gives rise to questions about how accurately the Equalization program measures what it is attempting to equalize. The data used to measure provincial fiscal capacity is subject to continuous revisions, and is not finalized until the last year it enters into the three-year rolling average. As a result, the lowest quality data is given the highest weight in the formula. This can lead to significant mis-measurement of the actual fiscal disparities between provinces. Given the amount of money involved in Equalization, it is important to equalize the differences between provinces as accurately as possible. Failing to do so can lead to either over- or under-equalization.

The scope of this potential for mis-measurement can be demonstrated by re-estimating Equalization entitlements with highest quality data. This can be done by substituting the final calculations of fiscal capacity for the t-minus 2 and 3 years for the first and second estimates that were used at the time the Equalization calculations were made (see Figure 25).

FIGURE 25

A Demonstration of the Exercise of Recalculating Fiscal Capacity with Final Data for Enhanced Accuracy

|	t	t-minus 1	t-minus 2	t-minus 3	t-minus 4
Entitlement Year Current Fiscal Capacity Data Used at Time of Release of Entitlements Estimates			50% First	25% Second	25% Final
Enhanced Accuracy Example Final Fiscal Capacity Data Estimates			50% Final	25% Final	25% Final

This exercise was conducted for Equalization entitlements between 2009-10 and 2015-16 (the last year for which this is possible with the available data). The initial findings reveal little difference between the entitlements produced by final data and the data used at the time of the release of entitlements. This is because the combination of the Fiscal Capacity Cap and GDP ceiling mute the impact of data revisions. However, re-running the same exercise as though a ten-province standard had been in place in that period tells a dramatically different story, and reveals the potential cost of mis-measuring fiscal capacity under a formula-driven program.

Recalculating Equalization under a hypothetical ten-province standard using final data, as opposed to data that would have been used at the time of the release of entitlements, indicates that the mis-measurement of the actual fiscal disparities between provinces can be costly. The use of preliminary data, as the formula currently does, leads to both over- and under-equalization of the actual fiscal disparities between provinces as measured by final data (see Figure 26). Over the seven years in question, the Equalization program would have paid out a total $2 billion less than what would have been required using final data. However, this mis-measurement could cut either way. Under-equalization – that is, providing less than required to equalize provinces to the national average – could contribute to an erosion of comparability of services across provinces. Conversely, over-equalization – transferring more money than required to equalize actual differences between provinces – is difficult to justify in a tight federal fiscal situation.

FIGURE 26

Difference in Equalization Entitlements Under a Ten-Province Standard Using Final Data Versus Preliminary Data ($ thousands)
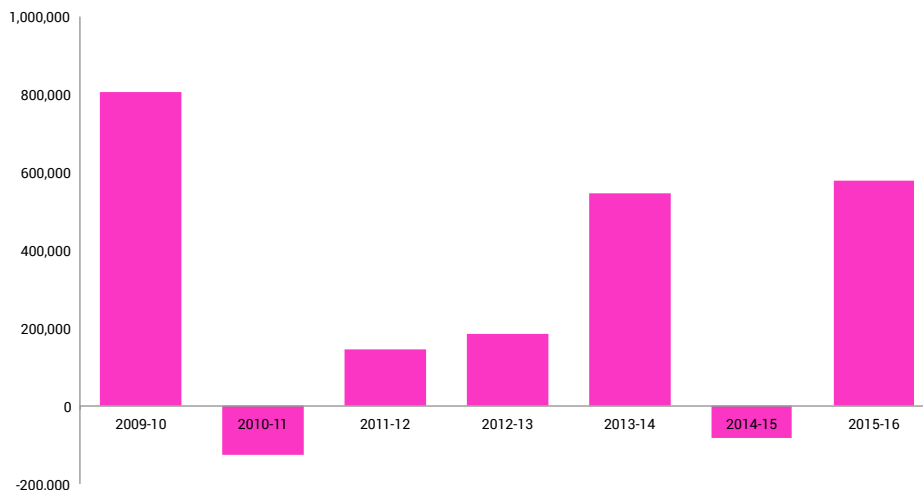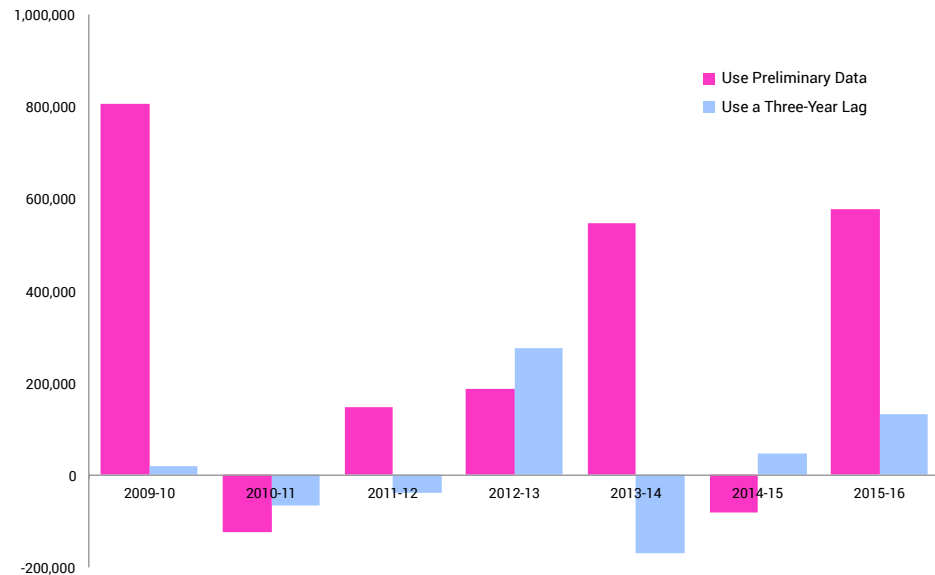
Unfortunately, it is not possible to use the most accurate, revised, final data at the time Equalization entitlements are calculated because they simply do not exist at that point. The best solution available to increase the accuracy of the fiscal capacity calculations are longer data lags.

Extending the length of the data lags to match the proposed four-year lag of resource revenues – as per

FIGURE 27

Comparing Differences in Equalization Entitlements Under a Ten-Province Standard Using Final Data Versus Preliminary Data and Final Data Versus a Three-Year Lag ($ thousands)

Recommendation #5 – to all revenues would provide the most accurate measure of fiscal capacity possible. It would also completely eliminate the problem of over- and under-equalization of the actual fiscal disparities between provinces as measured by final data. It would however, come at the expense of responsiveness. Extending the data lag for non-resource revenue by one more year – from two to three years – would significantly mitigate the accuracy trade-off while retaining an element of responsiveness.

Running the same recalculation exercise as above, but instead using a three-year lag in place of preliminary data, significantly increases the accuracy of the calculation of fiscal capacity. As seen in Section 7 (see Figure 18), the quality of data for non-resource revenues improves by the second estimate, with only slight variances from the final data. The result is that the difference in Equalization payments as calculated by a three-year lag and using final data are minimal.

Compared to the current use of preliminary data – which as seen above would have led to a total of $2 billion less in Equalization being paid out under a ten-province standard between 2009-10 and 2015-16 – the variance from actual using a three-year lag is reduced to $200 million over the same period (see Figure 27).

The tenfold reduction in the variance indicates that, under a formula-driven approach to calculating the size of the Equalization pot, the use of a three-year lag would significantly enhance the accuracy of the equalization of differences in provincial fiscal capacity. A three-year lag would also enhance the predictability of payments for both the federal government and the provinces, with only a small trade-off in responsiveness.

RECOMMENDATION #8

Subject non-resource revenues to a three-year lag.

FIGURE 28
Summary of Framework Proposed in Recommendations 4 through 8

			2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	2012-13	
Current	Data Inputs	Entitlement Year									
		Non-Resource Fiscal Capacity	→		50%	25%	25%				
		Resource Fiscal Capacity @ 50%	→		50%	25%	25%				
			two-year lag		three-year weighted average						

			2019-20	2018-19	2017-18	2016-17	2015-16	2014-15	2013-14	2012-13	2011-12
Proposed	Data Inputs	Entitlement Year									
		Non-Resource Fiscal Capacity	→	three-year lag		50%	25%	25%			
						three-year weighted average					
		Resource Fiscal Capacity @ 70%	→				20%	20%	20%	20%	20%
			four-year lag				five-year weighted average				

Taken together, the framework proposed in Recommendations 4 through 8 is outlined in Figure 28. These changes would significantly improve the predictability and accuracy of Equalization for both provinces and the federal government.

The enhancements in predictability and accuracy proposed above will take on added importance in the likely scenario where: Equalization returns to a formula-driven determination of the total size of the program; and Ontario hovers near the national average in terms of per capita fiscal capacity. As outlined in Section 7, it is not uncommon for the preliminary non-resource data used to calculate Equalization to vary by 3 or 4 per cent from the final calculation. Should Ontario remain within one or two percentage points of the national average, it is not difficult to foresee an instance where using preliminary data Ontario might initially qualify for Equalization, but upon revisiting the final data, it is determined that it should not have qualified. Conversely, the opposite – where Ontario should have received a payment but did not – is equally likely. The implication for Ontario is fairly straightforward – it could potentially lose out on Equalization payments it was entitled to because of the unreliability of preliminary data.

In the case of the federal government, a continued reliance on preliminary data of poor quality could lead to both cost-uncertainty and unnecessary expense. The example of Ontario mistakenly receiving Equalization because of inaccurate preliminary data from above summarizes the risks for the federal government neatly as well. As outlined in Section 4 above, Ontario is expensive to equalize. In a tight federal fiscal situation, there will likely be limited tolerance for inaccurate data leading to hundreds of millions of dollars (or more) in arguably unnecessary expenditure.

If such a situation were to arise, the initial temptation on the part of the federal government might be to either somehow claw-back or recover the funds from Ontario, or to reinstitute a multi-estimate payment system similar to that which was in place prior to the adoption of the one-estimate, one-payment system. The former measure would almost certainly lead to intergovernmental strife. The latter would reintroduce significant unpredictability to Equalization payments thereby adding more uncertainty to provincial budget-making. Both of these undesirable consequences are avoidable and unnecessary. Instituting the framework of lags and smoothing proposed in Recommendations 4 through 8 would militate against Ontario mistakenly receiving or non-receiving Equalization due to inaccurate data. Consequently, it would allow the federal government to retain the one-estimate, one-payment framework and the benefits with respect to certainty for provinces that accompany it.

RECOMMENDATION #9
Retain the one-estimate, one-payment system to avoid unpredictability that a recoveries system would entail for provinces.

Finally, the added predictability longer lags entail would allow the federal government to better foresee potentially unsustainable cost increases. While it is recommended that the size of the program be determined by the same formula that determines its allocation (see Recommendation #2) the federal government may deem it necessary at some point in the future to once again constrain the cost of the program. While this is not a particularly desirable outcome, as it could contribute to a widening in the divergence in service levels between provinces, increased predictability could be extended to the manner in which caps are imposed. Extending the program's data lags would afford the federal government the opportunity to give provinces a one-year notice of its intent to apply constraints. Disclosure of the nature and scope of proposed constraints would allow receiving provinces to adjust their own multi-year budget plans accordingly.

RECOMMENDATION #10

Should the federal government deem it necessary to constrain the Equalization program in the future, leverage the increased predictability afforded by longer data lags into a one-year notice provision before imposing constraints.

Responsiveness

Moving from the current two-year lag system to three- and four-year lags for non-resource and resource revenue respectively may give rise to concerns over a deterioration in the responsiveness of Equalization to economic conditions. While responsiveness cannot be completely dismissed, it is once again worth pointing out that the purpose of Equalization is to ensure comparable levels of service at comparable levels of taxation. Program spending tends to be far less variable than fiscal capacity, which suggests that there is scope for foregoing some responsiveness in Equalization (see Figure 29).

To better solve the problem of responsiveness to economic conditions, other policy tools should be examined. It is important to distinguish between the short-term stabilization and the long-term redistribution function of federal fiscal systems.[29] A sudden and non-structural drop in provincial revenue, for example, does not necessarily mean that a province needs Equalization. Equalization need not have a role in stabilizing provincial revenues. That is not what the program is for.

To find the appropriate policy tool to address the temporary fallout in provincial revenues that tends to accompany idiosyncratic economic shocks, one need look no further than the Federal-Provincial Fiscal Arrangements Act (FPFAA), the legislation that governs the Equalization program. Part II of the FPFAA enables the federal government to make Fiscal Stabilization payments to any province faced with a year-over-year decline greater than 5 per cent in its non-resource revenues or greater than 50 per cent in its resource revenues.

29 Von Hagen, Jurgen. 1992. "Fiscal Arrangements in a Monetary Union - Some Evidence from the US." In *Fiscal Policy, Taxes, and the Financial System in an Increasingly Integrated Europe*, edited by Don Fair and Christian de Boissieux. Dordecht: Kluwer Academic Publishers, pp. 337–359.

FIGURE 29
Average Year-Over-Year Changes in Resource Fiscal Capacity, Non-Resource Fiscal Capacity and Program Spending, 2004-05 to 2015-16

Year-Over-Year Changes in Weighted Average of:
Per Capita Resource Fiscal Capacity
Per Capita Non-Resource Fiscal Capacity
Per Capita Program Spending
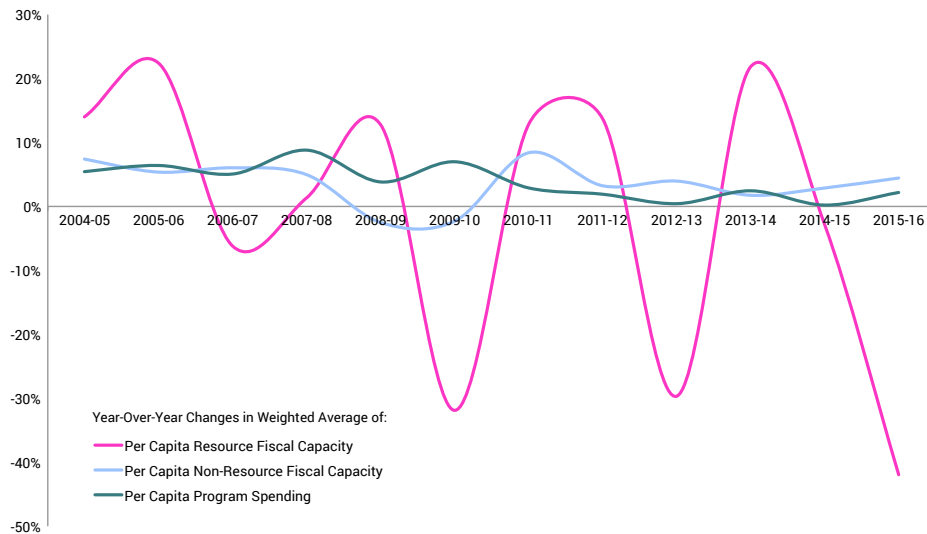
However, fiscal stabilization in Canada does not work particularly well. In fact, "there has been a virtual abandonment of meaningful fiscal stabilization arrangements within the current fiscal arrangements agreements."[30] There is a strong economic case, however, that as a federation, Canada should do much better at interregional fiscal stabilization.

In a federal system, fiscal stabilization to correct for idiosyncratic economic shocks is most effectively carried out using federal fiscal policy that involves a degree of redistribution across provinces.[31] While in a heavily decentralized system such as Canada, provinces can and do take countercyclical economic measures, they are riskier.[32] Distributing the risk of cushioning against economic shocks across a federation

is more effective. Evidence also suggests that lump-sum grants to sub-national governments are more effective countercyclical tools than transfers to individuals in provinces experiencing economic downturns, indicating the presence of a "flypaper effect," that is, "the money sticks where it hits."[33] An important consideration to ensuring stabilization grants will effectively perform as countercyclical economic levers, however, is to ensure that "the government can commit to an apolitical allocation process that is explicitly designed to smooth the revenues of constituent units."[34] To be effective, therefore, fiscal stabilization payments need clear, transparent and predictable rules.

The Fiscal Stabilization program included in the FPFAA has these characteristics on paper, but it is far from a reliable countercyclical tool. The simple evidence of this is that between 1994 and when Alberta qualified in 2016, no province received payments under this program, an era that notably included a very deep recession in 2008. Much of the ineffectiveness of the Fiscal Stabilization program has to do with its arcane measurement of provincial revenues. This includes attempts to net out tax cuts, and the use of reassessment data to calculate personal and

30 Selinger, Greg and Ronald H. Neumann. 2005. "Strengthening Intergovernmental Fiscal Arrangements in Canada." In Lazar, Harvey. *Canadian Fiscal Arrangements: What Works, What Might Work Better*. Institute of Intergovernmental Relations, pp. 209-225.
31 Bayoumi, Tamim and Paul R. Masson. 1998. "Liability-Creating Versus Non- Liability-Creating Fiscal Stabilisation Policies: Ricardian Equivalence, Fiscal Stabilisation and EMU." *The Economic Journal*, 108 (July) pp. 1026-1045. Royal Economic Society.
32 Hanniman, Kyle. 2015. "Calm Counsel: Fiscal Federalism and Provincial Credit Risk." *Mowat Centre*.

33 Dahlby, Bev and Ergete Ferede. 2015. "The Stimulative Effects of Intergovernmental Grants and the Marginal Cost of Public Funds." *International Tax and Public Finance*, 23 (1), pp 114-139.
34 Rodden, Jonathan and Erik Wibbels. 2009. "Fiscal Decentralization And The Business Cycle: An Empirical Study Of Seven Federations." *Economics and Politics*, Volume 22, No. 1, pp 37-67.

corporate income tax. A simpler and more refined measure of a province's ability to raise revenue is per capita fiscal capacity. Extending the use of fiscal capacity to calculate eligibility for Fiscal Stabilization payments would better measure the degree to which a province's ability to generate revenues has declined.

> ### RECOMMENDATION #11
>
> **Use year-over-year changes in per capita fiscal capacity to determine eligibility for Fiscal Stabilization payments.**

In order to be responsive to sudden and precipitous drops in provincial revenue, the measure of fiscal capacity for the purposes of Fiscal Stabilization would have to be based on very preliminary data. The tradeoff in accuracy that this would entail could lead to a situation where subsequent revisions to the data would reveal a payment, in part or in whole, was not in fact warranted. The purpose of Fiscal Stabilization payments ought to be to help provinces weather unpredictable short-term economic events, so in the instance of overpayments, clawing them back over time if necessary would be entirely reasonable and warranted.

> ### RECOMMENDATION #12
>
> **Claw back Fiscal Stabilization overpayments over time.**

The final question with respect to the Fiscal Stabilization program has to do with adequacy. In a decentralized federation such as Canada, where provinces have access to a broad array of revenue tools including largely unfettered access to credit markets, it would not be reasonable to
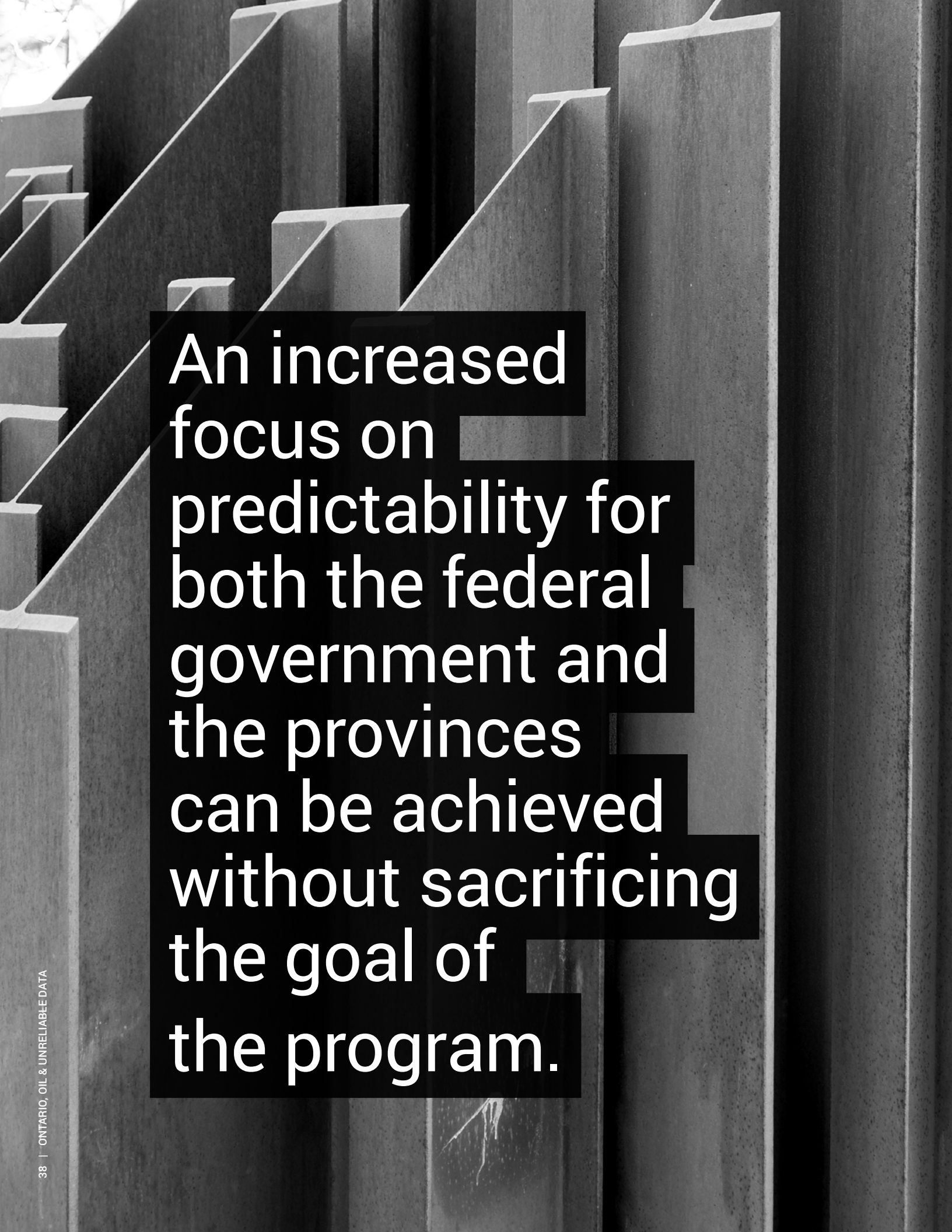
expect the federal government to completely backstop provincial revenues. In fact, the moral hazard that this would likely create would be counter-productive. It should be noted, however, that Fiscal Stabilization payments to provinces are capped at $60 per capita, an amount that has not been changed since 1987-88. If that cap had been allowed to grow with inflation, it would be worth almost double that today.[35]

> ### RECOMMENDATION #13
>
> **Rebase the cap on Fiscal Stabilization payments to account for inflation since it was instituted, and permanently index it to inflation thereafter.**

Addressing the shortcomings of the Fiscal Stabilization program would give Canada a tool to mitigate the provincial revenue impacts that idiosyncratic economic shocks create – a tool it is effectively lacking. Fiscal Stabilization is a more appropriate means to achieve this end than Equalization is. The primary function of Equalization is to give effect to the long-term redistribution necessary to ensure reasonably comparable levels of service at reasonably comparable levels of taxation across provinces.

35 Calculated using Statistics Canada annual Consumer Price Index data, Table 326-0021

An increased focus on predictability for both the federal government and the provinces can be achieved without sacrificing the goal of the program.

8 CONCLUSION

Looking ahead to the next decade, the issues of Ontario, oil and unreliable data are likely to be as problematic for the Equalization program as they were in the decade that preceded it. Attempting to address them by allowing the current design of the program to persist, however, will not work. The federal government will be confronted by a fresh set of trade-offs and choices in the face of these problems.

The cost-certainty for the federal government that came with a fixed envelope could instead lead to over-equalization. Conversely, under-equalization with respect to natural resources could erode comparability of services across provinces. An undue emphasis on responsiveness could bring increased volatility and unpredictability for provinces and the federal government alike, and comes at the cost of accuracy.

Accurate measurement of the differences in fiscal capacity that the Equalization program is meant to narrow, however, will take on additional importance in the context of a tight federal fiscal situation. An increased focus on predictability for both the federal government and the provinces would help both with cost-certainty for budgeting purposes, and can be achieved without sacrificing the goal of the program. Overall, the primary focus of the program should be on the explicit goal of the program, namely to ensure reasonably comparable levels of service are available at reasonably comparable levels of taxation to all Canadians, regardless of one's province of residence.

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APPENDIX

In economic theory, the permanent income hypothesis posits that while individuals' incomes fluctuate, their consumption patterns are smooth. In this theory, individuals choose their consumption levels based on their expectation of lifetime income. Permanent changes in income, such as long-term illness or occupational shifts, would have a strong impact on consumption. However, transitional factors, such as a strike or small bonus, would have a small impact on consumption as gains or losses are mitigated by saving or borrowing – thus smoothing consumption patterns. Studies have demonstrated that the impact of transitional factors depends heavily on the availability of credit. When credit markets are not available to individuals, the impact of transitional factors is stronger.

Applying the permanent income hypothesis to governments, volatile revenue sources would be expected to impact public spending less than revenue from taxes, which is more stable and permanent in nature. In addition, the impact of changes in resource revenues would likely be lagged over time as governments wait and see whether these changes are transitory or permanent in nature.

This analysis will use empirical methods to estimate the elasticity between natural resource revenues and program spending, and to determine the lag structure of this impact. The results will be compared with the results from a similar analysis on taxation revenue.

Methodology

To analyze the relationship between natural resource revenues and program spending, a panel-data regression was conducted on government finance data from public accounts beginning 1980-81[36], compiled by Kneebone and Wilkens from the School of Public Policy in the University of Calgary.[37] The analysis focuses on resource-rich provinces (Newfoundland & Labrador, Alberta, Saskatchewan and British Columbia) since this dataset does not separate natural resource revenues from other types of revenue for the remaining provinces.[38]

The regression uses per capita program spending as the dependent variable and per capita federal transfers as the independent variable[39]. Control variables include taxation and federal revenues per capita to proxy for permanent income[40]. All variables include the current year and four lags.[41][42]

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36 Statistics Canada published government finance statistics, the Financial Management System, for all provinces on a comparable basis from 1989 to 2009. However, resource royalties are not reported separately from "Investment Income", which limits its usefulness in this analysis. In addition, this data was discontinued and its replacement, Government Finance Statistics, is not comparable.

37 Kneebone, Ronald and Margarita Wilkins. 2016. "Canadian Provincial Government Budget Data, 1980/81 to 2013/14." *Canadian Public Policy*, Volume 42, Issue 1, March 2016.

38 Accounting standards often differ across provinces and, sometimes, accounting standards may change over time, which limits the comparability of this dataset. The authors who compiled this data make no attempt to adjust the data to improve comparability. However, this limitation in comparability is mitigated by examining the first difference in the data, rather than the levels.

39 The regression uses the year-over-year change in the log of the variables (termed log-difference) to avoid statistical issues with time series analysis and to mitigate the issue with comparability of public accounts data. In a regression, the coefficients of log differences indicate the percentage impact dependent variable (per capita program spending) from a one percentage point change in an independent variable (i.e. per capita natural resource revenues).

40 An interest on debt payments-to-revenue variable was initially included to capture liquidity constraints. However, it was subsequently dropped because it was statistically insignificant.

41 This approach was employed to determine the impact and lag structure of property housing prices on property tax revenues. See Lutz, Byron F. 2008. "The Connection Between House Price Appreciation and Property Tax Revenues." *National Tax Journal,* 2008, vol. 61, issue 3, pages 555-72.

42 A limitation of this regression specification is that it includes some lags which are statistically insignificant. Given the limited number of observations, having too many unnecessary variables could reduce the degrees of freedom and the reliability of the results. To test the robustness of the analysis, seven other regression specifications were also constructed, each with their own set of different lagged variables, and evaluated using the Akaike Information Criterion (AIC) to determine the optimal lag structure and minimize the number of variables. All regressions displayed similar characteristics and confirmed that the results are robust. See Parker, Jeffrey. "Distributed-Lag Models." (Instructor Draft Manuscript). Reed College.; Snipes, Michael and D. Christopher Taylor. 2014. "Model selection and Akaike Information Criteria: An Example from Wine Ratings and Prices." *Wine Economics and Policy*, Volume 3, Issue 1, June 2014, pp. 3-9.

Regression Specification

$$dlog(Program\ Spending_t)$$
$$= \alpha + dlog(Natural\ Resource_t) + \ldots + dlog(Natural\ Resource_{t-4}) + dlog(Taxation_t)$$
$$+ \ldots + dlog(Taxation_{t-4}) + dlog(Federal\ Transfers_t) + \ldots$$
$$+ dlog(Federal\ Transfers_{t-4}) + \varepsilon_t$$

Analysis

Changes in natural resource revenues have a statistically significant impact on program spending after a two-year lag. In comparison, taxation revenue has a statistically significant impact after a one-year lag.

Over a five-year period, the cumulative elasticity for natural resource revenue is 0.11, meaning that a 1 per cent increase in natural resource revenue would increase per capita program spending by 0.11 per cent over three years. In comparison, a 1 per cent change in per capita taxation revenue would increase per capita program spending by a cumulative 0.40 per cent.

A useful metric to compare the magnitude of the impact is the marginal propensity to consume (MPC)[43], which indicates the dollar increase in program spending resulting from a dollar increase in revenue. The 0.11 per cent elasticity on natural resource revenues implies that a 1 per cent increase ($160 million in 2014-15) in the aggregate natural resource revenues of Newfoundland, Saskatchewan, Alberta and British Columbia, , would result in $111 million in higher program expense. This results in an MPC of 0.69. In contrast, a 1 per cent increase in taxation revenue, or $405 million, would increase program spending by $390 million. This results in an MPC of 0.96.

FIGURE 30

Marginal Percentage Increase in Program Spending from Per Cent Increase in Revenue

	Natural Resources	Taxation
No Lag	0.01	-0.00
One-Year Lag	0.03	0.15
Two-Year Lag	0.04	0.05
Three-Year Lag	0.02	0.12
Four-Year Lag	0.01	0.08
Total	0.11	0.40

43 Elasticity is a close but not exactly related concept to marginal propensity to consume (MPC). Elasticities refer to the relationship between the percentage change in one variable compared to another. This percentage change must be applied to actual dollar values to arrive at MPC, which is the dollar increase to one variable of a dollar increase in another variable.

FIGURE 31
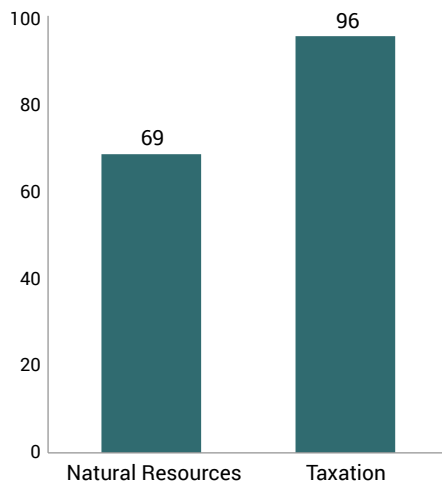### Increase in Program Expense From $1 Increase in Revenue: Marginal Propensity to Consume (cents)

FIGURE 32
Regression Results

Variable	Coefficient	t-Statistic	Prob.
Dependent Variable: DLOG(Per Capita Program Spending)			
DLOG(Per Capita Natural Resource Revenue)	0.009	0.606	0.546
DLOG(Per Capita Natural Resource Revenue (t-1))	0.028	1.820	0.072
DLOG(Per Capita Natural Resource Revenue (t-2))	0.044	*2.994	0.003
DLOG(Per Capita Natural Resource Revenue (t-3))	0.021	1.390	0.167
DLOG(Per Capita Natural Resource Revenue (t-4))	0.013	0.825	0.411
DLOG(Per Capita Taxation Revenue)	0.000	-0.005	0.996
DLOG(Per Capita Taxation Revenue(t-1))	0.151	*2.520	0.013
DLOG(Per Capita Taxation Revenue (t-2))	0.055	0.898	0.371
DLOG(Per Capita Taxation Revenue (t-3))	0.118	1.926	0.057
DLOG(Per Capita Taxation Revenue (t-4))	0.079	1.346	0.181
DLOG(Per Capita Federal Transfers)	0.135	*4.647	0.000
DLOG(Per Capita Federal Transfers (t-1))	0.063	*2.160	0.033
DLOG(Per Capita Federal Transfers (t-2))	0.039	1.363	0.176
DLOG(Per Capita Federal Transfers (t-3))	-0.015	-0.495	0.622
DLOG(Per Capita Federal Transfers (t-4))	0.023	0.793	0.430
Constant	0.007	0.676	0.501
Method:			Panel Least Squares
Panel Period			1985 2014
Periods included:			30
Cross-sections included:			4
Total panel (balanced) observations:			120
R-squared			0.32
Adjusted R-squared			0.23

Note: * indicates variables significant at the 95 per cent level.