Does Canadian fiscal federalism work for everyone?

January 2017

Canadian Centre for Economic Analysis

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GLOSSARY

Agent	Elements in an agent-based model that can make resource decisions
Agent-based modeling	Provides a framework for modeling a dynamic system, such as an economy, by means of individual agents (e.g., households, businesses, governments), their mutual interaction with each other and their environment
Decentralization	The devolvement of a portion of governing authority from the central government to subnational governments
Fiscal balance sustainability analysis	Examine, under assumption, what the 'structural' fiscal balances of various governments will be into the future to determine if they are sustainable
Fiscal federalism	The division of functions and financial relations among levels of government in a federal system
Fiscal flow analysis	Measures the redistribution of income among SNGs that results from federal revenue and expenditure policies. 'Fiscal flow' is the point-in-time difference between federal revenues derived in an SNG and federal expenditures that occur in that SNG
Horizontal fiscal imbalance	An imbalance between SNGs, insofar as they have different abilities to raise funds or to provide services
Needs Consumption Affordability Ratio **(NCAR)**	A CANCEA indicator that identifies a household's consumption of non-discretionary 'needs' as a proportion of its discretionary net inflows. An NCAR greater than 1 indicates that the household is spending beyond its means on needs.
Net debt	The value of all debt liabilities (paying principle or interest) – that is "gross debt" – less government financial assets which could, in principle, be used to pay back those liabilities (see slide 61)
Prosperity	Determined by the excess resources that remain after ensuring the system is sustainable
Prosperity at Risk **(PaR)**	CANCEA's cutting-edge and complex "big data" computer simulation platform that incorporates social, health, economic, financial, and infrastructure factors in an agent-based system
Sustainability	A system has access to sufficient resources needed to maintain the system's identify (i.e., it doesn't break down)
System	A set of elements (e.g., households) connected by a network of relationships
Systems approach	A line of thinking that employs the concepts of systems
Vertical fiscal gap/imbalance	A VFG represents an asymmetry between revenues relative to expenditure responsibilities. The use of imbalance is political, and ranges from the full VFG to a point at which one order of government can repay its debt while the other cannot

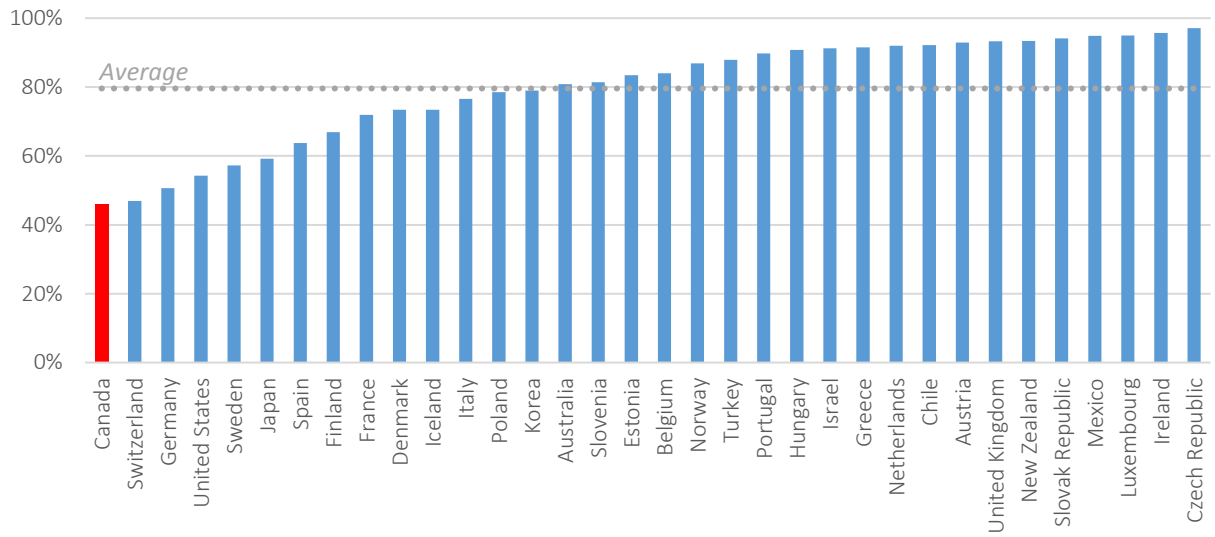
ACRONYMS

- CANCEA: Canadian Centre for Economic Analysis
- CG: Central government
- CIT: Corporate Income Tax(es)
- FBS: Fiscal balance sustainability
- GDP: Gross domestic Product
- HFI: Horizontal fiscal imbalance
- NCAR: *Needs Consumption Affordability Ratio*
- OECD: Organisation for Economic Co-operation and Development
- PaR: *Prosperity at Risk*
- PBO: Parliamentary Budget Officer
- PIT: Personal Income Tax(es)
- PT(s): Province and Territory -or- province and territory (singular and plural)
- SNG(s): Subnational government(s)
- VFG/VFI: Vertical fiscal gap/imbalance

EXECUTIVE SUMMARY

By many standards, Canada is now a highly decentralized federation, meaning the federal government has devolved much of its authority – and resultant revenue and expenditure responsibility – to the country's provinces/territories and municipalities.

Comparison of OECD countries: Federal/central share of tax revenues, excluding social security funds (2013)



Source: OECD, Revenue Statistics dataset; calculations by CANCEA

However, the federal government still collects a larger share of overall government revenue than its share of overall government expense. Significant literature has been generated (over decades) to investigate an at least perceived unfairness stemming from this result of Canada's fiscal federalism. Respectfully, the existing analytical methods suffer from a number of common issues:

- It is unclear in most analyses what the ultimate goal is, either due to weak problem statements, definitional issues, or too much subjectivity;
- All methods focus solely at the PT-level, ignoring the fact that it is residents who are the beneficiaries of government services (not PT governments), and ultimately bear the cost of government services; and
- Most methods are done at a point in time – generally ignoring how such measures change – and are not forward looking.

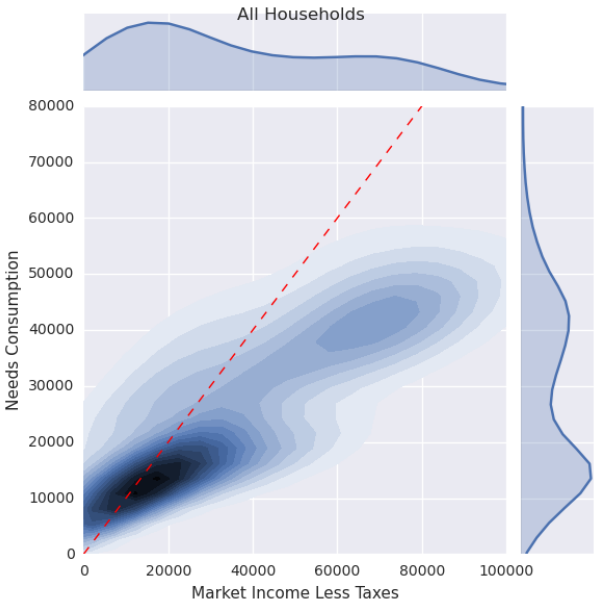
Utilizing CANCEA's powerful socio-economic modeling engine, *Prosperity at Risk* (PaR), and our *Needs Consumption Affordability Ratio* (NCAR) – which identifies a household's consumption of non-discretionary 'needs' as a proportion of its discretionary net inflows – we can start to investigate fiscal federalism in a new way.

Needs Consumption Affordability Ratio (NCAR)

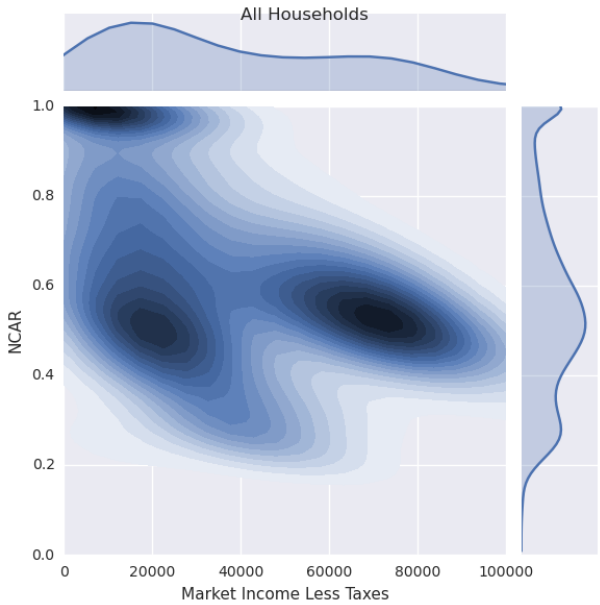
The higher NCAR gets, the more 'pressure' households feel in making ends meet in a given period, meaning trade-offs (e.g., labour for leisure, 'needs' for 'wants'). As a measure of needs, NCAR measures a household's ability to obtain both its 'basic needs' (i.e., their physical requirements for survival) plus their 'basic opportunity' (i.e., socially-defined minimums, such as education and health care in Canada). This means that 'needs' includes certain types of consumption (e.g., food), without any judgement regarding the choices made within those types (with some exceptions, such as excluding alcohol from beverages).

The following two charts showcase the distributions of Canadian households by after-tax market income and needs consumption (where darker areas represent more households[1]). The first presents how much is spent on needs in a given year versus after-tax market income. Households above/left of the red dashed line are by definition using transfers/borrowing/asset sales to consume their needs, giving them an NCAR of 1 in the period (the question of this being sustainable is a different question). As household income rises, so does spending on needs (though not equally), largely demonstrating an increase in 'basic opportunity' – that is, for example, that 'middle-income' households consume 'middle-income' housing[2]. The second figure presents NCAR versus income, and shows that many low-income families are under extreme pressure to make ends meet. It also shows that many low-income households have the same NCAR as many higher-income households, again demonstrating the impact of households consuming 'basic opportunity' needs.

Distribution of needs consumption vs. after-tax market income



Distribution of NCAR vs. after-tax market income

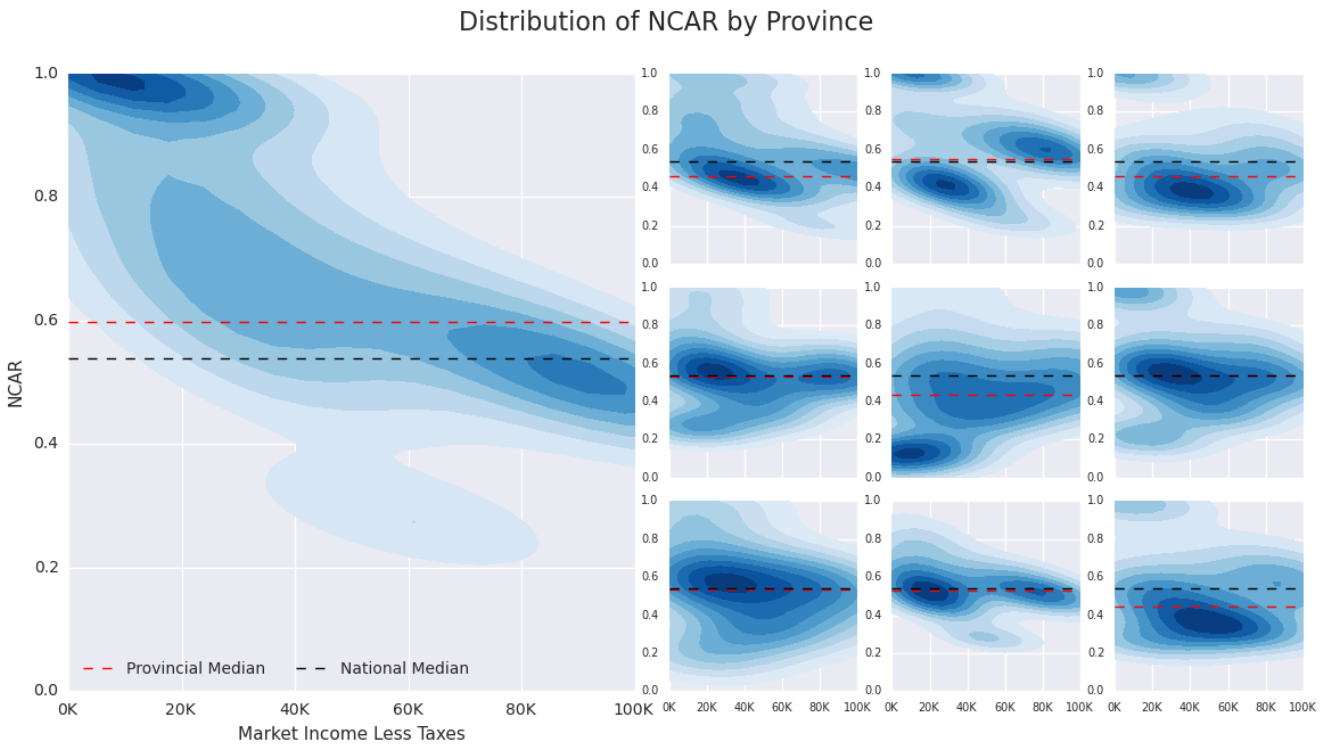


[1] All contours collectively capture at least 95% of households

[2] Note that in most cases, this is due to a distributed supply of big ticket 'needs', such as housing. While many household incomes may go down simultaneously due to a large economic change, there may not a matched stock of cheaper housing available to those households.

'Sustainability' is then about maintaining a household's 'Canadian' lifestyle, and thus carries a directional definition (e.g., "are things getting worse for me?"). If the distribution of NCARs across a PT sees too many households as unsustainable, then the PT as a whole can be said to be unsustainable. In such cases, the PT government would likely start to experience significant pressures on its income statement and balance sheet (and resultant indicators) as households start trading off between 'wants' and 'needs', or start depending on the PT government for the likes of financial assistance and health care.

Due to the fact that Canada is highly decentralized, NCAR and income distributions also vary widely by province of residence. We're purposefully not showing provincial names in the following figures (see appendix) to ask "does this seem 'Canadian'?" That is, does it look like fiscal federalism is working? Shouldn't a household's economic situation, and not their location, determine level of assistance?



We can then examine the impact that government action (or even structure, as is the case in this project) has on households' sustainability. The novelty of this approach is tracing the impacts of government processes as they affect the sustainability and prosperity of households. This ensures that the analysis is conceptually well-defined and objectively clear on the "so what?", done at the appropriate level – that is, tied to households as the base elements of a socio-economic system (as base elements, all the effects of government policy are reduced to the benefits and costs to households) – and dynamic in time, allowing for backward- and forward-looking sensitivity evaluation. As such, the analysis presented here should provide new insights in the discussion about fiscal federalism.

A New Approach

In order to examine fiscal federalism, we ensure that we are isolating the main drivers of it on households, within the allowable multi-order of government constraints of Canada's *Constitution Act*. Aspects of government within a single jurisdictional domain (e.g., healthcare, education, and property vs. criminal justice, defense, and foreign affairs; plus government administration) are not evaluated directly. (These are, however, part of the decision-system for government.) We therefore focus on taxation, transfers, and infrastructure as responsibility levers. Further, we are not examining the effectiveness of government taxation/expenditure policies here. This study is simply about the effects of one order of government taking up some policy 'space' (in taxation, transfers, or infrastructure) at the expense of the other.

For simplicity, the federal government is the main driver of policy changes in all modeled scenarios, with corresponding provincial actions. To ensure the clarity of the measured impact, any changes are fiscally neutral (i.e., no initial change in their surplus/deficit) for every government. Therefore, if provincial revenues change, then provincial expenditures need to change accordingly (which will be easier for some provinces than others). In the end, all results are simply about "who does what" in the federation.

Within this policy space, we run various scenarios to see the impacts of one order of government acting in the space relative to the other. These scenarios are not about changing general government policy (e.g., *overall* taxes increase to fund a new expense), only about the shares of these spaces taken up by each order of government. That is, it is to help set directional goals. There are four scenarios:

1. (De)centralization: Federal-provincial transfers range from down to zero up to double the current amount (roughly $75B) – in proportion to current transfers by province, and:

    a) Federal transfers to households offset correspondingly (with provinces changing their household transfers to remain fiscally neutral); or

    b) Feds offset via personal income taxes (provinces offset accordingly)

2. Corporate vs. personal tax: Federal government trades from down to zero up to provincial corporate income tax revenue (roughly $25B) – which is more risky and mobile – for personal income tax room

3. Infrastructure upload: Federal government increases revenue (provinces decrease) to spend between their current infrastructure spend (roughly $10B per year for fixed capital) and the current federal plus provincial spend (roughly $50B) on a per capita basis by province

What exactly are we trying to measure here? In each scenario, we adjust the given policies and determine: which households 'win' and 'lose' (where 'winners' see decreases in NCAR, meaning more prosperity; 'losers' see increases in NCAR, meaning growing pressure to make ends meet) and by how much do these households' NCARs change? From there, we can show:

- What is happening to NCARs across the country? (i.e., generally up or down?);

- What is happening to the distribution of NCAR across Canada? (e.g., are households already under the most pressure seeing more prosperity or less sustainability?); and
- In which province do these households live? Are provinces moving towards their 'fair share' of NCAR distribution? (this only matters from a political perspective).

Results

Scenario 1a: as federal-provincial transfers decrease in exchange for greater federal transfers to households, aggregate NCAR changes slightly. The median NCAR across Canada increases by 0.5% as federal-provincial transfers are eliminated and decreases by 0.4% as such transfers are doubled. The interesting point here is that households in some (larger/richer) provinces see improvements in NCARs as federal-provincial transfers decrease, but this is offset by significant increases in NCAR in other provinces where lower-income households *receive disproportionate transfers already*. That is, lower-income Canadians in some (particularly larger/richer) provinces are harmed by fiscal federalism while those in other provinces are helped by it.

Scenario 1b: as federal-provincial transfers decrease in exchange for more provincial PIT revenue, aggregate NCAR changes slightly. For example, the median NCAR in Canada decreases by 0.3%. This drop is more apparent for lower-income households, however, with only a tiny increase to higher-income households. Specifically, the median NCAR among lower-income Canadian households drops by 1.7% while the median among higher-income Canadian households only increases by 0.1%. Similar to Scenario 1a, households in the larger/richer provinces are the ones that see improvements, and NCARs across the countries converge. Part of the variation across provinces is because provincial tax rates vary widely.

Scenario 2: Overall, the CIT for PIT trade has a small effect on the aggregate NCAR across the country. The median NCAR would drop by 0.5% if the federal government took on all CIT. Lower-income households in some provinces see a slight decrease in NCAR as the federal government takes on more CIT vs. PIT, while those with higher incomes see a very slight increase. The range in changes in median NCARs across provinces is small (-1.5% to +0.5%) and there is essentially no convergence (i.e., lowering the variability of median NCAR, particularly across provinces) in this policy space.

Scenario 3: If the federal government uploaded all provincial infrastructure spending, then the median NCAR would increase by 0.3%. This is seen in a few provinces, with no noticeable change in others. The range in changes in median NCARs across provinces is small (-1.5% to +1.1%) and there is essentially no convergence in this policy space. While previous CANCEA research (Stiff and Smetanin 2016) has suggested that the federal government needs to play a larger role in infrastructure – given the increased revenue they receive as the economy grows – this scenario does so at the expense of provincial infrastructure spending, which hurts Canadian households overall. Further, this scenario – along with Scenario 1b – suggests that an increased infrastructure role for the federal government could also include transferring tax room to the provinces to build more infrastructure (a scenario not contemplated here due to a violation in the "who does what" constraint).

Conclusion

NCAR is a very useful measure in determining the sustainability of Canadian households, and can decrease through either increased income (including transfers), decreased taxes or debt, or decreased expenditures on "needs". When a household's NCAR decreases, this means less pressure on the household to make ends meet – that is, it adds to their prosperity. It would seem "Canadian" to argue that decreases in NCAR for lower-income households (who have far fewer options to do so through decreased spending on needs) more than offset equal increases in NCAR for higher-income households. Therefore, scenarios where NCAR can be decreased for lower-income households without significantly increasing it for higher-income households should be seen as positive. (Note that the unit of measurement here is households, such that higher-income households support lower-income households. This is a very different from high-income provinces supporting low-income provinces.)

In that regard, our results suggest that "who does what" often has relatively small effects on NCARs overall, with the exception of taxation (which varies widely across provinces). This can mean one of two things: roughly zero-sum effects where some 'win' and some 'lose' or little/no effect on anyone. This is largely because most scenarios simply "move money around". While *any* noticeable change suggests that "who does what" matters, certain shifts show larger differences among some lower-income households. For example, increased provincial PIT room (scenario 1b) sees a decrease in median NCAR among lower-income Canadian households of 1.7%; while increased federal CIT responsibility (scenario 2) sees a decrease in the median NCAR among this group of 1.0%. In general:

- Households in some (larger/richer) provinces see improvements in NCAR as federal-provincial transfers decrease, but this is largely offset nationally by significant increases in NCAR for households in other provinces who currently receive disproportionate transfers
- Such convergence in NCAR nationally seems 'Canadian'
- Canadians on the whole would be better off allowing provinces to self-fund their services, and that lower-income households overall are being unnecessarily harmed by federal-provincial transfers. This is particularly true on the taxation side, where it appears that low-income Canadians in some provinces are effectively supporting low-income households in others, raising the question of "where would you rather be poor?"

However, recall our starting point: the distribution of NCARs and income across the country vary widely, due to significant decentralization (e.g., allowing for widely disparate provincial tax rates and transfers – such as in Quebec, which has the 'flattest' NCAR vs. income). Equalizing significantly would require significant changes in this regard. That is, in order to see more significant changes to NCAR, there would need to be noticeable changes in general government *policy* (i.e., not just "who does what").

Nonetheless, beyond providing a new analytical approach which solves many of the issues presented by other methods (particularly looking at households individually), one *political* benefit is that it could spark a conversation about roles and responsibilities within the federation. In this regard, this paper has shown that our current fiscal federalism could – in a revenue-neutral way – be restructured to help many Canadian households.

To be clear, this means that Canada's fiscal federalism – which effectively treats households only as parts of provincial wholes – has created a situation where Canadian households with similar incomes are not seen as equal by government. While it is arguably "Canadian" for richer *households* to support less-well off households, it is harder to argue for the current situation in which lower-income households in certain provinces are effectively supporting similarly low-income households in other provinces simply because of where they live.

As such, Canada's federalism conversation should focus on how improvements can occur without the federal government simply providing more money to the provinces or opening up the *Constitution Act*. That the two orders of government can effectively collaborate to improve the prosperity of Canadian households without such things happening should be made a priority, especially at a time when the federal government is facing significant deficits for the foreseeable future while also being seemingly uninterested in addressing a perceived "fiscal imbalance" with the larger/richer provinces such as Ontario.

1.0 INTRODUCTION

Up until nearly 150 years ago, the colonies of British North America were politically unlinked (other than the fact that the British appointed governors to each). In 1867, three colonies – the Province of Canada (formerly separated into Upper and Lower), New Brunswick, and Nova Scotia – agreed to be 'federally united' in the form of the Dominion of Canada. Through numerous discussions, it was agreed that four provinces (Ontario, Quebec, New Brunswick, and Nova Scotia) would form the new country, with nine more provinces and territories (PTs) to join over time[i].

The idea of this federal union, like so many other, would be to assign governing authority to multiple orders of government. This effectively means that, through sections 92 and 93 of Canada's *Constitution Act, 1867*, the Provinces may exclusively make laws in relation to certain matters, without interference from the Federal Government, such as direct taxation, borrowing on credit, hospitals, municipalities, non-renewable natural resources, property and civil rights, and education (with some provisions).

Early on, this devolution of authority didn't carry large fiscal implications for the provinces. The major revenue tools then used (customs, excise taxes, and indirect taxes), lay within federal control. But by the 1920s, provinces were playing a significantly larger role in delivering programs and services, as well as in taxation. This was followed by the Great Depression and the Second World War, both of which required fundamental restructurings of federal-provincial relations (in opposite directions). In the following decades, provinces again took on a much larger role in the creation of Canada's major social programs (e.g., healthcare). (Department of Finance Canada 2006, Subcommittee on Fiscal Imbalance of the Standing Committee on Finance 2005)

By many standards, Canada is now highly decentralized, meaning the federal government has devolved much of its authority to the country's subnational governments (i.e., provinces/territories and municipalities). However, the federal government still collects a larger share of overall government revenue than its share of overall government expense.

Significant literature has been generated (over decades) to investigate an at least perceived unfairness stemming from this result of Canada's fiscal federalism. Methods of inquiry have included:

- *Fiscal flow analysis*, which examines differences between federal revenues derived in a PT and federal expenditures that occur within that PT, at a given point in time;
- *Vertical fiscal gap/imbalance analysis*, which examines asymmetries between revenues relative to expenditure responsibilities at each order of government;
- *Horizontal fiscal imbalance analysis*, which examines differences between PTs insofar as they have different abilities to raise funds or to provide services; and
- *Fiscal balance sustainability analysis*, which examines, under assumption, what the 'structural' fiscal balances of various governments will be into the future.

Respectfully, these analytical methods suffer from a number of common issues:

- It is unclear in most analyses what the ultimate goal is, either due to weak problem statements, definitional issues, or too much subjectivity;
- All methods focus solely at the PT-level, ignoring the fact that it is residents who are the beneficiaries of government services (not PT governments), and ultimately bear the cost of government services; and
- Most methods are done at a point in time – generally ignoring how such measures change – and are not forward looking.

The novelty of CANCEA's 'systems approach' is tracing the impacts of government processes as they affect the sustainability and prosperity of households, ensuring the analysis is:

- Conceptually well-defined and objectively clear on the "so what?";
- Done at the appropriate level, that is, tied to households as the base elements of a socio-economic system (as such, all the effects of government policy are reduced to the benefits and costs to households); and
- Dynamic in time, allowing for backward- and forward-looking sensitivity evaluation.

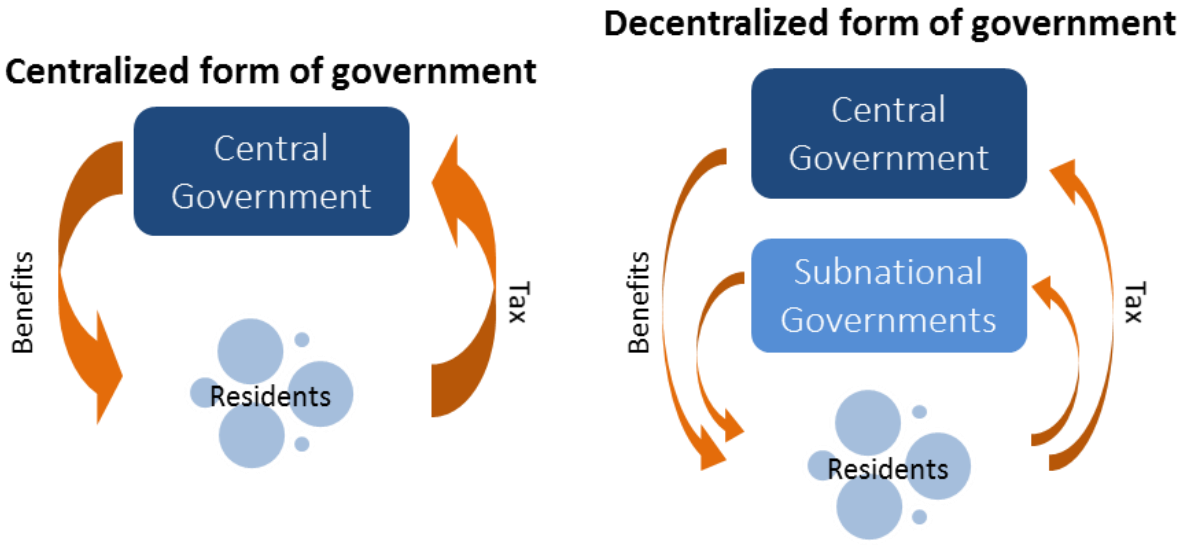
As such, the analysis undertaken herein should provide new insights in the discussion about fiscal federalism.

2.0 HOW DECENTRALIZED IS CANADA?

In federal systems, the central government devolves a (sometimes significant) portion of governing authority to subnational governments (SNGs) such as PTs. In such systems, there is often a clear split over spending authority, but less so for taxation (where tax bases are often shared in some way). There are a number of reasons for such 'decentralization':

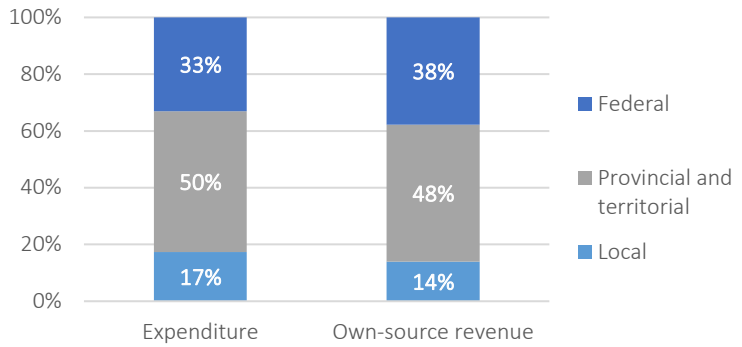
- To provide authority to regionally-based (often ethnically-based) groups over their own affairs;
- Sharing power among numerous political parties (avoiding 'winner take all'); or
- Moving authority closer 'to the ground' – i.e., allowing government to respond to local needs and wants (globally, this sometimes strengthens democratic transparency, but in other cases increases corruption).

Figure 1 Centralized vs. decentralized forms of government



In this regard, Canada is a little special: "Unlike most federations, our provinces are sovereign in their own areas of jurisdiction, meaning that the federal government cannot override provincial laws. Perhaps more importantly, the provinces also have sovereign taxing power and the ability to tap all significant tax sources" (Mendelsohn 2012b). Further, Canada has been decentralizing considerably since the mid-20th century, when the establishment of the welfare state saw the size of provincial expenditures grow significantly relatively to the Federal Government (Tremblay 2012). In the third quarter of 2016 (the latest data available), PT governments made up 50% of total government expenditures and 48% of total government own-source revenue (= total revenue – transfers from other governments). Conversely, the Federal Government spent 33% of total government expenditures and received 38% of total government own-source revenue.

Figure 2 Expenditure and own-source revenue shares, by order of government

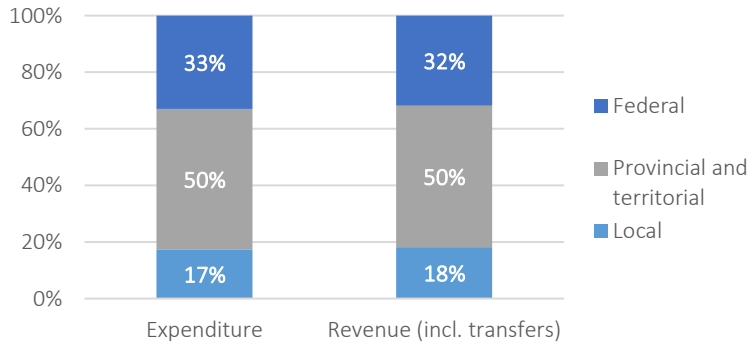


Source: CANSIM Table 380-0080; calculations by CANCEA

On the revenue side, the federal government currently brings in roughly 60% of personal and corporate income taxes paid to Canadian government, while PTs bring in over 50% of taxes on products and production and 55% of the sales of goods and services (or roughly 80% and 90% respectively when including local governments as well). On the expenditure side, the federal government provides 70% of transfers to households, while PTs provide over 55% of expenditures on goods and services, as well as over 50% of infrastructure investment (or 85% and 90% respectively when including local governments).

In addition, PT governments currently receive over $80 billion in federal transfers annually, while local governments receive over $60 billion in PT transfers. (In other words, as 'money is fungible', about three quarters of federal transfers to PTs are 'passed through' to local governments.[3]) As Figure 3 shows, once accounting for these transfers, all orders have roughly equal shares of revenue and expenditures.

Figure 3 Expenditure and total revenue shares, by order of government



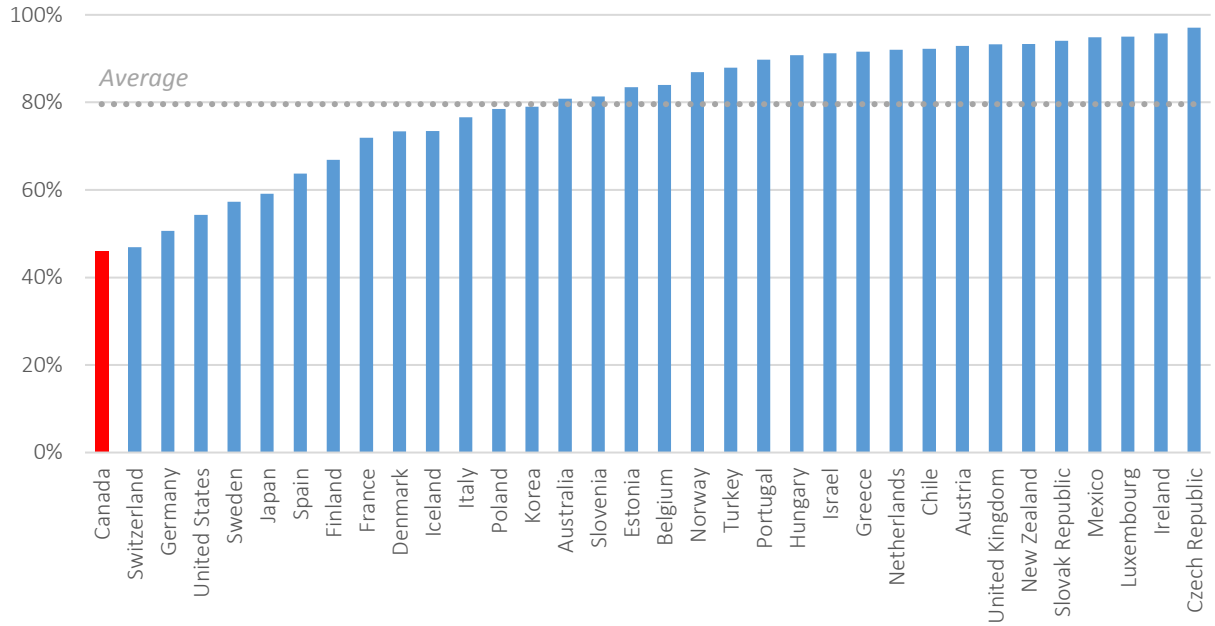
Source: CANSIM Table 380-0080; calculations by CANCEA

This paper discusses whether transfers are necessarily the most effective way of achieving this result. Nonetheless, that PTs occupy such a significant space in the government sphere (especially when including local governments) means that the "revenue-raising role of provinces has increased over time and taxation

[3] The federal government does provide some transfers (e.g., the Gas Tax Fund) directly to municipalities, although these are relatively quite small.

in Canada is now quite decentralization relative to [Organisation for Economic Co-operation and Development (OECD)] standards, especially corporate income taxation and consumption taxation" (Tremblay 2012). One might even go so far as to say that Canada currently finds itself as the most decentralized nation in the developed world. For example, among OECD countries, Canada's central government brings in the lowest share of government revenues (excluding social security funds), at a little over half the average.

Figure 4 Comparison of OECD countries: Federal/central share of tax revenues, excluding social security funds (2013)



Source: OECD, Revenue Statistics dataset; calculations by CANCEA

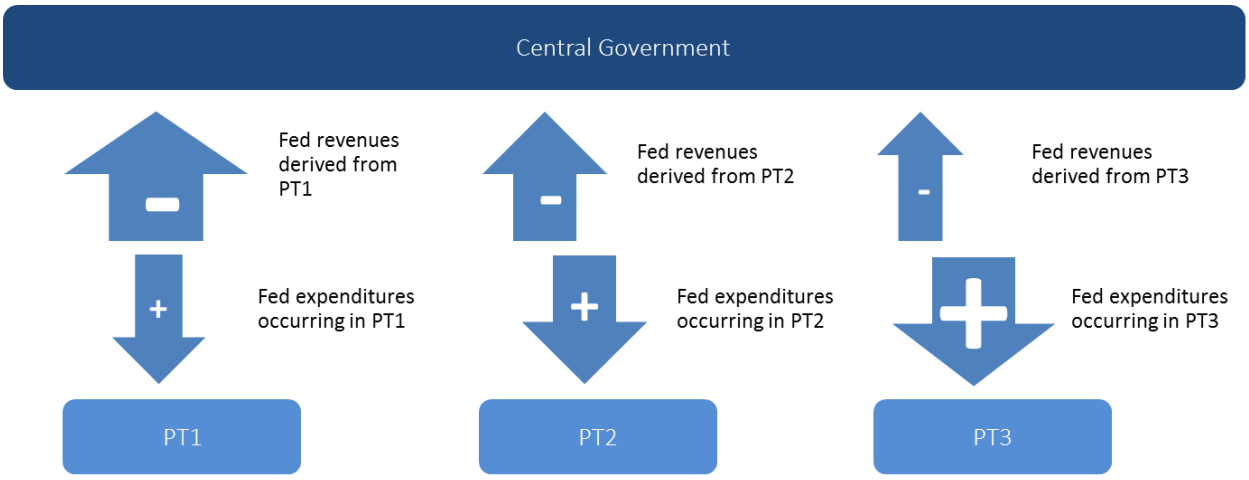
3.0 EXISTING METHODS OF EVALUATING FISCAL 'FAIRNESS'

Given that Canada is so fiscally decentralized, questioning whether our fiscal federation is 'working' only seems natural. Significant literature has been generated (over decades) to investigate an at least perceived unfairness stemming from this result of Canada's fiscal federalism. We investigate four types that broadly encompass such analyses.

3.1 Fiscal flow analysis

Borrowing from Bird (2003): fiscal flow analysis is intended to measure the redistribution of income among PTs that results from federal revenue and expenditure policies – and is often used to highlight 'imbalances' in the federation. It simply takes the difference between federal revenues derived in a PT and federal expenditures that occur within that PT, at a given point in time.

Figure 5 Fiscal flow analysis attempts to imply 'unfairness'



An individual PT experiences a 'favorable' fiscal flow (i.e., the PT is called a 'net recipient' or 'winner') if the income of its residents is raised *more* by the impact of federal spending in the PT than it is reduced by the federal revenues stemming from the PT. In the converse, the PT experiences a 'negative' fiscal flow (i.e., the PT is called a 'net contributor' or 'loser'). For example, in Figure 5 above, the federal government derives revenue (e.g., taxes and other revenues, such as crown corporations) from the residents of three separate PTs and spends money in those three PTs as well (e.g., on transfers to households, transfers to the PT governments, infrastructure). Given the residents of PT1 send more revenue to the federal government than the federal government spends in the PT, the residents are 'net contributors' to the federation. Conversely, the residents of PT3 are 'net recipients'.

This type of analysis has been used repeatedly in Ontario over the last decade, beginning with the Province itself. In late 2004, Ontario's Minister of Finance started what would become a long-running argument that "Each year, Ontarians pay $23 billion more to the federal government than we receive back in federal programs and transfer payments… One of the ways that Ottawa can help Ontario is by *improving the*

fairness of transfers it sends to provinces" [emphasis added] (Notes for Remarks by The Honourable Greg Sorbara Minister of Finance 2004). This number was repeated in provincial budget documents and in speeches and press releases by both the Minister and Premier. The argument was also supported by a few large organizations, such as TD Economics and CIBC World Markets (Burleton and Lavoie 2005, Weber 2005). By 2012, the Commission on the Reform of Ontario's Public Services – chaired by noted economist Don Drummond – made a similar argument (though at a lower magnitude). The Commission's report estimated that the net flow out of Ontario was $12.3 billion (2.1% of Ontario's 2009 GDP), largely due to federal spending and not taxation (Commission on the Reform of Ontario's Public Services 2012). The argument received some criticism, some of which was addressed in a 2013 Mowat Centre report (Zon 2013), which estimated that federal taxes are redistributed away from Ontario on a net basis at a rate of approximately $11 billion per year (2009-10), largely due to federal spending and not taxation. Using updated data (and new data accounting), the Mowat Centre recently recalculated this gap to be $7.7 billion per year, or $566 per person[4] (2014-15), again largely due to disproportionately small federal spending in Ontario (Hartmann and Thirgood 2017).

There have been some notable issues raised with fiscal flow analysis, specifically:

- It is irreconcilable: because it "implies that the amount of money flowing out of the net 'contributors' to Canada… equals the amount flowing into the rest of the country. However, this is almost never true… Unless the federal budget is perfectly balanced each and every year, total federal revenues… never equal total federal expenditures (in the provinces and territories)" (Holden 2005).

- It examines the wrong thing: "In any economic model of resource allocation, whether something is too high or too low depends on the gap between marginal costs and marginal benefits, and not on the gap between revenue and expenditure" (Dalby 2005).

- Incorrect unit of measurement: Inequality of income exists at the *individual resident* level (e.g., people, households, businesses), who aggregate themselves geographically for various reasons.

Let us quickly examine this last point in a little more detail, as it is an important one. As stated by the distinguished economist Richard Bird (2003): "The aggregation of people into territorial units has little to do with the factors determining the allocation of most flows [at the PT level]… Focusing on regional fiscal flows thus hides rather than reveals the most important distributive outcome of Canadian fiscal federalism." In other words, the reason that the residents of some PTs contribute more in aggregate is simply because those residents have higher incomes *on average*. Similarly, "the federal government also spends less in Ontario because… fewer individual Ontarians qualify for federal benefits" (Holden 2005) – again, because *on average* their incomes are higher. Therefore, taxes paid and benefits received will be different at higher-levels of aggregation not because the geography itself is different but because the individuals who reside there are different. In fact, a similar argument could be made that many major urban centres (e.g., Calgary, Ottawa, Toronto, and Vancouver) are 'net contributors' because their ratio of

[4] Alberta is the largest net contributor, at $23.9 billion or $5,815 per person. On a total basis, Quebec is the largest net recipient, at $14.9 billion; however, PEI is the largest net recipient per person, at $7,897 per person.

employment income to government transfers are higher than the country on the whole.[ii] (That said, the federal government does determine the allocation of $80 billion of major PT transfers at the PT level, versus nearly $90 billion in major transfers to persons.) We will come back to this notion repeatedly.

In addition, some less serious issues have been raised:

- The data may not be appropriate: Statistics Canada (West 2007) provides numerous caveats on the use of provincial economic accounts (PEA) data (at least previously) used to undertake such analysis (perhaps calling into question why they provided it in the first place). Unfortunately, the paper provides little sense of the scope of the problem, though a thorough reading would suggest that potential errors are small in magnitude. Further, as The Library of Parliament (Holden 2005) has said: "PEA data are considered to be a comprehensive summary of all federal revenues (taxes and social insurance contributions) and expenditures (direct spending, transfer payments and interest payments on the federal debt) in each province."

- It's hard to do: Statistics Canada (West 2007) also states "the underlying problem in measuring the costs and benefits of Confederation… [is that] the more general and widely shared benefits are, unfortunately, much less quantifiable either in magnitude or in geographic location." We would argue that this suffers from a lack of imagination of scope in economic modeling. In fact, as we will show in this report, a 'systems approach' and agent-based modeling (done by CANCEA, though not available at the time) is able to handle such an issue.

In the end, while fiscal flow analyses are roughly correct insofar as they provide an aggregate estimate of net contributions to the federal government by the residents of a PT at a point in time, they suffer from major conceptual flaws. Our main concern with fiscal flow analysis is that it is done at a regional level, which ignores the fact that 'regions' do not pay taxes or receive benefits. If investigated at the more appropriate resident level, it seems reasonable that some individuals pay more in taxes than they derive benefit from direct services (otherwise, what would the point of government be?). Further, such analyses do not attempt to measure sustainability or prosperity – that is, they ignore how the behaviour of residents changes when certain taxes are imposed or different government spending occurs (e.g., much needed, productivity-enhancing transit infrastructure vs. 'leaky' business supports).

3.2 Vertical fiscal gap/imbalance analysis

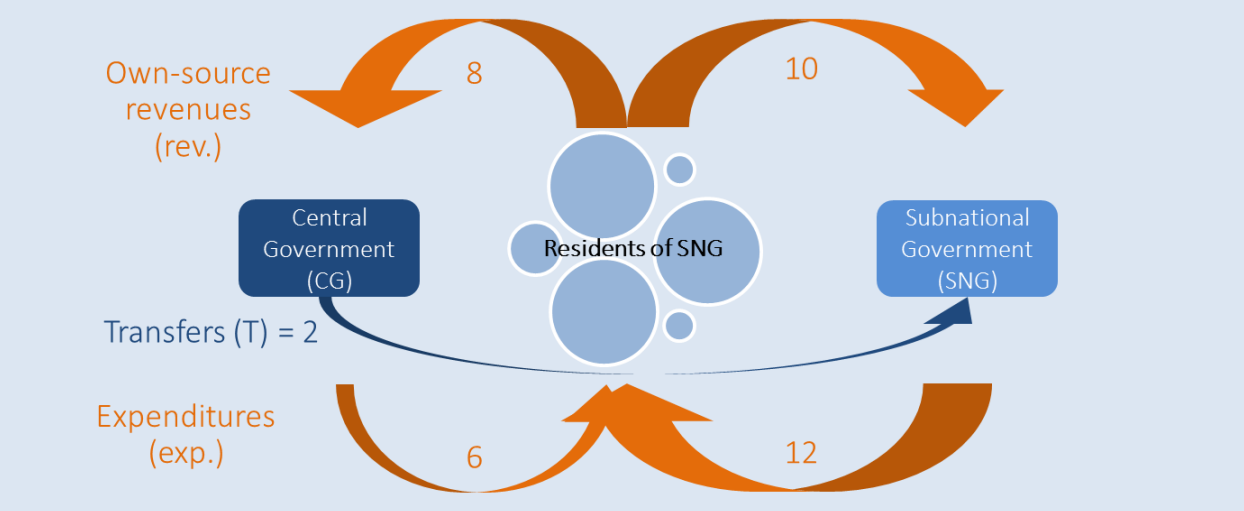
At the heart of the discussion about fiscal federalism is the notion of a vertical fiscal gap (VFG) (sometimes confusingly called 'imbalance') between the federal government and subnational governments (SNGs) such as PTs or states. The literature provides *many* definitions (some of which will be discussed further):

- Transfer dependency: transfers as a share of either PT spending or revenue, or as a share of federal revenue: "The size of the fiscal gap between orders of government is defined by the magnitude of the cash transfers that flow from one order of government to another" (Lazar, St-Hilaire and Tremblay 2004).

- Fiscal ratio: the ratio of own source revenues to (non-transfer) expenditures.

- Fiscal 'balance': takes difference between own-source revenues and (non-transfer) expenditures: A VFG is "a mismatch between revenue sources and expenditure responsibilities." (Winer and Hettich 2010).
- Some combination: including concepts of revenue and spending decentralization (e.g., Eyraud & Lusinyan (2012), Sorens (2016)).

Figure 6 Illustrative Examples of VFG measures



$$\textit{Transfer dependency ratio} = \frac{T}{SNG\ rev.} = \frac{2}{10} = 20\%\ [OR] = \frac{T}{SNG\ exp.} = \frac{2}{12} = 17\%\ [OR] = \frac{T}{CG\ rev.} = \frac{2}{8} = 25\%$$

$$\textit{Fiscal ratio} = 1 - \frac{SNG\ rev.}{SNG\ exp.} = 1 - \frac{10}{12} = 17\%\ [OR] = \frac{SNG\ exp.}{SNG\ rev.} - 1 = \frac{12}{10} - 1 = 20\%$$

$$\textit{Fiscal balance} = SNG\ rev. - SNG\ exp. = 10 - 12 = -2$$

$$\textit{Fiscal (de)centralization ratios} = \frac{CG\ rev.}{(CG\ rev. + SNG\ rev.)} - \frac{CG\ exp.}{(CG\ exp. + SNG\ exp.)} = \frac{8}{(8+10)} - \frac{6}{(6+12)} = 11\%\ (decentralization\ equiv. = -11\%)$$

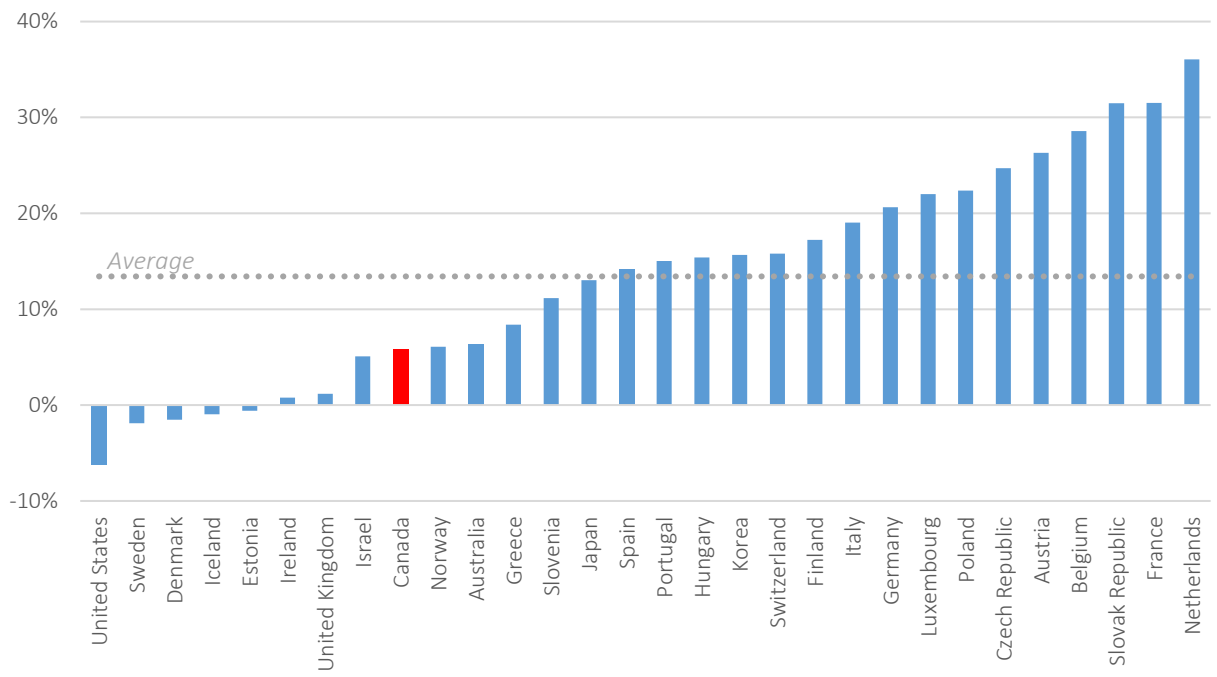
$$Note: \textit{Fiscal flow} = CG\ Rev. - (CG\ Exp. + T) = 8 - (6+2) = 0$$

Figure 6 shows a number of examples of such measures, and how they lead to fairly different assessments of the VFG. Regardless of such differences, the general idea is that a VFG represents an asymmetry between federal/SNG revenues relative to federal/SNG expenditure responsibilities (i.e., all the measures in Figure 6 indicate that there is a VFG).

Taking the central government share of revenue and subtracting their expense share (the 'fiscal centralization ratio') across OECD countries, we see in Figure 7 that Canada[5] has a below average VFG (and in fact, that some countries, notably the United States, have *negative* VFGs):

[5] OECD expenditure data are not available for Canada: as such, the figure used here was prorated using the OECD expenditure figures and the Statistics Canada data shown in Figure 2.

Figure 7 Comparison of OECD countries: Federal/central revenue share minus expense share



Source: OECD, Revenue Statistics dataset, Government expenditure by function dataset; CANSIM Table 380-0080; calculations by CANCEA

But is a VFG necessarily a bad thing? That is, does it imply 'unfairness'? The fact that there is a mismatch between expenditures and revenues is not necessarily an indication of a vertical fiscal imbalance (VFI), which we will get to momentarily. In fact, there may be legitimate reasons for a VFG, including:

- Fiscal insurance: used to stabilize PTs through economic shocks by pooling risk, while allowing for better coordination with macroeconomic policies (e.g., monetary/exchange).
- Redistribution: intended to correct imbalances *among* PTs.
- Internalize spillovers: citizens of one PT may benefit from investments in another PT (e.g., transportation infrastructure), or suffer from a lack of investment in certain things (e.g., law enforcement).
- Economies of scale as a public good: centralized collection of taxes, for example, has reduced administrative costs, provides greater tax harmonization, and reduces economic distortions (e.g., corporations moving capital to lower taxing SNGs).

The discussion of 'unfairness' in this regard then reduces to a subjective, political one – not very helpful from a *policy*-setting perspective. From the example in Figure 6, the federal transfer (of 2) fills the VFG, so the central government could argue it has eliminated the perceived 'imbalance'. However, it could have also transferred 2 in tax room to the SNG or uploaded 2 in expenditures; both of which eliminate the VFG *and* the perceived 'imbalance'.

As such, there are many definitions of VFI (increasing in strictness). First, a VFI exists when at least "one order of government has more fiscal resources than it requires to meet its spending obligations and the other order of government is in the opposite situation" (Subcommittee on Fiscal Imbalance of the Standing Committee on Finance 2005, Lazar). Second, "the [VFG] is taken to be the optimal level of transfers when the second best is achieved by… a unitary national government… A [VFI] is then defined as any deviation—positive or negative—from the optimal [VFG]" (Boadway and Tremblay 2005). Third, Matier, Wu, and Jackson (2001) compare a government's initial net debt to the present value of its projected primary balances (revenues minus expenditure). A VFI exists only if one order of government is found to have fiscal room (i.e., current net debt is repayable over time) while the other suffers from a fiscal gap (i.e., current net debt is not repayable over time).[6]

Whatever the definition, there a number of potentially significant costs to a VFI – particularly with respect to the use of transfers to 'correct' it – which include:

- Incentivizing additional spending/debt or creating bailout expectations: federal transfers, particularly matching grants (where PTs pay a portion of a joint expense), incentivize PTs to spend more than they would have otherwise, or not reduce taxes when they could. A 'soft budget constraint' occurs when the cost of spending is not adequately internalized by a PT (i.e., it does not feel fully responsible for making ends meet). "In particular, recent literature highlights the importance of 'hard' versus 'soft' budget constraints in fostering sustainable fiscal policy. Decentralization with open-ended transfers leads recipients to expect the provider of transfers to finance excesses, either because it has formally committed to do so, or because commitments not to do so will prove practically impossible to keep. If intergovernmental grants permit bailouts, the temptation will be to expand public programs beyond levels that reflect public preferences or are sustainable over time." (Robson and Laurin 2015)

- Relaxing inter-PT competition: federal transfers limit tax-benefit competition among PTs, lowering their efficiency at delivering services relative to revenue.

- Affecting vertical linkages: borrowing or tax changes (on shared bases) by one order of government could crowd out options for the other order (e.g., limiting available credit).

- Inhibiting transparency: Voters become confused about which government is responsible for spending, so democratic scrutiny becomes clouded.

On the whole, the broad consensus in the literature is that VFIs are bad. In particular, work by Sorens (2014, 2016) has shown that VFIs "incentivize bigger, more expensive, and more indebted government and inhibit the democratic accountability and responsiveness of [SNGs]… Intergovernmental transfers, even in the form of unrestricted block grants, make the recipients spend much more but not necessarily tax less… The problem appears to be that transfers simply make recipient governments too big." Similarly, Eyrand and Lusinyan (2012) showed that "a decline in the VFI is always found to be beneficial, and this effect is more

[6] This strict definition was used by the authors – of the federal Department of Finance – to show that "there does not appear to be a [VFI] between the federal and provincial/territorial governments in Canada."

pronounced at higher VFI levels… reducing the share of [SNG] spending financed by transfers and borrowing leads to an improvement in fiscal outcomes. On average, the general government balance increases by 1 percent of GDP for every 10 percentage points decline in the VFI... [Further,] reducing VFIs increases revenue, which may create trade-offs for governments seeking to reduce the tax burden."

There are concerns that exist with VFI analysis, particularly that – in the end – it is simply a normative/subjective exercise:

- Inconsistent definitions: Seemingly every paper on the topic uses a different definition, making comparison difficult.
- Highly political: "Unfortunately, there is no ideal model from which to determine the optimal size of [the VFG]. Indeed such an exercise is very much of a normative exercise" (Lazar, St-Hilaire and Tremblay 2004).
- Ever changing: "There's an ebb and flow to the fiscal position of the federal and provincial governments [with many changes since WWII]… and I doubt there was ever a moment at any point in time when there was perfect vertical balance" (Subcommittee on Fiscal Imbalance, 2005: H. Lazar).

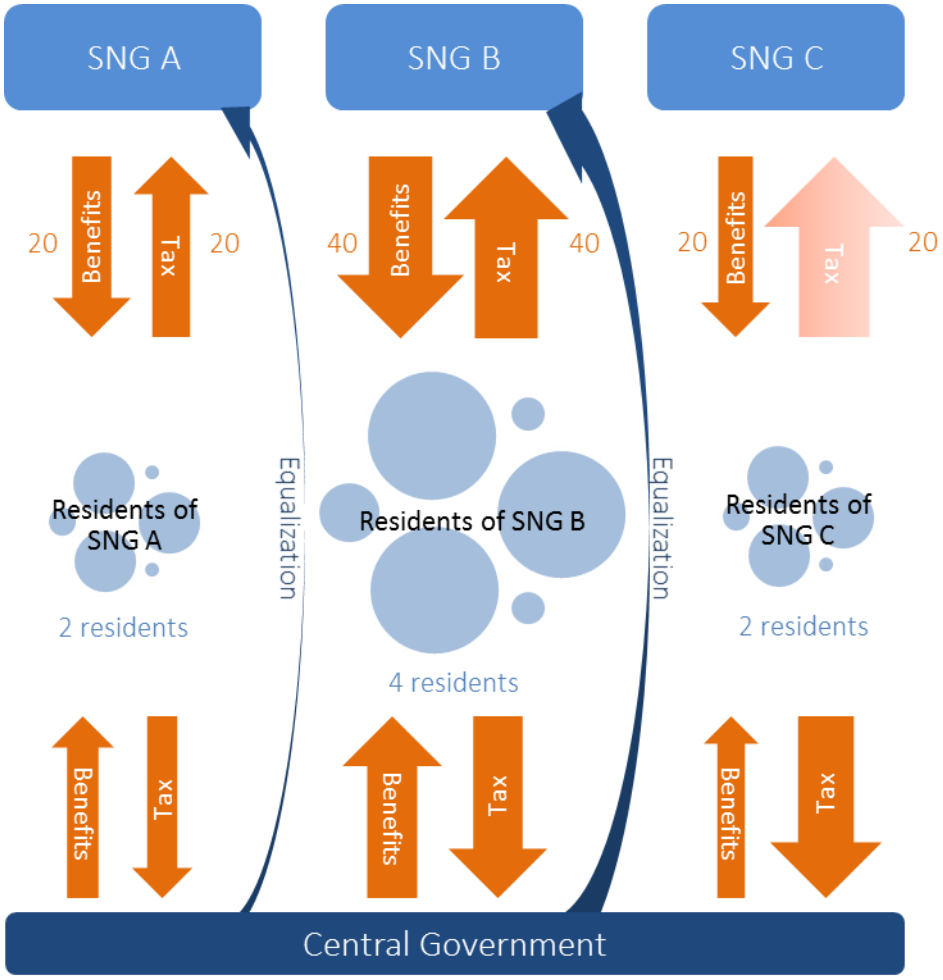
There is a very extensive literature on the topic of VFG/VFI (see, in particular, Sorens (2016) for a thorough review) that appears to have come to the consensus that such gaps produce negative outcomes, particularly for fiscal discipline at the SNG level. However, the topic suffers from debates similar to those of the 'infrastructure deficit' – such as definitional issues, but foremost that the notion of an 'optimal' gap (in this case, the optimal VFG) seems difficult to identify objectively (e.g., there are non-economic reasons for a VFG). Further, similar to fiscal flow analysis, the unit of measurement is at the PT level, and not at the resident level.

3.3 Horizontal fiscal imbalance analysis

Highly related to VFI is the concept of a horizontal fiscal imbalance (HFI) between SNGs, insofar as they have different abilities to raise funds or to provide services. The literature again provides numerous definitions, but Bird (2003) gives the cleanest, especially related to the VFI: "HFI might be interpreted as the VFI that is, so to speak, 'left over' when the VFI problem of revenue-expenditure imbalance is solved for the richest [SNG]." The major (blunt) policy response to such inequities is to create federal equalization programs – "basically the equal-treatment-of-equals concept applied to the total impact of the public sector" (Dalby 2005).

Similar to our review of VFI, let's look at an illustrative example:

Figure 8 Illustrative example of the HFI



In this illustrative example, residents of SNG-A pay 10 in tax per resident and receive 10 in benefits per resident. As this is also true in SNG-B (despite being larger), there is no HFI between these two SNGs. The government of SNG-C also pays out 10 in benefits per resident and raises this much in tax. However, given it has a richer tax base, it could have easily raised 20 in tax per resident – meaning a fiscal capacity ratio of 2:1. Seeing this 'imbalance', the federal government decides to provide equalization payments to the governments of both SNG-A and SNG-B, such that they can provide the same level of services as the government of SNG-C at the same level of taxation. In one such program, these payments might equal 10 per resident, or 20 to SNG-A and 40 to SNG-B.

In general, the main arguments for fiscal equalization programs include three related concerns:

- Reducing fiscally-induced migration: i.e., to reduce the amount of capital or people moving to better tax-benefit SNGs rather than for more efficient reasons (i.e., economic fundamentals), potentially trapping lower-income SNGs.
- Achieving horizontal equity: i.e., that all SNGs can provide the same services at the same cost.

- Equalizing the marginal cost of public funds across SNGs: i.e., that each SNGs raising of taxes to provide those services affecting their tax bases equally.

This, again, comes from decentralization, which "allows richer [SNGs] to levy lower tax rates for the same level of services relative to poorer [SNGs] (or equivalently, a more lavish level of services for a given tax rate)… [Ultimately] inequality grows over time, and poorer regions lose the incentive even to attempt to attract investment" (Sorens 2016). The question then becomes what, exactly, are we trying to *equalize*? Bird (2003) summarizes effectively: "While generally ill-defined, regional disparity is often interpreted in such a way that the supposed objective of transfers is to reduce such disparity, whether understood in terms of differences in per capita income between [SNGs] or in terms of differential regional growth rates, unemployment rates, or some other economic variable… Basing intergovernmental transfers solely on such concerns, however, may produce undesirable economic incentives." For example, trying to equalize per capita expenditures of each SNG ignores the fact that residents may want differences, "one of the main rationales for decentralization in the first place. It also ignores local differences in needs, costs, and own revenue-raising capacity. Equalizing actual outlays would discourage both [SNG] revenue-raising effort and [SNG] expenditure restraint, since under this system those with the highest expenditures and the lowest taxes would get the largest transfers."

Fortunately, Canada's equalization program does not try to do this (though it has its own problems[iii]). Instead, Canada attempts to equalize the *capacity* of the Provinces to deliver public services, "which is more applicable to federal settings in which [SNGs] have constitutional expenditure and revenue responsibilities, the aim is to provide each [SNG] with sufficient funds (own source revenues plus transfers) to deliver a centrally-predetermined level of services" (Bird 2003). Specifically, the *Constitution Act, 1982* states: "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" [emphasis added]. This essentially says that all Canadians – as citizens – are entitled to public services of comparable quality (Béland and Lecours 2012) and, as a measure of fiscal capacity, is not meant to be a "a moral indictment, an indicator of poverty, or evidence of a lack of entrepreneurial spirit" (Mendelsohn 2012a). Nonetheless, there are certainly some persistent recipients – namely Prince Edward Island, Nova Scotia, New Brunswick, Quebec, and Manitoba. However, while P.E.I. currently receives the least in equalization payments (among recipients), it has consistently been at or near the top in per capita terms. Conversely, while Quebec receives over half of equalization payments, in per capita terms it is around the average.

Figure 9 Equalization payments received, by Province, 1993-94 to 2015-16

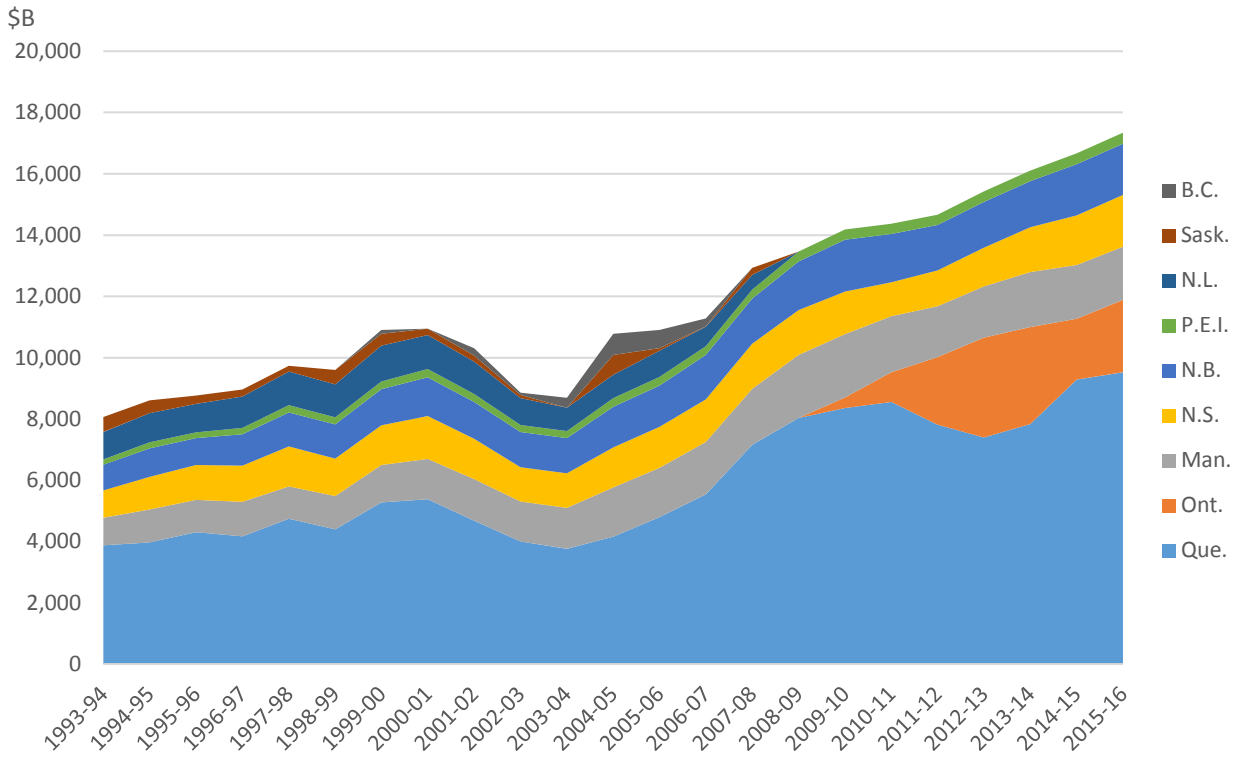
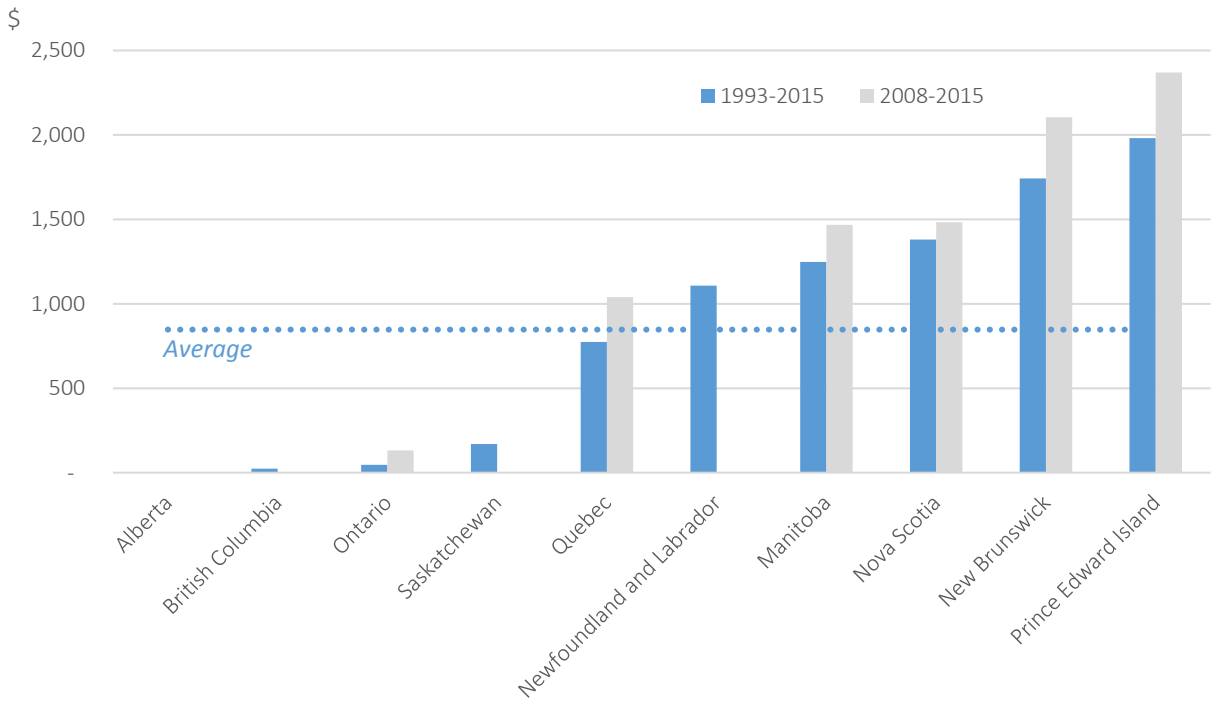


Figure 10 Average annual per capita equalization payment



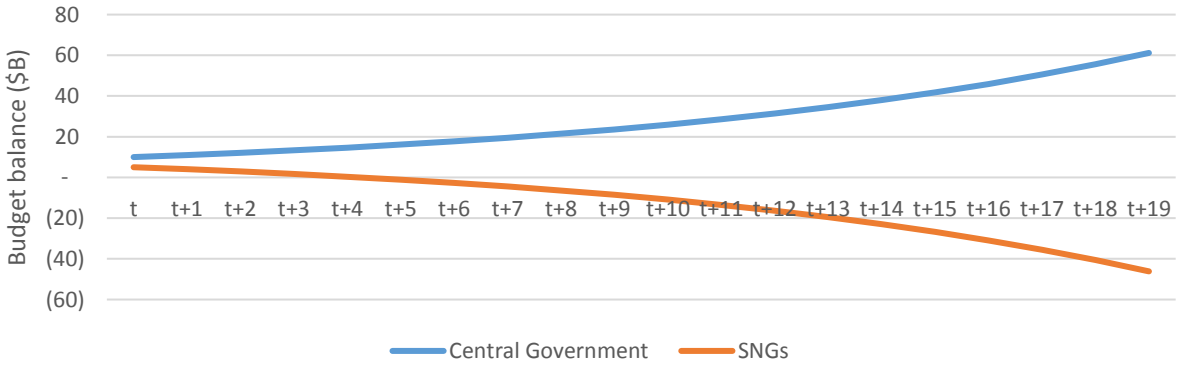
While changes to Canada's equalization program as it stands (including its elimination) are beyond the scope of this paper, there are a few HFI issues worth highlighting for our purposes. First and foremost, and similar to the main issue with the other types of analysis, HFI focuses on the wrong unit of measurement. "Interregional equity is not interpersonal equity… If the principal objective of policy is to alleviate poverty, intergovernmental transfers are unlikely to be either the most appropriate or the most efficient way to achieve this aim" (Bird, 2003). Accordingly, Kent (2007) has argued that the federal spending power (i.e., its ability to spend on objectives outside its scope) – which has been used for decades to share the Province's costs of instituting major expenditures (e.g., health care) – should now be dedicated for transfers to people. In such a case, many of the externalities highlighted as reasons for equalization programs above could be dealt with through interprovincial negotiation: "In the United States [which has no equalization program], states already do this for some regulatory issues, such as nursing licenses, fisheries management, and life insurance,… [and] interstate services such as ports, transit systems, and bridges" (Sorens 2016).

In the end, the term HFI is really a difference in VFIs, and so its use confounds the discussion of fiscal imbalance. Even so, like the main issue with fiscal flow analysis, equalization programs (including Canada's) appear to be inefficient at addressing differences in individual resident income (versus aggregate, PT-level income) and are as such, fairly blunt instruments. Further, the existence of equalization programs is highly political, with divisive language such as "have" and "have not" – only making the discussion of fiscal imbalance highly charged.

3.4 Fiscal balance sustainability analysis

As its name suggests, fiscal balance sustainability (FBS) analysis examines whether fiscal balances are sustainable over time. In practice, such analysis "often reduces to assertions about the present and projected future course of fiscal flows…An obvious interpretation of fiscal sustainability… is simply that a government should cover public expenditures out of its own revenues – reducing, for example, its dependence on transfers, if it is a [SNG], on foreign assistance, if it is a national government, or on borrowing regardless of its level" (Bird 2003). Effectively, such analyses examine, under assumption, what the 'structural' fiscal balances of various governments will be into the future, and use such results to state if such a future is 'unfair'.

Figure 11 Illustrative Fiscal Outlook



Therefore, analysts employing FBS investigate whether a government can afford to pay its bills over time (sometimes meaning forever), not just within a given year. "The inter-temporal fiscal gap... is another indicator of fiscal sustainability. It is defined as the permanent spending decrease or revenue increase that would be necessary at a point in time to ensure a specified debt-to-GDP constraint is met at the end of the projection horizon. The main benefits in using the fiscal gap are that it communicates the fiscal position in one summary number and indicates the magnitude of the required fiscal adjustment" (Bell, et al. 2010). Some go further: "The analysis produced [by Matier, Wu, & Jackson (2001)]… broadens the [VFI] debate by pointing out the need to take into account existing debt levels and the prudence factor required to ensure [FBS], when comparing the structural fiscal balances of both orders of government. It also advances the argument that [VFI] is only an issue if one order of government has excess fiscal room while the other suffers from a fiscal gap" (Lazar, St-Hilaire and Tremblay 2004).

In Canada, the most prolific analysis on FBS comes from the Parliamentary Budgetary Office (PBO), which started publishing annual "Sustainability Reports" in 2010 (Askari, Barnett, et al. 2010, Askari, Barnett, et al. 2011, Barnett, et al. 2012, Askari, Bartlett, et al. 2013, Cameron, Lao and Shaw 2014, Cameron, Lao and Matier, et al. 2015, Office of the Parliamentary Budget Officer 2016). According to the most recent report, "Fiscal sustainability means that government debt does not grow continuously as a share of the economy. PBO assesses sustainability using the fiscal gap—the difference between current fiscal policy and a policy that is sustainable over the long term. The fiscal gap represents the immediate and permanent change in revenues, program spending, or combination of both (expressed as a share of GDP) that is required to stabilize the net debt-to-GDP ratio at its current level over the long term. PBO refers to a negative fiscal gap (that is, net debt is expected to fall as a share of GDP) as fiscal room." (Office of the Parliamentary Budget Officer, 2016). As Table 1 illustrates, not only has the federal government consistently had a smaller fiscal gap, since 2012 has had fiscal room, whereas the PTs have not.

Table 1 Fiscal gap as % of GDP, according to corresponding annual PBO Fiscal Sustainability Reports

Report:	2010	2011	2012	2013	2014	2015	2016
Federal:	1	1.2	-1.4	-1.3	-1.4	-1.4	-0.9
PTs:	N/A	1.5	2	1.9	1.7	1.4	1.5

Perhaps as expected, like other types of analysis previously discussed, there are concerns with FBS analysis:

- Too assumption driven: "The results of this approach seem very sensitive to both model specification and empirical assumptions" (Bird 2003).
- Often too aggregated: "Of course, [these PBO] estimate[s of PTs' fiscal gap] masks substantial variations across provinces in indebtedness levels and in the levels of fiscal adjustment required to achieve sustainability. There is also a risk of widening disparities in provincial fiscal capacities, especially if resource prices increase significantly in the future. Larger disparities, combined with

> greater provincial occupation of the tax room, could in turn raise difficult horizontal equity issues." (Tremblay 2012).

CANCEA applauds the use of sustainability in a conceptual measure of unfairness. However, FBS models are (so far) highly assumption driven (at a macro-level), and do not allow for policy changes (e.g., government surpluses often tend towards +/- infinity). Further, like other types of analysis previously discussed, FBS analyses do not examine what effects taxation and spending types have on agent behaviour.

3.5 So where does this leave us?

It appears that all the existing analytical methods to determine whether fiscal federalism works suffer from a number of common issues:

- Lack of clarity on what is being optimized: it is unclear in most analyses what the ultimate goal is, either due to weak problem statements, definitional issues, or too much subjectivity.
- Inappropriate level of analysis: all methods focus solely at the SNG-level, ignoring the fact that it is *residents* who are the beneficiaries of government services, not PT governments and ultimately bear the cost of government services.
- Unsuitable time frame: all methods (other than FBS analysis) are done at a point in time – generally ignoring how such measures change – and are not forward looking.

CANCEA's systems approach to economic modeling addresses all of these concerns, and provides decision makers a new way of thinking about fiscal federalism. By looking at the sustainability of Canadian households, we can start to see the impacts of fiscal federalism where it really matters.

4.0 A SYSTEMS APPROACH TO FISCAL FEDERALISM

It is likely that our approach will require some in the debate to think fairly differently. As such, we will take some time to carefully walk through a few basic systems concepts.

In its simplest form, a 'system' is a group of elements (e.g., households) connected by a network of relationships[7] (Klir 1991). The 'identity' of the system is defined by this network of relationships (self-organization), which provides resources to the system elements to pursue their unique and common goals[8] (Skyttner 2005). The sustainability of a system over time requires access to sufficient resources needed to maintain the system's identity (e.g., it doesn't break down) (Ubbelohde 1947). The notion of *sustainability* can be broken down into its two component parts: 'sustain-' meaning the final consumption of resources needed to maintain its identity (e.g., air, food, water, shelter, clothing), and '-ability' meaning needed resources are sourced from either the environment, other agents in the system, or other agents outside the system (e.g., non-residents). This includes turning intermediate resources (e.g., trading labour or other resources) into needed ones. The *prosperity* of a system is determined by the excess resources that remain after ensuring the system is sustainable; in other words: prosperity = (total net resources) – (total needed resources).

Households are the elements that define the identity of a socio-economic system: they are the final consumers, whose 'needs' drive what is meant by being 'sustainable'. Governments and firms merely act as intermediary processes between households – that is, they are a 'means to an end'. For example, governments ensure the stability of the system through the likes of a legal system, defense, infrastructure, and redistribution; industry provides a means of trading resources. The consequences of such intermediate processes ultimately find their way to either resident or non-resident households (or their descendants). As such, households require a stable system of relationships (self-organization) where they have the ability to either gather resources from their environment directly or provide value to other households in exchange for their needs (intermediate processes).

A household's 'residence' is defined by their physical location, say in a particular PT. (This means that PTs are defined simply by the households who reside within given political borders, not as aggregate entities.) PT-resident households interact with: each other via government (e.g., taxes, benefits) and PT-resident industry (e.g., owners, employees), households in other PTs via government and Canadian industry (e.g., suppliers), and non-Canadian households via government (e.g., immigration) and global industry (e.g., trade). As such, relationships between households are affected by government.

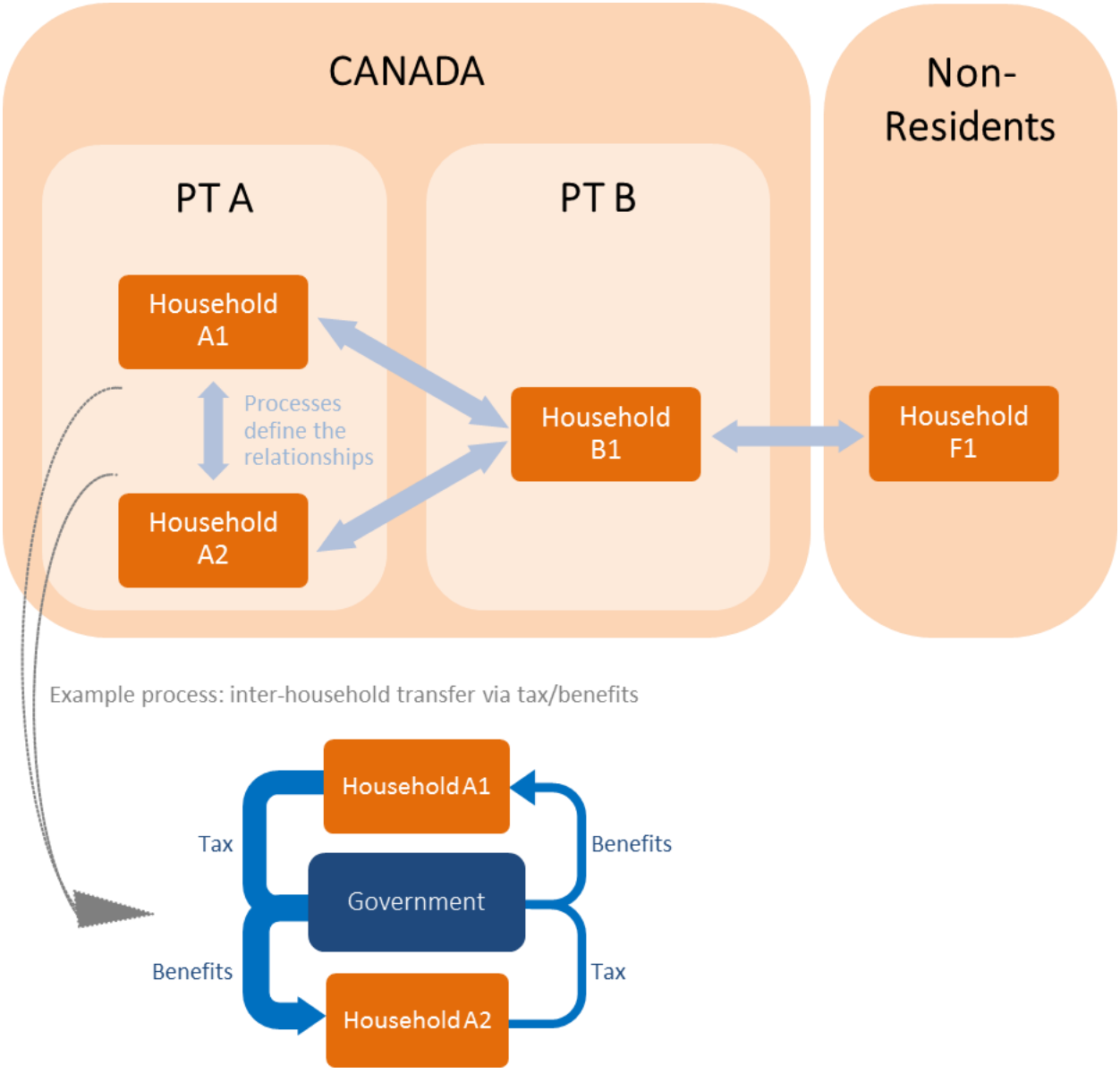
The set of Canadian household relationships will work for some better than others. For example, some government services (e.g., legal system, defense, and infrastructure) insure resource-rich residents more against shocks, as they have more 'at risk'. For others, the act of redistribution through various means (including universal education and health care, in addition to household transfers) disproportionately help those with less resources. *Average* resources (at the PT level) are not a measure of the integrity of the PT

[7] In the General Systems Theory (GST) literature, a useful definition of a system is a 'product of elements and relationships'

[8] In the GST literature, this additional requirement is referred to as the 'continuity of identity and goal directedness'

if the failure of a number of PT-residents to sustain themselves badly damages the whole PT. Therefore, the federal government acts as a 'pinch point' if it creates/induces a scarcity of resources within a specific PT to transfer them to another, particularly if the PT government cannot overcome this action itself to maintain sustainability.

Figure 12 Simplified illustrative example of government process in a system



In this simple example, four households interact with each other through various processes. Government (both federal and PTs) have numerous processes that represent the interaction between households (e.g., transfers between households through taxes and benefits). While a government 'agent' makes decisions about such processes (e.g., tax and benefit rates/exemptions), ultimately the *relationship* is between the households. (These benefits may also include the salary of a government employed household.)

4.1 *Modeling a complex socio-economic system*

Obviously, modeling an economy in this way – that is, from the bottom up – requires methodologies largely unused in traditional economics. Thankfully, with improvements in computing power, a new method is on the rise.

Agent-based modeling provides a framework for modeling a dynamic system, such as an economy, by means of individual agents (e.g., households, businesses, governments), their mutual interaction with each other and their environment. *Prosperity at Risk* (PaR) is CANCEA's award-winning and complex "big data" computer simulation platform that incorporates social, health, economic, financial, and infrastructure factors in an agent-based system. As such, PaR simulates the interactions of more than 40 million virtual agents that are encoded with behavioural rules that enable them to make decisions, act based on those rules, and be influenced by the actions of others (whether intended or not). Each agent can have over 850 features and interacts with other agents across 235 industries and 440 commodities within 5,000+ census areas. (See Appendix A for more details.)

Utilizing this powerful engine, CANCEA has developed indicators related to the consumption of needed goods and services (note that "needs" here can include a portion of a specific good or service, insofar as households may 'overconsume' such things relative to their needs). The *Needs Consumption Affordability Ratio* (NCAR) is one such indicator – tied to each household agent in PaR – that identifies a household's consumption of non-discretionary 'needs' as a proportion of its discretionary net inflows[9]:

$$NCAR = \frac{Cost\ of\ 'needed'\ consumption}{'Discretionary'\ net\ inflows}$$

The higher NCAR gets, the more 'pressure' households feel in making ends meet in a given period, meaning trade-offs (e.g., labour for leisure, 'needs' for 'wants'). As a measure of needs, NCAR measures a household's ability to obtain both its 'basic needs' (i.e., their physical requirements for survival) plus their 'basic opportunity' (i.e., socially-defined minimums, such as education and health care in Canada). This means that 'needs' includes certain types of consumption (e.g., food), without any judgement regarding the choices made within those types (with some exceptions, such as excluding alcohol from beverages). Sustainability is then about maintaining a household's 'Canadian' lifestyle, and thus carries a directional definition (e.g., "are things getting worse for me?"). If the distribution of NCARs across a PT sees too many households as unsustainable, then the PT as a whole can be said to be unsustainable. In such cases, the PT government would likely start to experience significant pressures on its income statement and balance

[9] Discretionary net inflows = All sources of inflows (e.g., wages, transfers, net savings) less non-discretionary financial obligations such as taxes and interest payments. Only taxes and transfers are applicable to our analysis herein. See the appendix for further details.

sheet (and resultant indicators) as households start trading off between wants and needs, or start depending on the PT government for the likes of financial assistance and health care.

We can then examine the impact that government action (or even structure, as is the case in this project) has on households' sustainability. For example, simulations can be run in PaR to see the impact of various policy changes (at the federal and PT government levels) to determine how much influence each order of government can have on the PT's sustainability. Such policy changes could include tax rates/exemptions, transfers to individuals, or infrastructure investments. Each simulation can also track many other outcomes such as government fiscal balances and debt-to-GDP ratios, and economic activity. As shown in section 4.4, our approach is to define such scenarios and investigate their impacts on households (not PTs) across the country.

Some of the existing literature does hint at this approach. For example:

- VFI "could be an issue when one order of government is able to achieve structural fiscal balance or surpluses on a consistent basis while the other order of government is in a precarious fiscal position… [However,] there is nothing automatic about these circumstances being symptoms of [VFI]... it is only when the order of government with the weaker fiscal structure is effectively precluded from correcting this weakness on its own (say because the fiscally stronger level of government has occupied too much tax room or has unilaterally reduced its share of joint-program funding) that a VFI can be said to exist." (Lazar, St-Hilaire and Tremblay 2004).
- "The argument has been made that the federal government's fiscal response to its structural deficit and debt problems that built up over the 1980s has been a disproportionate reduction in transfers to the provinces, effectively passing on some of its deficit to the latter." (Boadway and Tremblay 2005).
- "Meeting voters' demands for services… should be the basis for defining a [VFI]." (Dalby 2005).
- "Citizens demand services from their elected officials, and elected officials respond subject to the availability of government resources." (Inman 2008).
- "The presumption that the provision of public services should be located at the lowest level of government encompassing, in a spatial sense, the relevant benefits and costs." (Oates 1999).

The novelty of this approach is tracing the impacts of government processes as they affect the sustainability and prosperity of households. This ensures that the analysis is conceptually well-defined and objectively clear on the "so what?", done at the appropriate level, that is, tied to households as the base elements of a socio-economic system (as base elements, all the effects of government policy are reduced to the benefits and costs to households), and dynamic in time, allowing for backward- and forward-looking sensitivity evaluation. As such, the analysis presented here should provide new insights in the discussion about fiscal federalism.

4.2 The current situation in Canada

The following two charts showcase the distributions of Canadian households by after-tax market income and needs consumption (where darker areas represent more households[10]). Figure 13 presents how much is spent on needs in a given year versus after-tax market income. Households above/left of the red dashed line are by definition using transfers/borrowing/asset sales to consume their needs, giving them an NCAR of 1 in the period (the question of this being sustainable is a different question). As household income rises, so does spending on needs (though not equally), largely demonstrating an increase in 'basic opportunity' – that is, for example, that 'middle-income' households consume 'middle-income' housing[11]. Figure 14 presents NCAR versus income, and shows that many low-income families are under extreme pressure to make ends meet. It also shows that many low-income households have the same NCAR as many higher-income households, again demonstrating the impact of households consuming 'basic opportunity' needs.

Figure 13 Distribution of needs consumption vs. after-tax market income

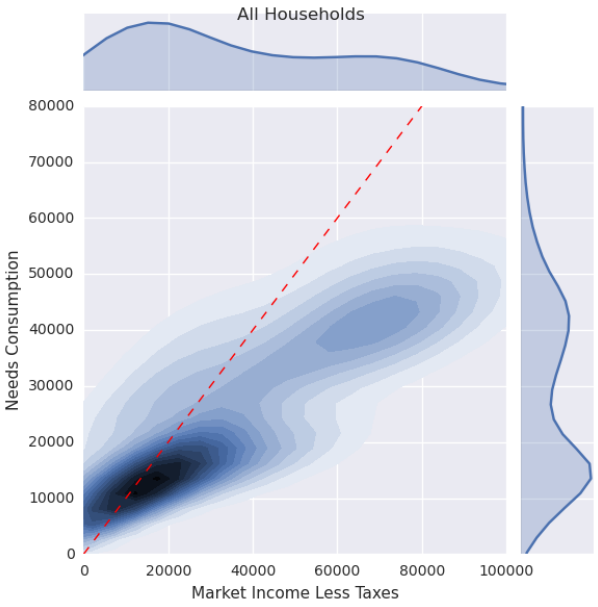
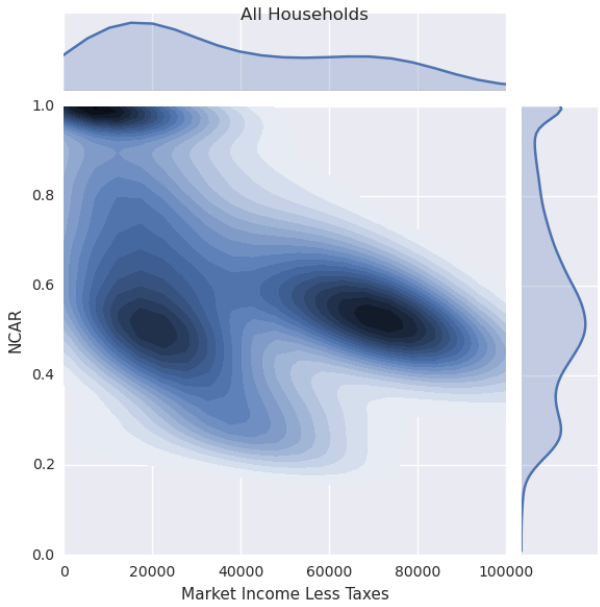


Figure 14 Distribution of NCAR vs. after-tax market income



However, breaking these charts down by household type, an even starker picture starts to emerge for lone-parents (and singles to an extent) trying to make ends meet. As Figure 15 and Figure 16 show, while singles are typically lower-income relative to other household types, a smaller portion of them are under extreme pressure to make ends meet than the lone-parent households. Most couple households have below average NCARs, meaning it is easier for them to make ends meet than the other household types.

[10] All contours collectively capture at least 95% of households

[11] Note that in most cases, this is due to a distributed supply of big ticket 'needs', such as housing. While many household incomes may go down simultaneously due to a large economic change, there may not a matched stock of cheaper housing available to those households.

Figure 15 Distribution of needs consumption vs. after-tax market income by household type

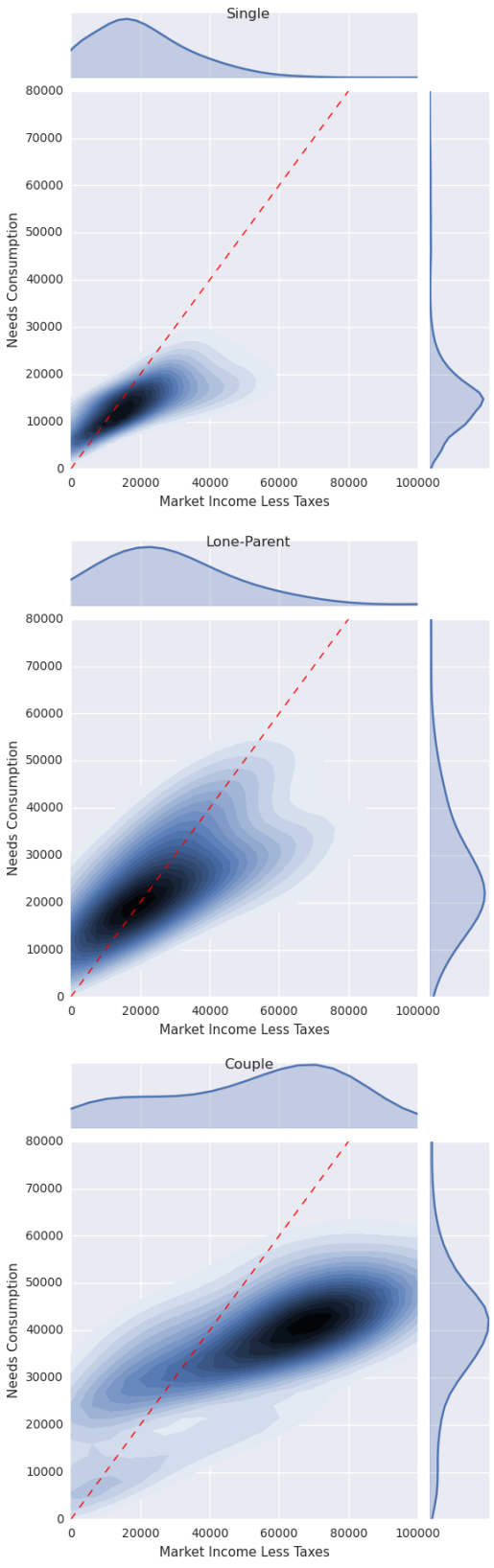
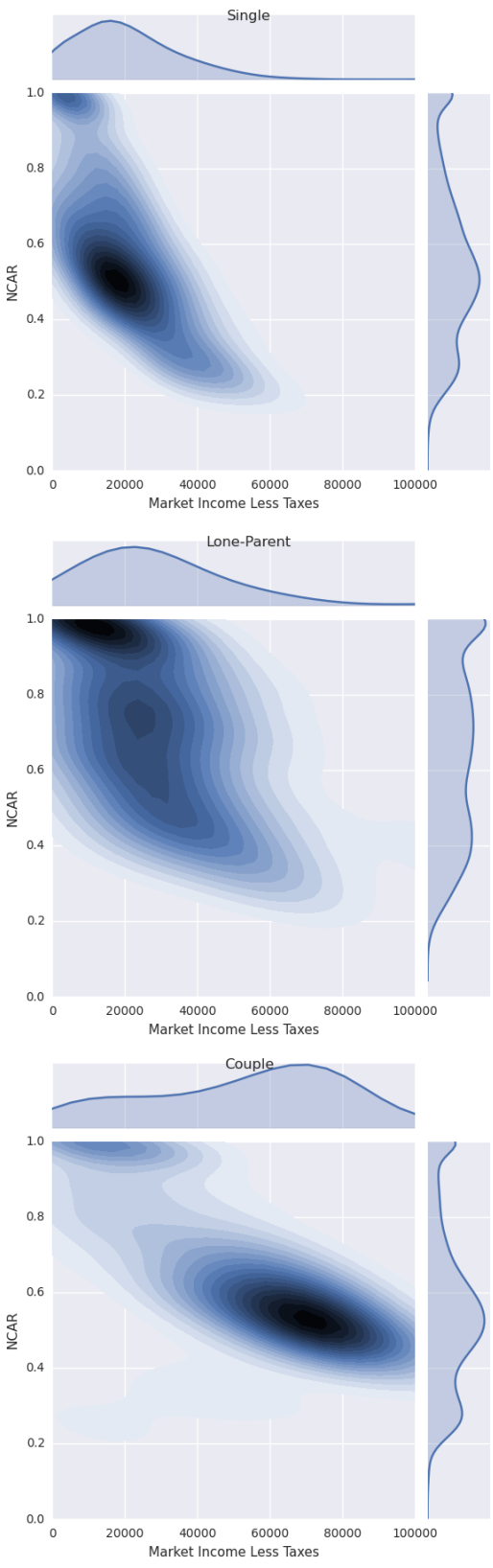


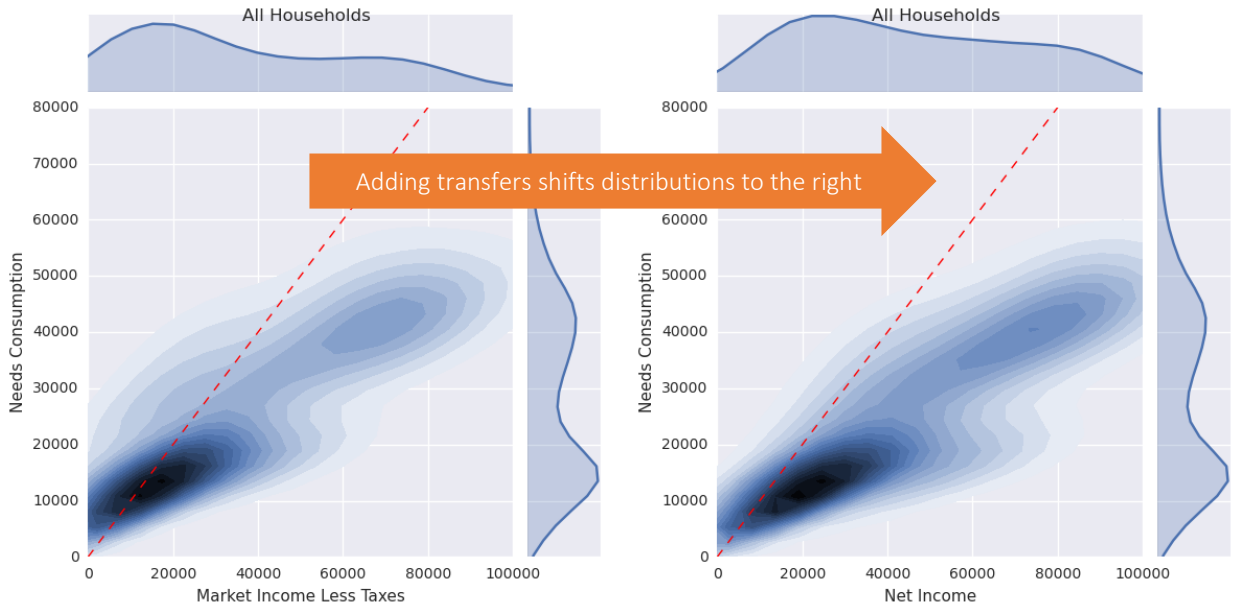
Figure 16 Distribution of NCAR vs. after-tax market income by household type



4.2.1 CANADIANS TAKE CARE OF THEIR OWN

Canadian governments transfer significant amounts of money to (predominantly lower-income) households. In the third quarter of 2016 (seasonally-adjusted at annual rates), the federal, provincial, and local governments transferred roughly $145 billion to households, plus over another $15 billion to non-profits serving households[12]. Federal/provincial/local transfers to households and the non-profits serving them respectively represent 39%/15%/4% of own-source revenue, meaning that much of what the federal government does (and the provinces to a much lesser, though still noticeable extent) is transfer money from one household to another. The result of such transfers, as shown on the bottom chart (which includes transfers in income), is that pressure to make ends meet is significantly reduced, especially for lower-income families. That is, transfers make lower-income households more sustainable at their current consumption rates (or, the transfers afford them great 'basic opportunity', in some cases). Interesting to note is that the NCARs for many households, including those with relatively *higher* incomes, are lowered by transfers. This is likely due to the extensive redistributive benefits for seniors (e.g., Old-Age Security).

Figure 17 Distribution of needs consumption vs. income, without (left) and with (right) transfers

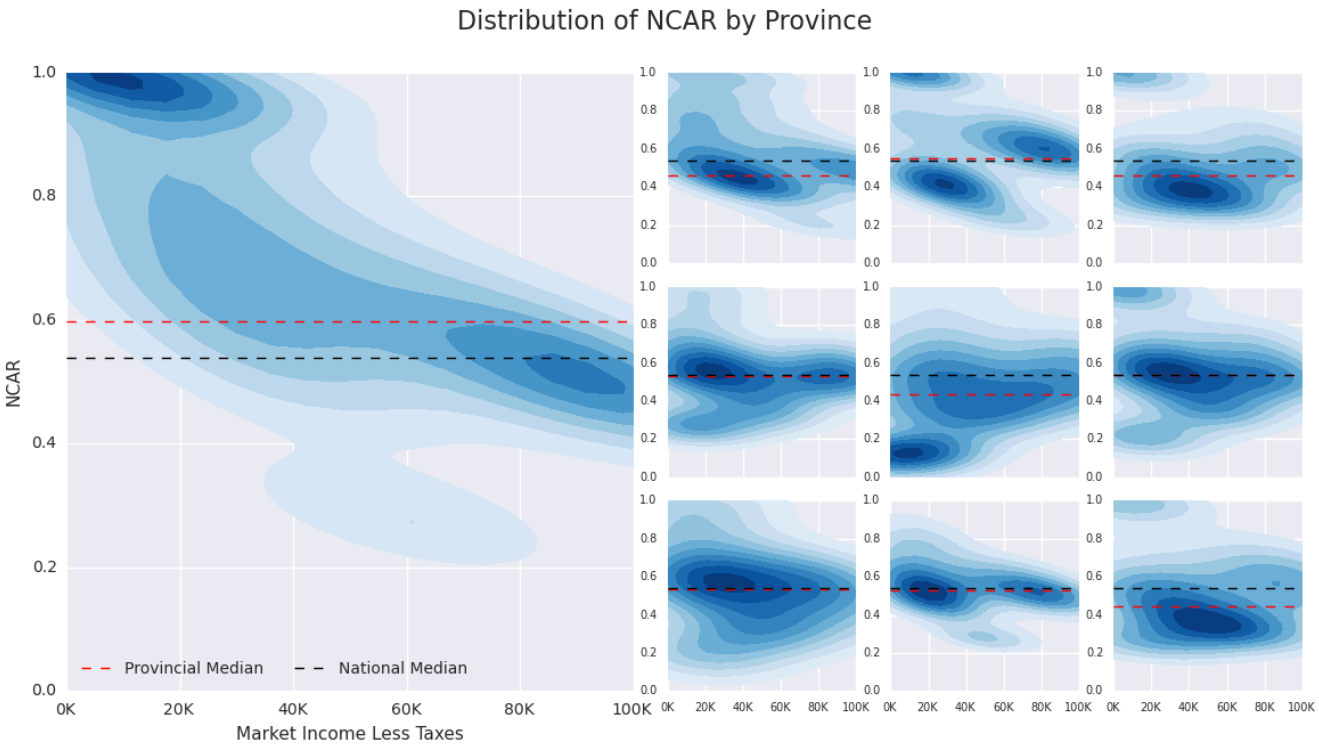


4.2.2 A LARGE DISPARITY BETWEEN PROVINCES

Due to the fact that Canada is highly decentralized (as discussed in Section 2.0), NCAR and income distributions also vary widely by province of residence. We're purposefully not showing provincial names in the following figures (see appendix) to ask "does this seem 'Canadian'?" That is, does it look like fiscal federalism is working? Shouldn't a household's economic situation, and not their location, determine level of assistance?

[12] CANSIM Table 380-0080, excludes CPP/QPP

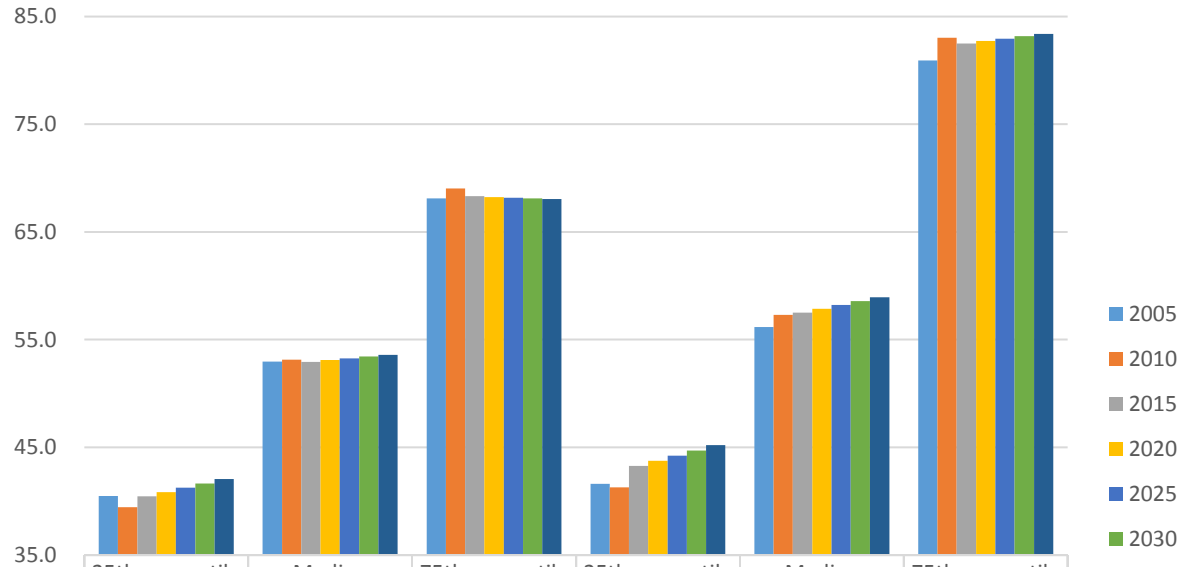
Figure 18 Distribution of NCAR by province



4.3 NCAR over time

As context (and as shown in Figure 19), NCAR does change over time as incomes, prices, and demographics change. (Years beyond 2015 are based on CANCEA's base projections for the Canadian economy, with Ontario shown specifically as well.) Note that the median Canadian NCAR changes by 1.2% between 2005 and 2035 while it changes by 5.0% for Ontario specifically, which was higher to begin with. Because NCAR does not change wildly in aggregate (though can do so at the individual household level), these small sounding changes actually represent significant tightening of household pocketbooks. That means that even small sounding changes in NCAR due to *policy* changes can represent noticeable differences in households' ability to make ends meet, particularly those at the high end. From this perspective, the 75th percentile NCAR in Canada actually decreases by 0.1% between 2005 and 2035. Unfortunately, the same metric in Ontario gets worse by 3.1%, increasing to 83.4 – meaning that 25% of Ontario households will be spending at least 83.4 cents of every disposable dollar in their pockets on "needs", well above the national average.

Figure 19 NCAR over time

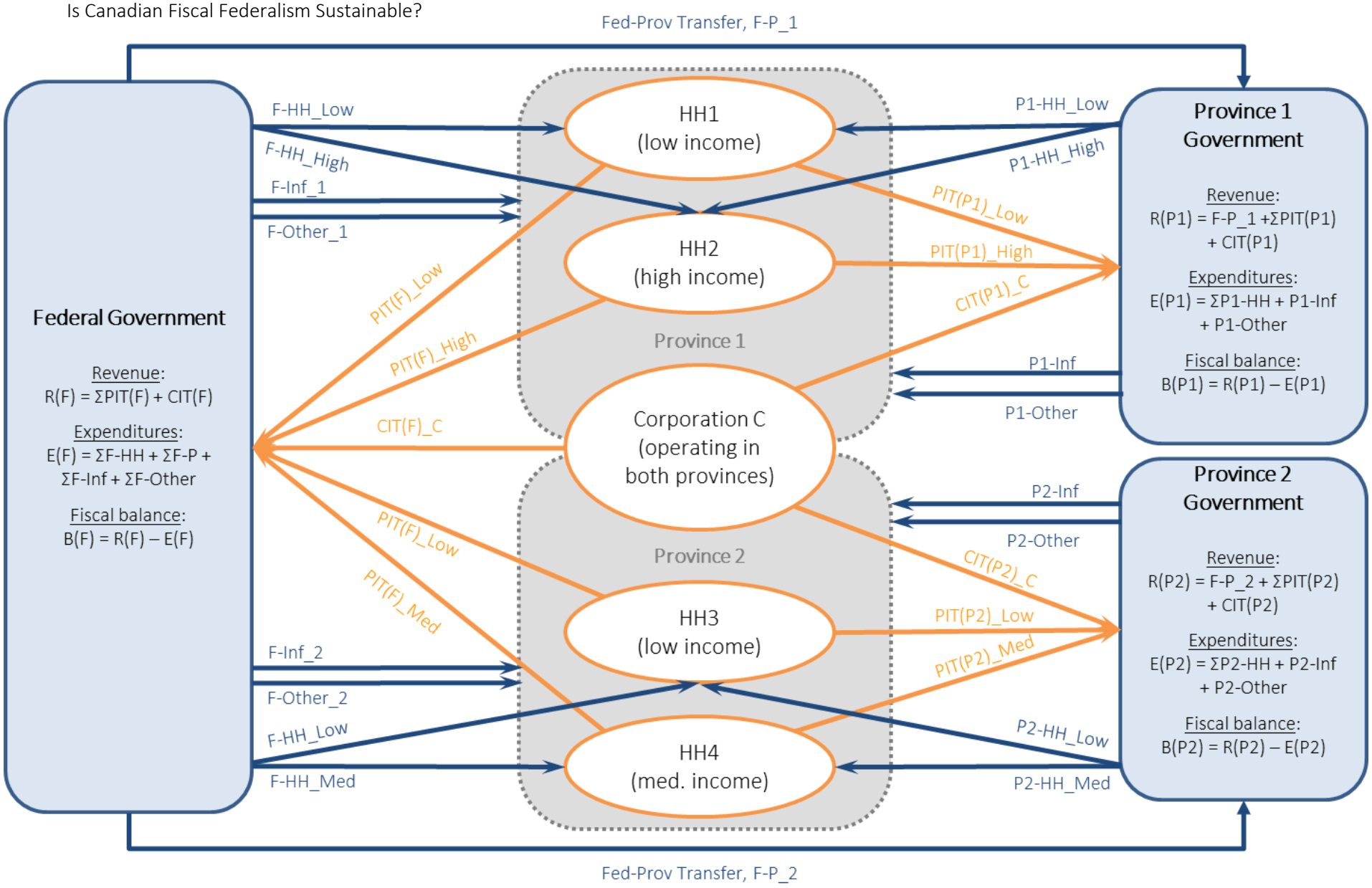


	25th percentile	Median	75th percentile	25th percentile	Median	75th percentile
		Canada			Ontario	
2005	40.5	53.0	68.1	41.6	56.2	80.9
2010	39.4	53.2	69.0	41.3	57.3	83.0
2015	40.4	52.9	68.3	43.3	57.5	82.5
2020	40.8	53.1	68.2	43.8	57.9	82.7
2025	41.2	53.3	68.2	44.2	58.2	82.9
2030	41.7	53.4	68.1	44.7	58.6	83.2
2035	42.1	53.6	68.0	45.2	58.9	83.4

4.4 Defining the policy 'space'

In order to examine fiscal federalism, we ensure that we are isolating the main drivers of it on households, within the allowable multi-order of government constraints of the *Constitution Act*. Aspects of government within a single jurisdictional domain (e.g., healthcare, education, and property vs. criminal justice, defense, and foreign affairs; plus government administration) – called "other" herein – are not evaluated directly. (These are, however, part of the decision-system for government.) We therefore focus on taxation, transfers, and infrastructure as responsibility levers.

Further, we are not examining the effectiveness of government taxation/expenditure policies here. This study is simply about the effects of one order of government taking up some policy 'space' (in taxation, transfers, or infrastructure) at the expense of the other. The following page provides a flow-chart of possible scenario policies (in a toy model system; the one we use for modeling uses all households, industries, and governments in Canada). The flow-chart, while highly simplified, shows the complexity of the economic system as it actually works on the ground, and can be thought of as a household-level 'fiscal flow analysis'.



LEGEND: PIT = Personal Income Tax; CIT = Corporate Income Tax; Inf = Infrastructure spending; Other = Other expenditures

For simplicity, the federal government is the main driver of policy changes in all modeled scenarios, with corresponding provincial actions. To ensure the clarity of the measured impact, any changes are fiscally neutral (i.e., no initial change in their surplus/deficit) for every government:

$$\Delta B(F)=0 \text{ and } \Delta B(Px)=0 \text{ for each Px}$$

Therefore, if provincial revenues change, then provincial expenditures need to change accordingly (which will be easier for some provinces than others). In the end, all results are simply about "who does what" in the federation. This assumes that Provinces can adjust their rates accordingly.

4.4.1 THE SCENARIOS

With the policy space now defined, we can run various scenarios to see the impacts of one order of government acting in the space relative to the other. These scenarios are not about changing general government policy (e.g., *overall* taxes increase to fund a new expense), only about the shares of these spaces taken up by each order of government. That is, it is to help set directional goals. There are four scenarios:

1. (De)centralization: Federal-provincial transfers range from down to zero up to double the current amount (roughly $75B) – in proportion to current transfers by province, and:

    a) Federal transfers to households offset correspondingly (with provinces changing their household transfers to remain fiscally neutral); or

    b) Feds offset via personal income taxes (provinces offset accordingly)

2. Corporate vs. personal tax: Federal government trades from down to zero up to provincial corporate income tax revenue (roughly $25B) – which is more risky and mobile – for personal income tax room

3. Infrastructure upload: Federal government increases revenue (provinces decrease) to spend between their current infrastructure spend (roughly $10B per year for fixed capital) and the current federal plus provincial spend (roughly $50B) on a per capita basis by province

In table format, and tying back to the flow-chart on the previous page:

Table 2 Factors affected by the each scenario

Scenario	F-P transfer	F-HH transfer	Prov-HH transfer	Fed Inf	Prov Inf	Fed PIT	Fed CIT	Prov PIT	Prov CIT
1a	↓/↑	↑/↓	↓/↑						
1b	↓/↑					↓/↑		↑/↓	
2						↓/↑	↑/↓	↑/↓	↓/↑
3				↑	↓	↑	↑	↓	↓

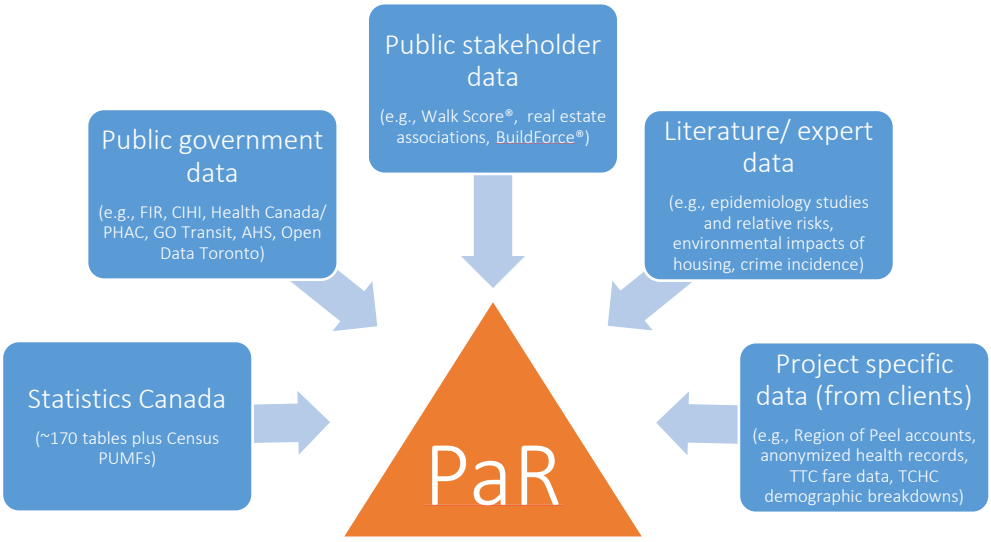
What exactly are we trying to measure here? In each scenario, we adjust the given policies and determine: which households 'win' and 'lose' (where 'winners' see decreases in NCAR, meaning more prosperity; 'losers' see increases in NCAR, meaning growing pressure to make ends meet) and by how much do these households' NCARs change? From there, we can show:

- What is happening to NCARs across the country? (i.e., generally up or down?);
- What is happening to the distribution of NCAR across Canada? (e.g., are households already under the most pressure seeing more prosperity or less sustainability?); and
- In which province do these households live? Are provinces moving towards their 'fair share' of NCAR distribution? (this only matters from a political perspective).

Given the underlying tendency of Canadians to help each other out (again, 2/3 of transfers to households or non-profits serving them come from the federal government, versus 1/3 from PTs), intergovernmental policy shifts that lower NCAR overall – but particularly for households at lower incomes – make households more sustainable.

4.5 Data

Data in PaR is drawn from hundreds of data sources, especially Statistics Canada data:



Such data are 'triangulated' to individual agents such that each data set is reconcilable from PaR. Table 3 shows a number of example descriptive statistics of Canadian households (each province would have different values).

Table 3 Example descriptive statistics of Canadian households (2014)

		Canada
Average Expenditure By Income Quintile	[0,20)	33,423
	[20,40)	48,624
	[40,60)	69,119
	[60,80)	95,101
	[80,100)	161,554
Fraction of Income from Transfers by Income Bracket	<20,000	46.8%
	20,000 to 49,000	29.5%
	50,000 to 99,000	13.9%
	100,000+	9.7%

	Number of households by type				Household Income (incl. singles)
Province	Couple	Lone-Parent	Single	Total	Median
Alberta	983,556	146,550	640,840	1,770,946	67,695
British Columbia	1,128,641	164,906	814,976	2,108,523	49,697
Manitoba	290,248	56,879	198,965	546,092	47,043
New Brunswick	187,654	35,307	129,383	352,345	44,064
Newfoundland & Labrador	135,173	25,172	81,986	242,332	50,725
Nova Scotia	219,909	46,175	167,499	433,583	43,899
Ontario	3,192,178	556,396	2,082,470	5,831,045	52,663
Prince Edward Island	34,516	6,418	23,481	64,415	44,479
Québec	1,930,323	309,654	1,629,423	3,869,399	42,596
Saskatchewan	256,807	51,703	170,367	478,877	55,741
Canada (all provinces)	8,359,003	1,399,162	5,939,390	15,697,555	50,421

5.0 RESULTS

We present our results as 'box-plots' here to provide a sense of both the changes in NCAR on the whole, but also the distribution of NCAR across households.

Each box-plot shows the full range of NCAR distributions for all households (as well as those below and above the median market income for Canada) under each policy option. The top and bottom horizontal lines represent the top and bottom of the distribution. The "boxes" show the range for the middle half of households. The middle line shows the median (i.e., middle) household, where half of households have a higher NCAR and half have a lower NCAR. The smaller the box, the smaller the range between the 25th and 75th percentile households. The higher the numbers, the more stress households are under to make ends meet.

A policy of +/-0.5 'policy' means an *immediate* 50% shift away from the status quo. So, for example, in Scenario 1a: the -1 policy shift means a 100% decline (or elimination) in federal-provincial transfers while a +1 means a 100% increase (or doubling) of such transfers. Each box-plot indicates the policy change in blue arrows. These shifts all occur immediately, but given the requirement for immediate balanced budgets as well, such outcomes would perpetuate over time. So it is enough to state the direction and relative magnitude of a change in order to understand the longer-term implications as well.

Some numeric results are provided below, with all being presented in the appendix. We should note that, while some of the changes may be difficult to see on the charts, make no mistake that even a small difference in NCAR could make a real difference in the lives of millions of households (e.g., imagine having 5% more of your discretionary income to spend on 'wants' or save).

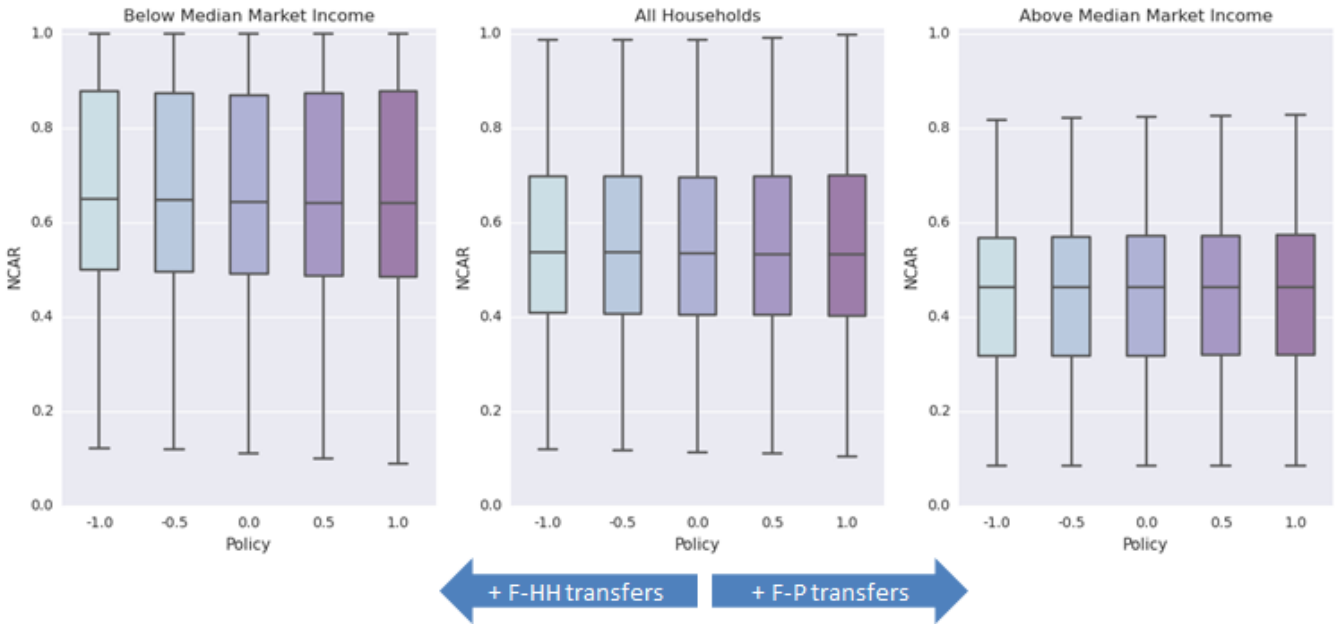
Scenario 1a

In our first scenario, federal-provincial transfers go down (or up), federal transfers to households go up (or down), and provincial transfers to households go down (or up). (Government could deliver "needs" directly – e.g., via subsidy – but this is both logistically more difficult and would, in most cases, not reduce NCAR by as much as a cash transfer[13]). The result is that the federal government changes its support to households directly vs. indirectly through provinces. In other words, this is a centralization (or decentralization) of transfers to households.

As shown in Figure 20, as federal-provincial transfers decrease in exchange for greater federal transfers to households, the aggregate NCAR (i.e., the median lines under each 'policy' in the middle "all households" chart) changes only slightly. The median NCAR across Canada increases by 0.5% (from 53.4 to 53.6) as federal-provincial transfers are eliminated and decreases by 0.4% as such transfers are doubled.

[13] This is because a reduction in needs appears in the numerator while an increase in income is in the denominator. NCAR would be lowered more by an equally-valued delivery of needs when *overall* needs are less than income (with transfers), which in most cases would likely not occur (i.e., why would such households be getting assistance?) Further, the additional delivery costs would necessitate additional taxation, creating a (potentially very) small increase in NCAR.

Figure 20 Canada-wide changes on NCAR – Scenario 1a



However, households in some provinces see slight overall improvements in NCAR as federal-provincial transfers decrease (moving left on the charts) while others (especially those with disproportionate transfers provided currently) see NCAR increase significantly. This is particularly true for lower-income[14] households, as shown in Figure 21. For example, the median NCAR in Ontario and British Columbia would decrease by 1.8% and 0.8% respectively through the elimination of federal-provincial transfers versus an increase in median NCARs in New Brunswick and PEI of 15.9% and 15.5% respectively. Remember here that a) the population sizes are very different; and b) Ontario and B.C. have the highest median NCARs to begin with.

The important point here is that households in some (larger/richer) provinces see improvements in NCARs as federal-provincial transfers decrease, but this is offset by significant increases in NCAR in other provinces where lower-income households *receive disproportionate transfers already*. That is, lower-income Canadians in some (particularly larger/richer) provinces are harmed by fiscal federalism while those in other provinces are helped by it. However, as federal spending shifts to the household directly, NCARs across the country converge, meaning a roughly zero-sum (but arguably "fair") policy trade[15]. What we mean by this is that by providing federal support directly, we end up treating households as 'Canadian' with different economic statuses, versus 'provincial' with different geographic 'statuses'.

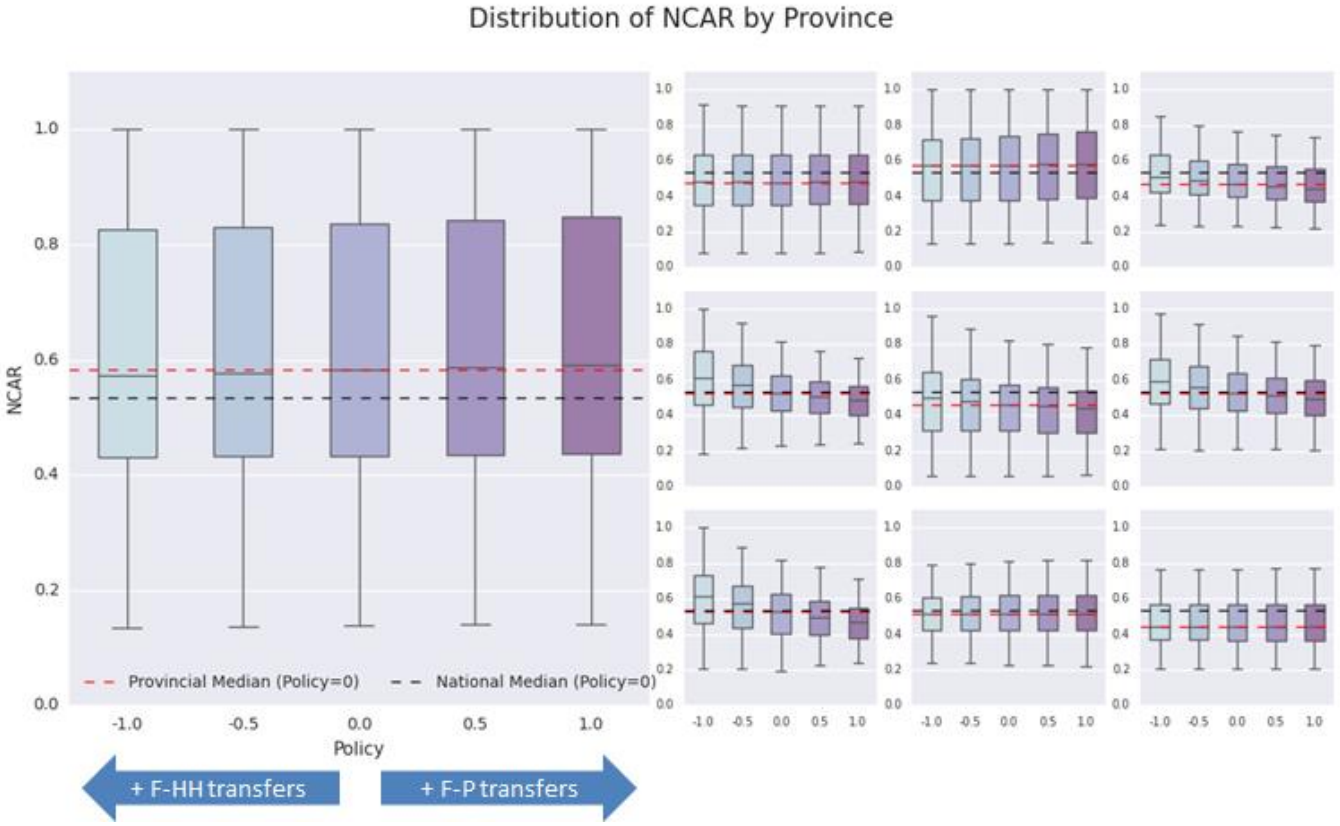
This convergence (i.e., lowering the variability of median NCAR, particularly across provinces) does not require a full elimination of federal-provincial transfers, however. In fact, the variance across provinces (as

[14] From hereafter, "lower-income" means below median after tax income, including transfers.

[15] We'll note that the (status quo) median NCAR in Ontario is 58.3 versus 44.3 in Saskatchewan. However, among lower-income households, the range increases as Ontario's median NCAR among this group shoots up to 83.2 with no similar increase in other (less economically diverse) provinces.

well as the range across them) is lower at the 50% reduction level than at the 100% reduction level. This suggests that there could be an *optimal* restructuring of fiscal federalism.

Figure 21 Province-specific changes to NCAR among lower-income households – Scenario 1a

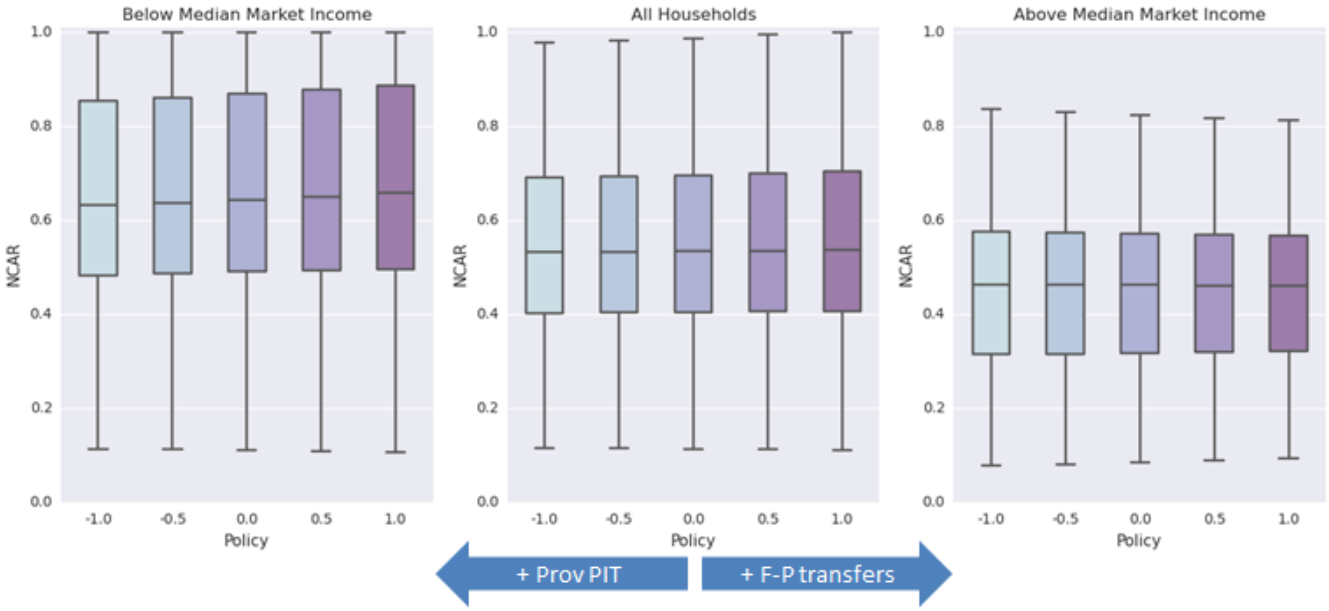


Scenario 1b

In our second scenario, federal-provincial transfers go down (or up), federal PIT goes down (or up), and provincial PIT goes up (or down). The result is that PIT are more (or less) of a provincial responsibility than they are currently. In other words, this is a decentralization (or centralization) of PIT revenue.

As shown in Figure 22, as federal-provincial transfers decrease in exchange for more provincial PIT revenue, aggregate changes in NCAR are again relatively small. For example, the median NCAR in Canada decreases by 0.3% (from 53.4 to 53.2). This drop is more apparent for lower-income households, however, with only a tiny increase to higher-income households. Specifically, the median NCAR among lower-income Canadian households drops by 1.7% (from 64.3 to 63.1, a noticeable drop) while the median among higher-income Canadian households only increases by 0.1% (from 46.2 to 46.3).

Figure 22 Canada-wide changes on NCAR – Scenario 1b



Provinces are split in overall changes to NCAR as federal-provincial transfers decrease. Similar to Scenario 1a, households in the larger/richer provinces are the ones that see improvements, though only as NCARs across the countries converge. Québec, Ontario, British Columbia, and Alberta all see noticeable drops in median NCAR (of 1.0%, 1.9%, 2.5%, and 3.4% respectively), while the other provinces see increases (ranging from 1.0% to 11.5%).

Part of the variation across provinces is because provincial tax rates vary widely. As an example, Table 4 shows provincial PIT payable (in 2016) as a percentage of taxable income (applying the provincial basic personal exemptions only, so are heavily simplified). As is seen, Quebec residents pay the highest taxes at virtually all income levels while Alberta/British Columbia residents pay the lowest (or close to it) at all incomes. Ontario starts near the bottom, but ends up in the middle for higher incomes – almost entirely due to their legacy 'surtax' (an additional PIT imposed on the basic PIT itself; PEI is the only other province with such a tax, though it is relatively *much* smaller).

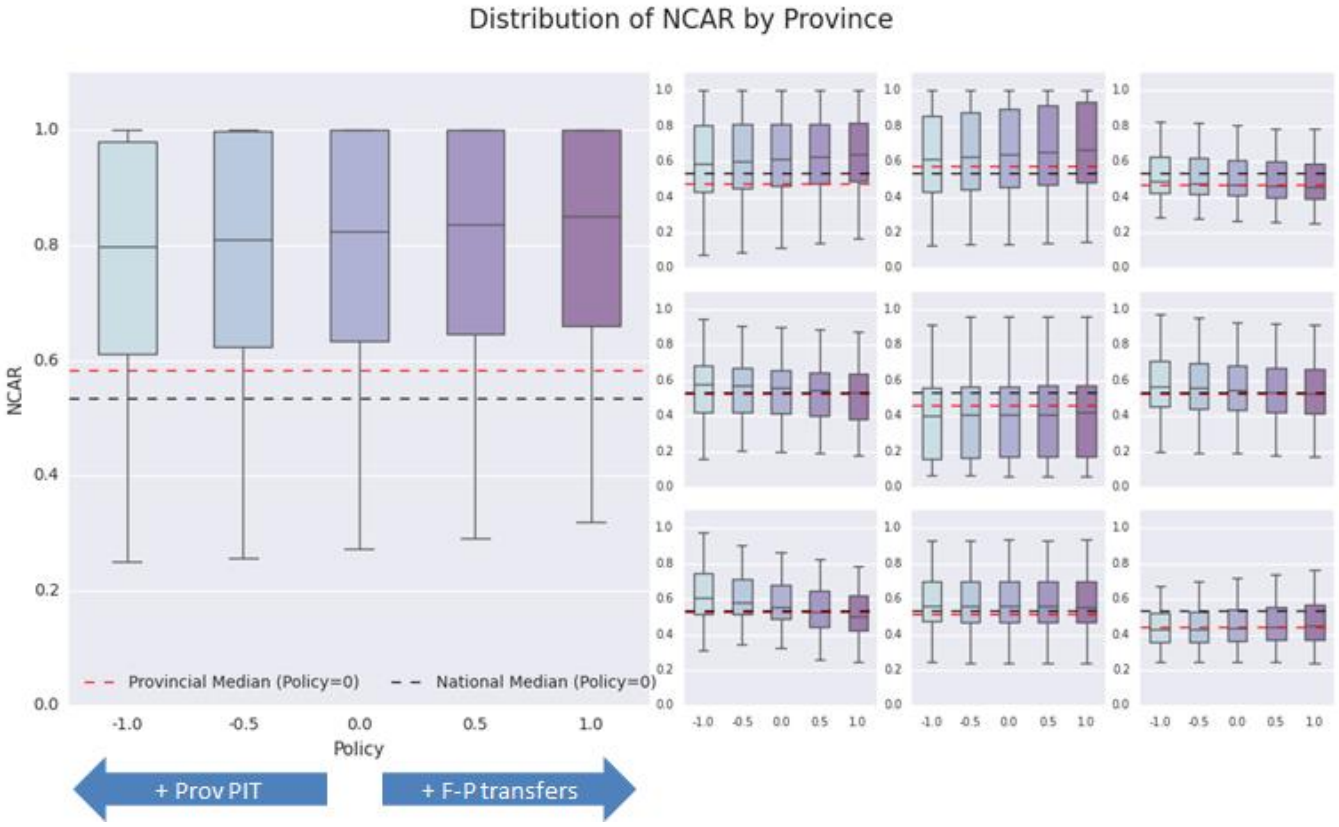
Table 4 (Simplified) provincial PIT payable (2016) as a percentage of taxable income

Taxable Income	NFLD	PEI	N.S.	N.B.	ONT	QUE	MAN	SASK	ALB	B.C.
10,000	1%	2%	1%	0%	0%	0%	1%	0%	0%	0%
20,000	5%	6%	5%	5%	3%	4%	6%	2%	1%	3%
30,000	6%	7%	6%	7%	3%	8%	8%	5%	4%	3%
40,000	7%	9%	9%	7%	4%	10%	9%	7%	5%	4%
50,000	8%	10%	10%	9%	5%	12%	10%	8%	6%	5%
60,000	9%	10%	11%	10%	5%	13%	10%	9%	7%	5%
70,000	10%	11%	12%	10%	6%	14%	11%	9%	7%	6%
80,000	10%	12%	12%	11%	7%	15%	12%	10%	8%	6%
90,000	11%	12%	13%	12%	7%	16%	12%	10%	8%	6%
100,000	11%	13%	13%	12%	8%	17%	13%	10%	8%	7%
110,000	12%	13%	14%	13%	9%	17%	13%	11%	8%	8%
120,000	12%	14%	14%	13%	10%	18%	13%	11%	8%	8%
130,000	12%	14%	14%	13%	11%	19%	14%	11%	9%	9%
140,000	12%	14%	14%	13%	11%	19%	14%	11%	9%	9%
150,000	13%	15%	15%	14%	11%	20%	14%	12%	9%	10%
160,000	13%	15%	15%	14%	12%	20%	14%	12%	9%	10%
170,000	13%	15%	15%	15%	12%	20%	15%	12%	10%	10%
180,000	13%	15%	16%	15%	13%	21%	15%	12%	10%	10%
190,000	13%	15%	16%	15%	13%	21%	15%	12%	10%	11%
200,000	13%	16%	16%	15%	13%	21%	15%	12%	10%	11%
250,000	14%	16%	17%	16%	15%	22%	16%	13%	11%	12%
300,000	15%	17%	18%	17%	16%	23%	16%	13%	11%	12%
350,000	15%	17%	18%	17%	16%	23%	16%	14%	12%	12%
400,000	15%	17%	19%	18%	17%	23%	16%	14%	12%	13%
450,000	15%	17%	19%	18%	17%	24%	16%	14%	13%	13%
500,000	15%	17%	19%	18%	18%	24%	16%	14%	13%	13%
550,000	16%	17%	19%	19%	18%	24%	17%	14%	13%	13%
600,000	16%	17%	19%	19%	18%	24%	17%	14%	13%	13%
650,000	16%	18%	20%	19%	18%	24%	17%	14%	13%	14%
700,000	16%	18%	20%	19%	18%	24%	17%	14%	13%	14%
750,000	16%	18%	20%	19%	19%	25%	17%	14%	14%	14%
800,000	16%	18%	20%	19%	19%	25%	17%	14%	14%	14%
850,000	16%	18%	20%	19%	19%	25%	17%	14%	14%	14%
900,000	16%	18%	20%	19%	19%	25%	17%	14%	14%	14%
950,000	16%	18%	20%	19%	19%	25%	17%	14%	14%	14%
1,000,000	16%	18%	20%	19%	19%	25%	17%	14%	14%	14%

Source: Canada Revenue Agency; calculations by CANCEA.

Given this large variation in personal taxes paid, lower-income households in many provinces could be better supported by their richer in-province neighbours. Therefore, as shown in Figure 23, NCARs (and their spreads) decrease in many provinces as federal-provincial transfers decrease. Similar to Scenario 1a, lower-income households in larger provinces are significantly better off versus smaller provinces. For example, the median NCAR among lower-income households in British Columbia decreases by 4.9% (from 63.5 to 60.4).

Figure 23 Province-specific changes to NCAR among lower-income households – Scenario 1b



On the whole, if the federal government provided PIT "room" – with the provinces themselves raising the funds necessary to pay for services – NCARs would decrease and converge slightly overall, especially for lower-income households. This would suggest that Canadians *on the whole* would be better off allowing provinces to self-fund their services, and that lower-income households *overall* are being unnecessarily harmed by federal-provincial transfers. This is mainly because there are currently more low-income Canadians living in higher-income provinces, and are therefore not proportionately helped by centralization. This convergence is noticeable among lower-income households, where the range in median NCARs across the provinces among this group drops by 5%.

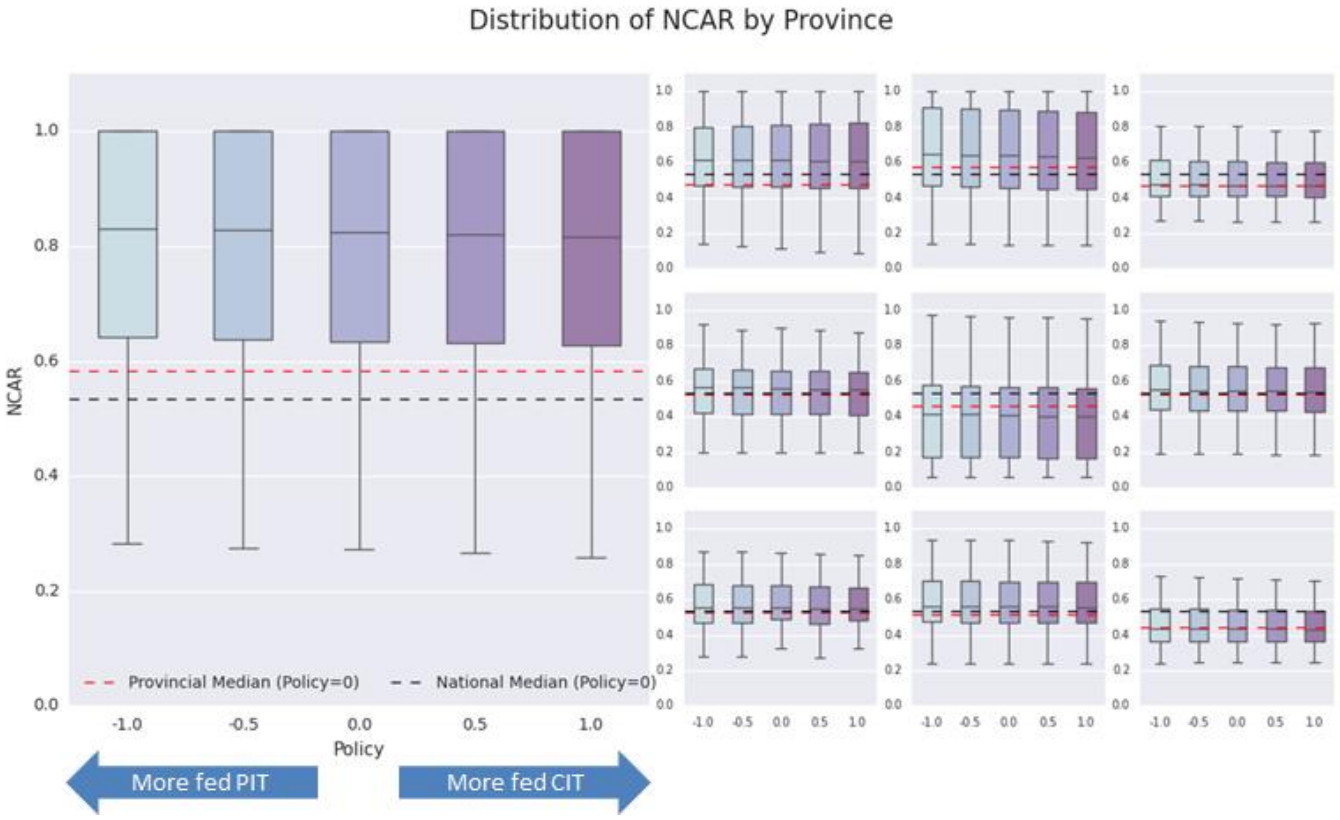
This raises the fundamental question of these first two scenarios: "given our fiscal federalism, where would you rather be a low-income Canadian?" That there may be an answer to that question should give us pause.

Scenario 2

In this scenario, federal personal income taxes go down (or up) and corporate taxes go up (or down), while provincial personal income taxes go up (or down) and corporate taxes go down (or up). The result is PIT is more/less of a provincial responsibility than they are currently while CIT is more/less of a federal responsibility. In other words, this is a trade of corporate taxes for personal income taxes.

Overall, the CIT for PIT trade has a relatively small effect on the aggregate NCAR. The median NCAR across the country would drop by 0.5% (from 53.4 to 53.1) if the federal government took on all CIT. Lower-income households in some provinces see a slight decrease in NCAR as the federal government takes on more CIT vs. PIT, while those with higher incomes see a very slight increase. The range in changes in median NCARs across provinces is small (-1.5% to +0.5%) and there is essentially no convergence in this policy space.

Figure 24 Province-specific changes to NCAR among lower-income households – Scenario 2



This would suggest that the main reason to have the federal government take on a greater share of CIT vs. PIT is one of risk management for provincial revenues (as corporate income is more mobile than personal). While beyond the scope of this paper, we point out that, similar to PIT, there are significantly varying CIT rates across provinces:

Table 5 Provincial CIT rates (2016)

Province	General CIT rate	Small Business Rate*
Alberta	12%	3%
British Columbia	11%	2.50%
Manitoba	12%	0%
New Brunswick	14%	4%
Newfoundland & Labrador	15%	3%
Nova Scotia	16%	3%
Ontario	11.50%	4.50%
Prince Edward Island	16%	4.50%
Quebec	11.90%	8%
Saskatchewan	12%	2%

** Small business limit is $350,000 in NS, $450,000 in MB, and $500,000 in other provinces*

Source: Taxtips.ca

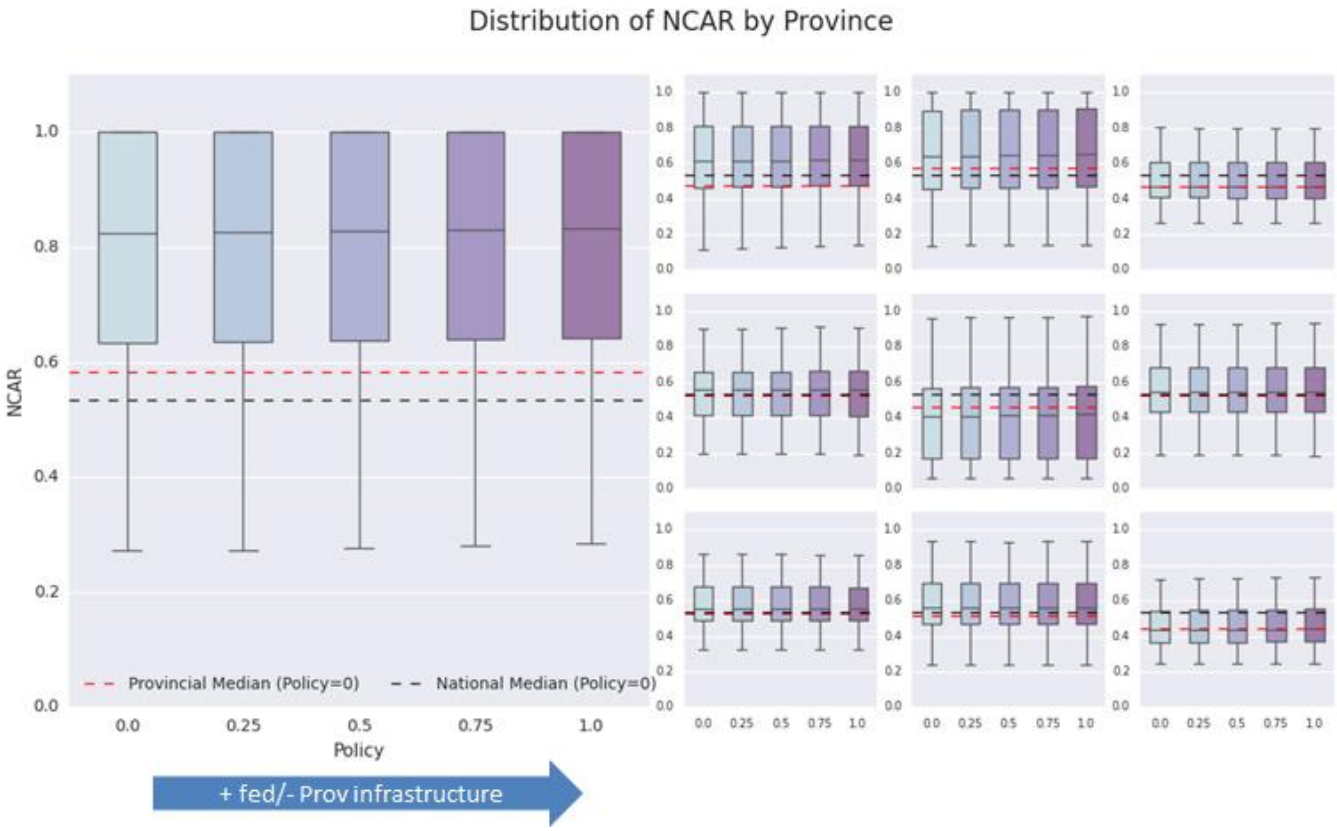
Scenario 3

In this final scenario, federal taxes go up as do federal infrastructure expenditures, while provincial taxes go down as do provincial infrastructure expenditures. The result is that infrastructure spending is more of a federal responsibility than it currently is. In other words, this is an upload of provincial infrastructure spending.

If the federal government uploaded all provincial infrastructure spending, then median NCARs in the country would increase by only 0.3% (from 53.4 to 53.5). This is seen in a few provinces, with no noticeable change in others. The range in changes in median NCARs across provinces is again small (-1.5% to +1.1%) and there is essentially no convergence in this policy space.

While previous CANCEA research (Stiff and Smetanin 2016) has suggested that the federal government needs to play a larger role in infrastructure – given the increased revenue they receive as the economy grows – this scenario does so at the expense of provincial infrastructure spending, which hurts Canadian households overall. Further, this scenario – along with Scenario 1b – suggests that an increased infrastructure role for the federal government could also include transferring tax room to the provinces to build more infrastructure (a scenario not contemplated here due to a violation in the "who does what" constraint).

Figure 25 Province-specific changes to NCAR among lower-income households – Scenario 3



5.1 Which scenarios are more "convergent"?

The goal of convergence – that is, changes that tend towards equalizing NCARs – is arguably desirable. It suggests that regardless of income, the ability to make ends meet should be roughly equal (i.e., indirectly accounting for the varied costs of living).

The following figures indicate which policy *direction* is required for greater convergence, and an example policy *level* which lowers median NCAR across the country given that direction. (The exception is Scenario 3, in which the status quo is already more converged.) The orange circles represent the current situation for each province, while the blue circles represent the outcome situation. The size of the circle represents the population of the province in question, to provide a sense of the "gravity" of the shift.

These illustrate a number of things. First, there is a disparity in median NCARs that currently exist across provinces, seemingly regardless of median household income. Second, extreme policies are not always required to improve individual situations. Third – and a key message of this report – that fiscal federalism can help Canadian households on the whole without additional government spending. Finally, some policies are more effective than others at driving change.

Figure 26 Convergence in Scenario 1a: Policy -0.5

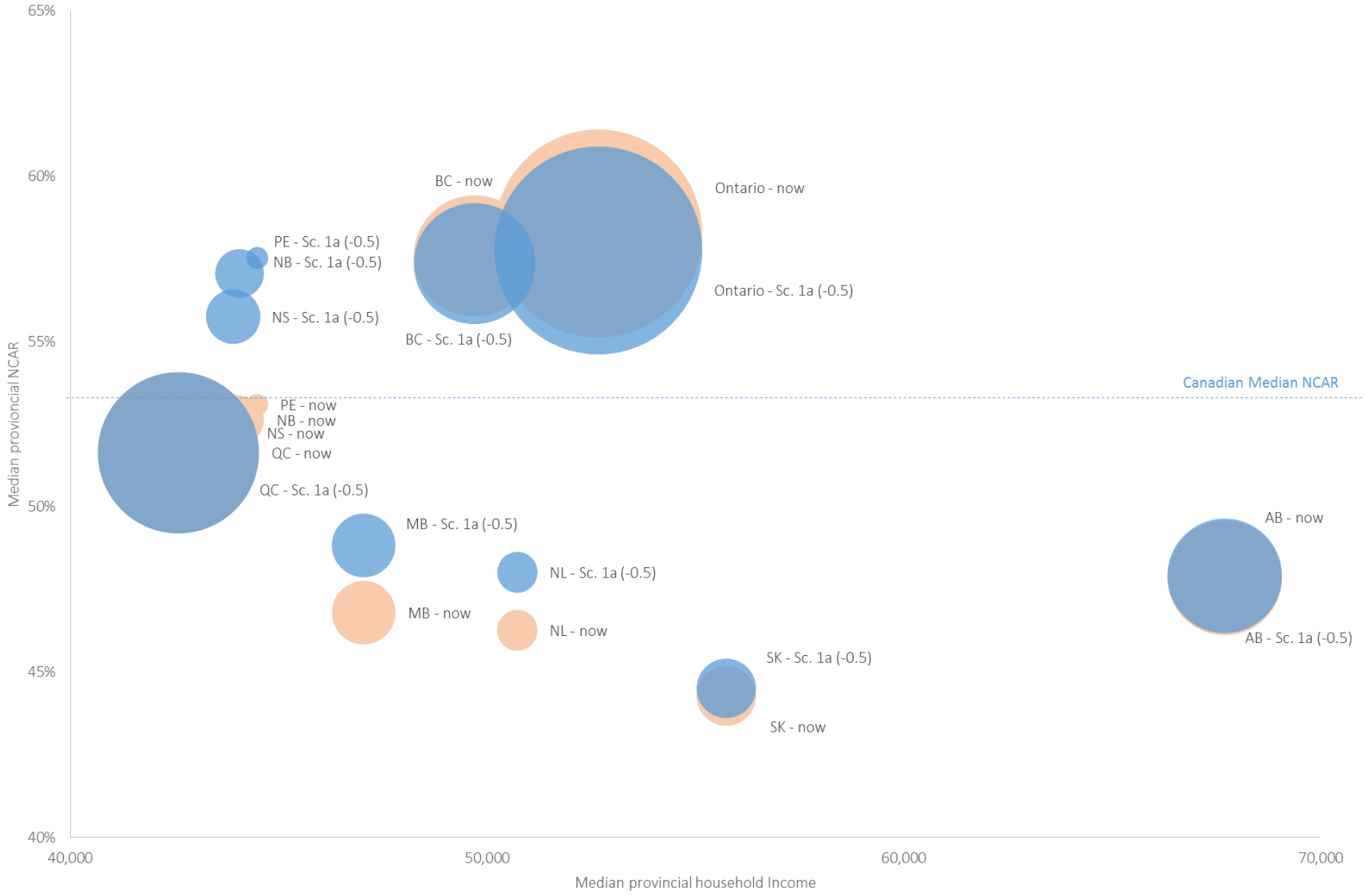


Figure 27 Convergence in Scenario 1b: Policy -0.5

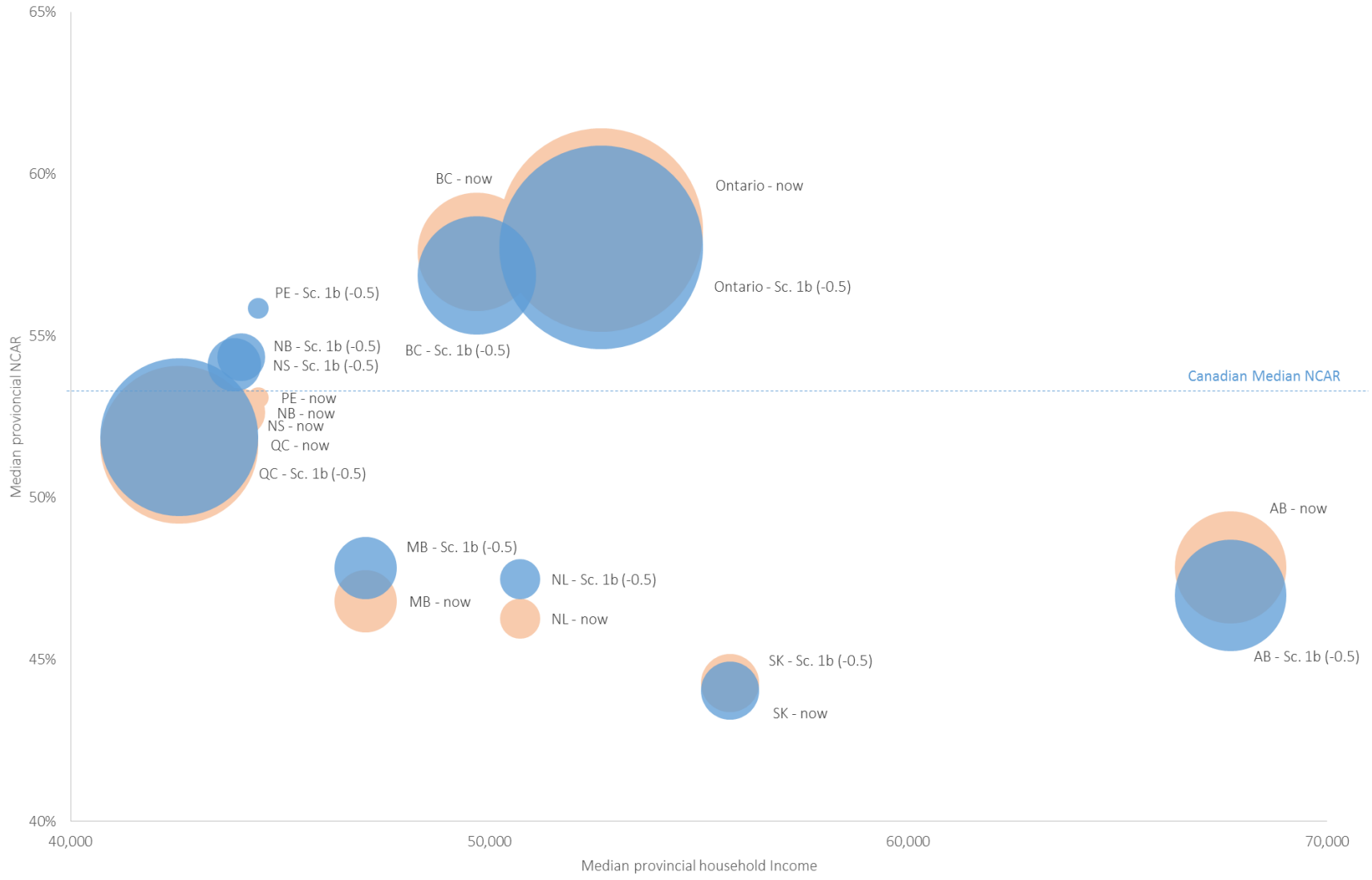
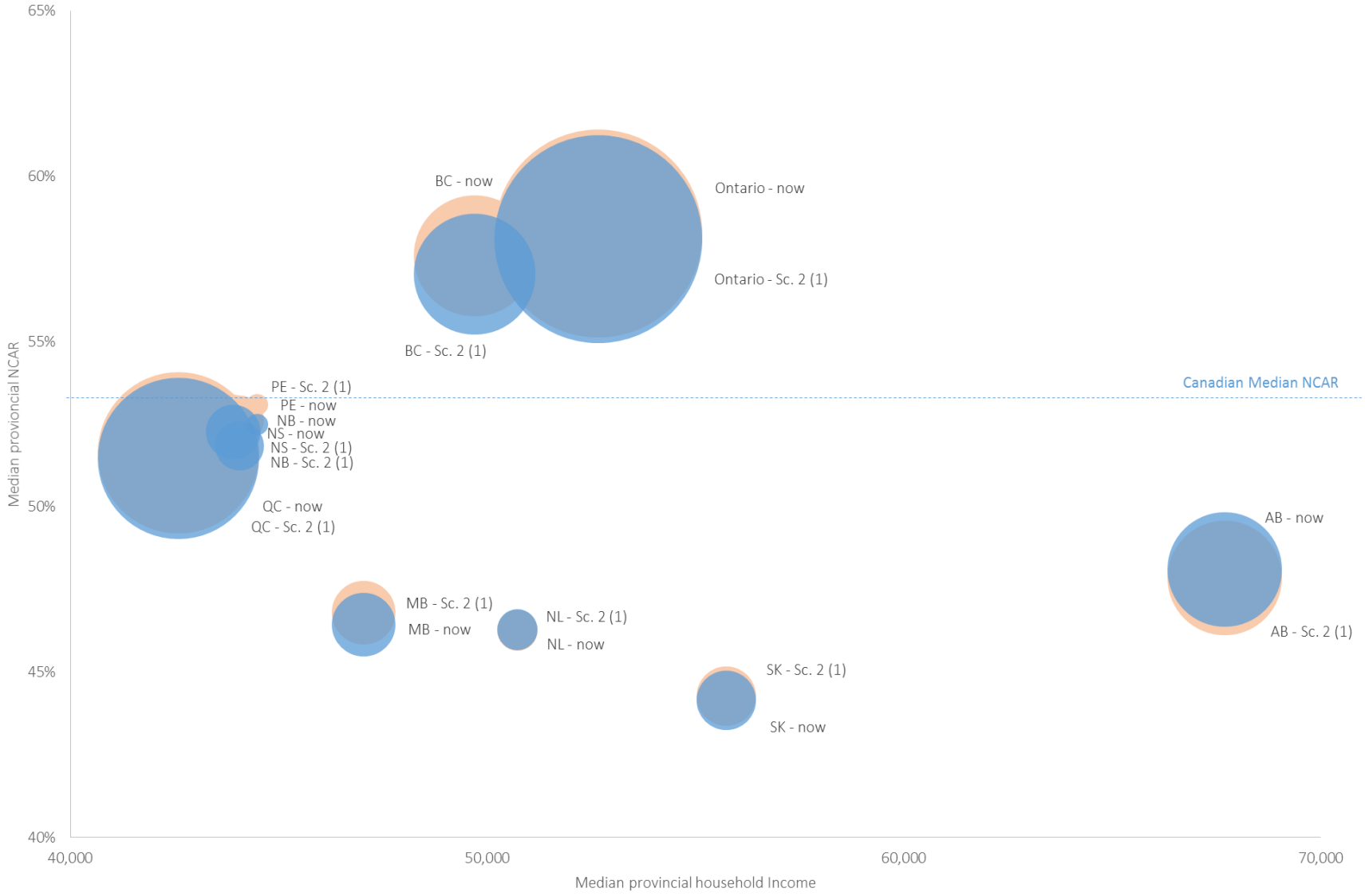


Figure 28 Convergence in Scenario 2: Policy 1.0



5.2 What happens to Ontario in these scenarios?

The large boxes on the provincial comparison figures above show the effects on Ontario households. To summarize the effects:

- Scenario 1a: Ontario households do better when federal-provincial transfers are reduced and the federal government instead provides greater transfers to households directly (median NCAR drops 1.8%, from 58.3 to 57.2)
- Scenario 1b: Ontario households (particularly lower-income) do even better when federal-provincial transfers are reduced and the Province self-funds its services (-1.9% in median NCAR)
- Scenario 2: Ontario households experience no noticeable change in NCAR overall, though lower-income households benefit slightly from increased federal CIT collection and therefore provincial PIT (-0.6% in median NCAR among lower-income households, from 83.2 to 82.7)
- Scenario 3: Ontario households see very small increases in NCAR as the federal government uploads provincial infrastructure spending (0.7% increase in median NCAR), potentially due to the Province's existing commitment to infrastructure investment

Overall, Ontario households are worse off under fiscal federalism under these constraints.

5.3 Further research

There are a number of areas in which this new approach to studying fiscal federalism could be applied. First, investigating the relative drivers of NCAR across each province would provide some insight into the varying issues affecting each province. For example, a low NCAR in a given province could be due to low incomes, high taxes, high cost of living, high debt-to-income ratios, low government transfers, or differing preferences, to name a few, or even a combination of numerous factors.

Second, this study imposed significant constraints on government policy in order to focus specifically on the "who does what" questions of fiscal federalism. This could obviously be relaxed to investigate new policies (e.g., where the federal government increased transfers without offsetting tax revenue).

Third, and perhaps most obvious, would be to investigate the "optimal" policies as discussed (or new ones) to meet specific goals (e.g., lowering median NCAR, maximum convergence).

6.0 CONCLUSIONS

NCAR is a very useful measure in determining the sustainability of Canadian households, and can decrease through either increased income (including transfers), decreased taxes or debt, or decreased expenditures on "needs". When a household's NCAR decreases, this means less pressure on the household to make ends meet – that is, it adds to their prosperity. It would seem "Canadian" to argue that decreases in NCAR for lower-income households (who have far fewer options to do so through decreased spending on needs) more than offset equal increases in NCAR for higher-income households. Therefore, scenarios where NCAR can be decreased for lower-income households without significantly increasing it for higher-income households should be seen as positive. (Note that the unit of measurement here is households, such that higher-income households support lower-income households. This is a very different from high-income provinces supporting low-income provinces. As we've shown, the latter policy effectively hurts lower-income households living in higher-income provinces.)

In that regard, our results suggest that "who does what" often has relatively small effects on NCARs overall, with the exception of taxation (which varies widely across provinces). This can mean one of two things: roughly zero-sum effects where some 'win' and some 'lose' or little/no effect on anyone. This is largely because most scenarios simply "move money around". While *any* noticeable change suggests that "who does what" matters, certain shifts show more noticeable differences among some lower-income households. For example, increased provincial PIT room (scenario 1b) sees a decrease in median NCAR among lower-income Canadian households of 1.7%; while increased federal CIT responsibility (scenario 2) sees a decrease in the median NCAR among this group of 1.0%. In general:

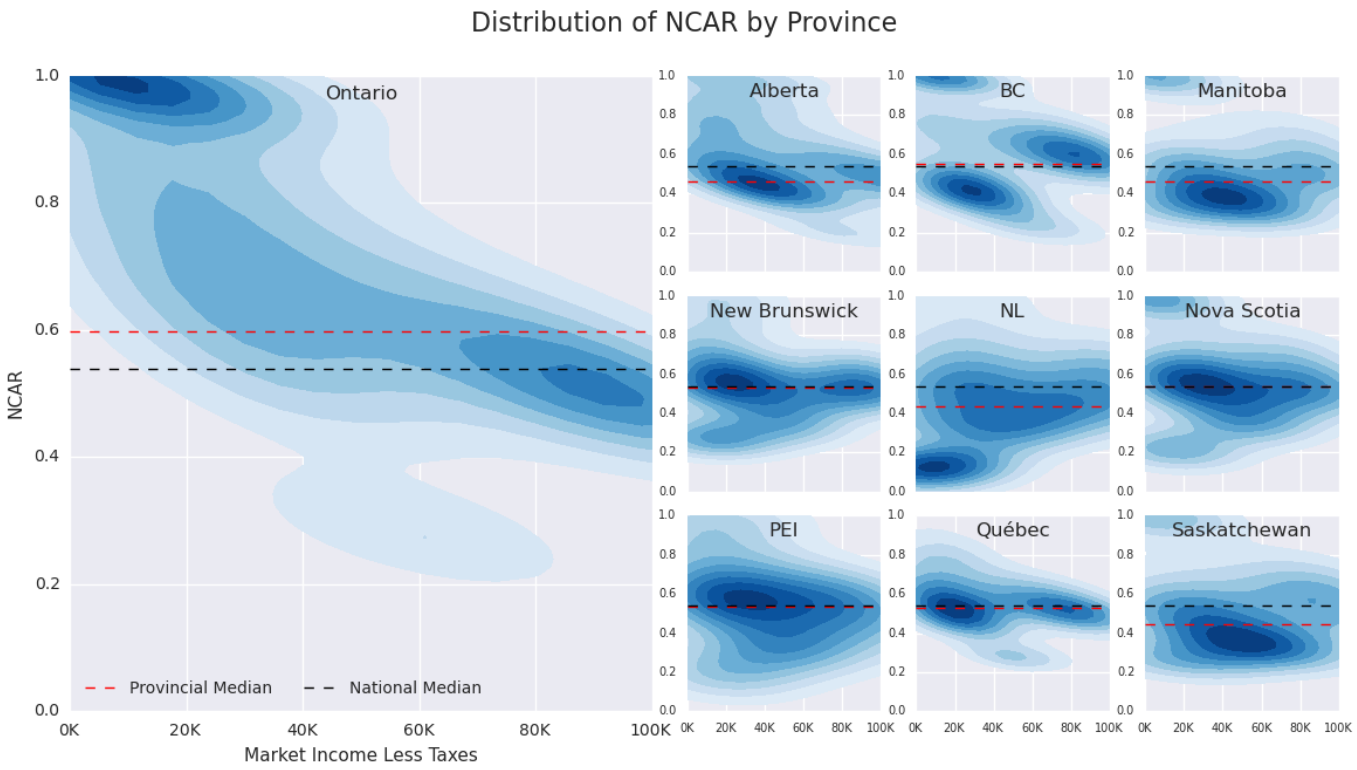
- Households in some (larger/richer) provinces see improvements in NCAR as federal-provincial transfers decrease, but this is largely offset nationally by significant increases in NCAR for households in other provinces who currently receive disproportionate transfers

- Such convergence in NCAR nationally seems 'Canadian'

- Canadians on the whole would be better off allowing provinces to self-fund their services, and that lower-income households overall are being unnecessarily harmed by federal-provincial transfers. This is particularly true on the taxation side, where it appears that low-income Canadians in some provinces are effectively supporting low-income households in others, raising the question of "where would you rather be poor?"

However, recall our starting point: the distribution of NCARs and income across the country vary widely, due to significant decentralization (e.g., allowing for widely disparate provincial tax rates and transfers – such as in Quebec, which has the 'flattest' NCAR vs. income). Equalizing significantly would require significant changes in this regard.

Figure 29 Distribution of NCAR by province (identified)



In order to see more significant changes to NCAR, there would need to be noticeable changes in general government *policy* (i.e., not just "who does what"). Examples include:

- Increased federal role in infrastructure investment, either directly (offset by increased federal revenue) or indirectly (e.g., a tax transfer to PTs or municipalities to build more themselves)
- Increased government transfers to households (either cash or in-kind), offset by increased revenue
- Reduced taxes, though this would not benefit many low-income households, who pay little in tax (if they are required pay at all)
- More indirect measures, such as improving labour productivity (e.g., through enhanced education, or favourable capital investment tax policy), raising wages

Nonetheless, beyond providing a new analytical approach which solves many of the issues presented by other methods, one *political* benefit is that it could spark a conversation about roles and responsibilities within the federation without simply being a request of PTs to the federal government for increased funding. In this regard, this paper has shown that our current fiscal federalism could – in a revenue-neutral way – be restructured to help many Canadian households.

To be clear, this means that Canada's fiscal federalism – which effectively treats households only as parts of provincial wholes – has created a situation where Canadian households with similar incomes are not seen as equal by government. While it is arguably "Canadian" for richer *households* to support less-well off households, it is harder to argue for the current situation in which lower-income households in certain

provinces are effectively supporting similarly low-income households in other provinces simply because of where they live.

As such, Canada's federalism conversation should focus on how improvements can occur without the federal government simply providing more money to the provinces or opening up the *Constitution Act*. That the two orders of government can effectively collaborate to improve the prosperity of Canadian households without such things happening should be made a priority, especially at a time when the federal government is facing significant deficits for the foreseeable future while also being seemingly uninterested in addressing a perceived "fiscal imbalance" with the larger/richer provinces such as Ontario.

APPENDIX A. PROVINCIAL FIGURES

Ontario	Alberta	British Columbia	Manitoba
	New Brunswick	Newfoundland & Labrador	Nova Scotia
	Prince Edward Island	Quebec	Saskatchewan

APPENDIX B. DETAILED RESULTS

The following tables provide summary NCAR statistics (essentially the boundaries of the boxplots presented in the body of the paper) for each scenario, province (and Canada overall), and degree of policy change.

For example, here are some data for Scenario 1a for Canada. The current situation (i.e., policy 0), shows a median NCAR of 0.53 (solid oval). This means that the median Canadian household is currently spending 53% of their discretionary income on "needs". Under the -1 policy (i.e., federal-provincial transfers are replaced by federal-household transfers), that median has increased to 0.54 (dashed oval).

	All Households				
	-1	**-0.5**	**0**	**0.5**	**1**
Canada					
max	1.00	1.00	1.00	1.00	1.00
75th percentile	0.70	0.70	0.70	0.70	0.70
median	0.54	0.54	0.53	0.53	0.53
25th percentile	0.41	0.41	0.40	0.40	0.40
min	0.06	0.06	0.06	0.06	0.06

Going down the same middle column in the tables, Ontario is shown to have the highest median NCAR across all provinces (at over 0.58), followed very closely by B.C. (at just under 0.58). The most "affordable" place to live, by this measure (i.e., the easiest place to make ends meet for the median household) is Saskatchewan.

Scenario 1a

	Below Median Income Households					All Households					Above Median Income Households				
	-1	-0.5	0	0.5	1	-1	-0.5	0	0.5	1	-1	-0.5	0	0.5	1
Canada															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.88	0.87	0.87	0.87	0.88	0.70	0.70	0.70	0.70	0.70	0.57	0.57	0.57	0.57	0.57
median	0.65	0.65	0.64	0.64	0.64	0.54	0.54	0.53	0.53	0.53	0.46	0.46	0.46	0.46	0.46
25th percentile	0.50	0.50	0.49	0.49	0.48	0.41	0.41	0.40	0.40	0.40	0.32	0.32	0.32	0.32	0.32
min	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.08	0.08	0.08	0.08	0.09
Alberta															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.81	0.82	0.83	0.83	0.84	0.63	0.63	0.63	0.63	0.63	0.50	0.51	0.51	0.51	0.51
median	0.63	0.63	0.63	0.63	0.63	0.48	0.48	0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.41
25th percentile	0.53	0.53	0.53	0.53	0.53	0.35	0.35	0.35	0.35	0.36	0.31	0.31	0.31	0.32	0.32
min	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.08	0.09
British Columbia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.85	0.87	0.89	0.91	0.94	0.72	0.73	0.74	0.75	0.77	0.65	0.66	0.67	0.67	0.68
median	0.62	0.63	0.63	0.64	0.65	0.57	0.57	0.58	0.58	0.58	0.54	0.54	0.55	0.55	0.55
25th percentile	0.45	0.45	0.45	0.45	0.46	0.38	0.38	0.38	0.38	0.39	0.31	0.31	0.32	0.32	0.32
min	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15
Manitoba															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.92	0.89	0.87	0.85
75th percentile	0.85	0.70	0.60	0.58	0.56	0.64	0.60	0.58	0.57	0.55	0.59	0.58	0.57	0.56	0.55
median	0.53	0.50	0.47	0.45	0.43	0.51	0.49	0.47	0.46	0.45	0.49	0.47	0.47	0.46	0.46
25th percentile	0.45	0.43	0.41	0.39	0.38	0.42	0.41	0.40	0.38	0.37	0.39	0.38	0.38	0.37	0.36
min	0.27	0.27	0.27	0.27	0.26	0.24	0.24	0.23	0.23	0.22	0.24	0.24	0.23	0.23	0.22
New Brunswick															
max	1.00	1.00	1.00	0.94	0.85	1.00	1.00	1.00	0.94	0.85	1.00	0.82	0.79	0.78	0.76
75th percentile	0.83	0.74	0.65	0.60	0.56	0.76	0.68	0.62	0.59	0.56	0.64	0.61	0.59	0.58	0.57
median	0.70	0.62	0.54	0.50	0.47	0.61	0.57	0.53	0.50	0.49	0.56	0.53	0.51	0.50	0.49
25th percentile	0.43	0.42	0.40	0.38	0.35	0.46	0.45	0.43	0.41	0.40	0.48	0.45	0.44	0.43	0.42
min	0.19	0.19	0.20	0.19	0.18	0.19	0.19	0.20	0.19	0.18	0.27	0.27	0.27	0.27	0.26
Newfoundland and Labrador															
max	1.00	0.98	0.96	0.94	0.92	1.00	0.98	0.96	0.94	0.92	0.97	0.93	0.91	0.89	0.88
75th percentile	0.67	0.62	0.57	0.54	0.51	0.64	0.61	0.57	0.56	0.54	0.62	0.60	0.58	0.57	0.57
median	0.48	0.45	0.40	0.38	0.36	0.50	0.48	0.46	0.45	0.44	0.50	0.49	0.48	0.48	0.47
25th percentile	0.19	0.18	0.17	0.16	0.15	0.31	0.31	0.31	0.30	0.30	0.42	0.40	0.39	0.39	0.39
min	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.21	0.21	0.21	0.21	0.21
Nova Scotia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.94	0.90	0.86	0.84
75th percentile	0.78	0.72	0.65	0.62	0.59	0.72	0.68	0.64	0.61	0.60	0.66	0.64	0.62	0.61	0.60
median	0.62	0.57	0.53	0.50	0.48	0.59	0.56	0.53	0.51	0.49	0.57	0.54	0.53	0.52	0.51
25th percentile	0.45	0.43	0.41	0.40	0.39	0.46	0.44	0.42	0.41	0.40	0.48	0.45	0.44	0.43	0.42
min	0.18	0.18	0.18	0.17	0.17	0.18	0.18	0.18	0.17	0.17	0.28	0.28	0.28	0.28	0.27
Ontario															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	1.00	1.00	1.00	1.00	1.00	0.83	0.83	0.84	0.84	0.85	0.54	0.55	0.55	0.56	0.56
median	0.82	0.83	0.83	0.84	0.85	0.57	0.58	0.58	0.59	0.59	0.45	0.45	0.45	0.45	0.45
25th percentile	0.63	0.64	0.64	0.64	0.65	0.43	0.43	0.43	0.43	0.44	0.27	0.27	0.28	0.28	0.28
min	0.25	0.27	0.27	0.27	0.27	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Prince Edward Island															
max	1.00	1.00	0.99	0.90	0.82	1.00	1.00	0.99	0.90	0.82	1.00	0.95	0.90	0.85	0.81
75th percentile	0.80	0.74	0.67	0.64	0.60	0.73	0.68	0.63	0.59	0.55	0.64	0.61	0.57	0.55	0.52
median	0.65	0.60	0.54	0.51	0.47	0.61	0.58	0.53	0.50	0.47	0.56	0.53	0.51	0.49	0.47
25th percentile	0.57	0.52	0.46	0.45	0.41	0.46	0.44	0.40	0.40	0.38	0.40	0.37	0.36	0.36	0.35
min	0.17	0.17	0.16	0.15	0.14	0.17	0.17	0.16	0.15	0.14	0.26	0.25	0.25	0.25	0.24
Saskatchewan															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.56	0.56	0.56	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.58
median	0.45	0.45	0.44	0.44	0.44	0.45	0.45	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
25th percentile	0.38	0.38	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.35	0.35	0.36	0.36	0.36
min	0.27	0.26	0.24	0.24	0.23	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Québec															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.82	0.82	0.83	0.84	0.85
75th percentile	0.68	0.68	0.69	0.69	0.69	0.61	0.61	0.62	0.62	0.62	0.55	0.56	0.56	0.56	0.56
median	0.55	0.55	0.55	0.55	0.55	0.52	0.52	0.52	0.52	0.51	0.48	0.48	0.48	0.48	0.48
25th percentile	0.46	0.46	0.46	0.46	0.46	0.43	0.42	0.42	0.42	0.42	0.34	0.34	0.34	0.34	0.34
min	0.18	0.18	0.18	0.18	0.18	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Scenario 1b

	Below Median Income Households					All Households					Above Median Income Households				
	-1	-0.5	0	0.5	1	-1	-0.5	0	0.5	1	-1	-0.5	0	0.5	1
Canada															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.85	0.86	0.87	0.88	0.89	0.69	0.69	0.70	0.70	0.70	0.58	0.57	0.57	0.57	0.57
median	0.63	0.64	0.64	0.65	0.66	0.53	0.53	0.53	0.54	0.54	0.46	0.46	0.46	0.46	0.46
25th percentile	0.48	0.49	0.49	0.49	0.50	0.40	0.40	0.40	0.41	0.41	0.31	0.32	0.32	0.32	0.32
min	0.07	0.06	0.06	0.06	0.06	0.07	0.06	0.06	0.06	0.06	0.08	0.08	0.08	0.09	0.09
Alberta															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.83	0.83	0.83	0.83	0.83	0.61	0.62	0.63	0.64	0.66	0.50	0.50	0.51	0.51	0.52
median	0.60	0.62	0.63	0.65	0.66	0.46	0.47	0.48	0.49	0.49	0.40	0.40	0.41	0.42	0.42
25th percentile	0.50	0.52	0.53	0.54	0.55	0.34	0.35	0.35	0.36	0.37	0.30	0.31	0.31	0.32	0.33
min	0.08	0.09	0.09	0.09	0.10	0.08	0.08	0.08	0.09	0.09	0.08	0.08	0.08	0.09	0.09
British Columbia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.85	0.87	0.89	0.90	0.92	0.73	0.73	0.74	0.75	0.75	0.66	0.66	0.67	0.67	0.67
median	0.60	0.62	0.63	0.65	0.66	0.56	0.57	0.58	0.58	0.59	0.54	0.54	0.55	0.55	0.55
25th percentile	0.43	0.44	0.45	0.46	0.48	0.36	0.37	0.38	0.39	0.40	0.31	0.31	0.32	0.32	0.32
min	0.13	0.13	0.14	0.14	0.15	0.13	0.13	0.14	0.14	0.15	0.14	0.14	0.15	0.15	0.16
Manitoba															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.92	0.89	0.87	0.84
75th percentile	0.62	0.61	0.60	0.59	0.59	0.61	0.59	0.58	0.57	0.55	0.60	0.58	0.57	0.55	0.54
median	0.49	0.48	0.47	0.46	0.45	0.49	0.48	0.47	0.46	0.45	0.49	0.48	0.47	0.45	0.44
25th percentile	0.42	0.42	0.41	0.40	0.39	0.41	0.40	0.40	0.39	0.38	0.39	0.38	0.38	0.37	0.36
min	0.29	0.28	0.27	0.26	0.25	0.23	0.23	0.23	0.23	0.22	0.23	0.23	0.23	0.23	0.22
New Brunswick															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.83	0.79	0.75	0.73
75th percentile	0.67	0.66	0.65	0.64	0.63	0.67	0.64	0.62	0.61	0.59	0.65	0.62	0.59	0.56	0.54
median	0.56	0.55	0.54	0.52	0.51	0.56	0.54	0.53	0.51	0.49	0.56	0.54	0.51	0.49	0.47
25th percentile	0.42	0.41	0.40	0.38	0.38	0.46	0.45	0.43	0.41	0.40	0.48	0.46	0.44	0.42	0.40
min	0.15	0.21	0.20	0.19	0.18	0.15	0.21	0.20	0.19	0.18	0.30	0.29	0.27	0.26	0.25
Newfoundland and Labrador															
max	0.96	0.96	0.96	0.96	0.96	0.98	0.96	0.96	0.96	0.96	0.98	0.94	0.91	0.87	0.84
75th percentile	0.56	0.56	0.57	0.57	0.57	0.59	0.58	0.57	0.56	0.56	0.62	0.60	0.58	0.56	0.55
median	0.40	0.40	0.40	0.41	0.41	0.48	0.47	0.46	0.45	0.45	0.52	0.50	0.48	0.47	0.45
25th percentile	0.16	0.17	0.17	0.18	0.18	0.33	0.32	0.31	0.30	0.29	0.43	0.41	0.39	0.38	0.37
min	0.07	0.06	0.06	0.06	0.06	0.07	0.06	0.06	0.06	0.06	0.23	0.22	0.21	0.20	0.19
Nova Scotia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.90	0.86	0.83
75th percentile	0.68	0.66	0.65	0.64	0.63	0.68	0.66	0.64	0.62	0.60	0.68	0.65	0.62	0.60	0.58
median	0.55	0.54	0.53	0.51	0.51	0.56	0.54	0.53	0.51	0.50	0.57	0.55	0.53	0.51	0.49
25th percentile	0.43	0.42	0.41	0.40	0.39	0.45	0.43	0.42	0.41	0.40	0.46	0.45	0.44	0.42	0.41
min	0.18	0.12	0.18	0.18	0.17	0.18	0.12	0.18	0.18	0.17	0.30	0.29	0.28	0.27	0.26
Ontario															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.98	1.00	1.00	1.00	1.00	0.81	0.82	0.84	0.85	0.86	0.55	0.55	0.55	0.56	0.56
median	0.81	0.82	0.83	0.85	0.86	0.57	0.58	0.58	0.59	0.60	0.45	0.45	0.45	0.45	0.46
25th percentile	0.62	0.63	0.64	0.65	0.67	0.42	0.43	0.43	0.44	0.44	0.27	0.27	0.28	0.28	0.29
min	0.26	0.26	0.27	0.27	0.28	0.13	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.14	0.14
Prince Edward Island															
max	1.00	1.00	0.99	0.94	0.92	1.00	1.00	0.99	0.94	0.92	1.00	0.95	0.90	0.85	0.81
75th percentile	0.74	0.70	0.67	0.64	0.61	0.70	0.67	0.63	0.59	0.56	0.65	0.61	0.57	0.55	0.52
median	0.60	0.57	0.54	0.52	0.50	0.59	0.56	0.53	0.50	0.47	0.58	0.54	0.51	0.48	0.46
25th percentile	0.51	0.48	0.46	0.44	0.42	0.46	0.43	0.40	0.38	0.36	0.41	0.39	0.36	0.34	0.32
min	0.18	0.17	0.16	0.15	0.14	0.18	0.17	0.16	0.15	0.14	0.29	0.27	0.25	0.24	0.22
Saskatchewan															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.53	0.55	0.56	0.57	0.59	0.56	0.56	0.57	0.57	0.58	0.59	0.58	0.58	0.57	0.57
median	0.43	0.44	0.44	0.45	0.46	0.44	0.44	0.44	0.45	0.45	0.44	0.44	0.44	0.44	0.44
25th percentile	0.37	0.37	0.37	0.38	0.38	0.36	0.36	0.37	0.37	0.37	0.35	0.35	0.36	0.36	0.36
min	0.25	0.25	0.24	0.24	0.24	0.20	0.20	0.21	0.21	0.22	0.20	0.20	0.21	0.21	0.22
Québec															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.84	0.83	0.83	0.83
75th percentile	0.69	0.69	0.69	0.69	0.69	0.62	0.62	0.62	0.62	0.61	0.57	0.56	0.56	0.56	0.55
median	0.55	0.55	0.55	0.55	0.55	0.52	0.52	0.52	0.51	0.51	0.49	0.49	0.48	0.48	0.47
25th percentile	0.46	0.46	0.46	0.46	0.46	0.43	0.43	0.42	0.42	0.42	0.35	0.34	0.34	0.34	0.33
min	0.18	0.18	0.18	0.18	0.18	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Scenario 2

	Below Median Income Households					All Households					Above Median Income Households				
	-1	-0.5	0	0.5	1	-1	-0.5	0	0.5	1	-1	-0.5	0	0.5	1
Canada															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.88	0.87	0.87	0.87	0.86	0.70	0.70	0.70	0.69	0.69	0.57	0.57	0.57	0.57	0.57
median	0.65	0.65	0.64	0.64	0.64	0.54	0.54	0.53	0.53	0.53	0.46	0.46	0.46	0.46	0.46
25th percentile	0.50	0.49	0.49	0.49	0.48	0.41	0.41	0.40	0.40	0.40	0.32	0.32	0.32	0.32	0.32
min	0.06	0.06	0.06	0.05	0.06	0.06	0.06	0.06	0.05	0.06	0.09	0.09	0.08	0.08	0.08
Alberta															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.81	0.82	0.83	0.83	0.84	0.63	0.63	0.63	0.63	0.63	0.50	0.50	0.51	0.51	0.51
median	0.64	0.63	0.63	0.63	0.62	0.48	0.48	0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.41
25th percentile	0.54	0.53	0.53	0.53	0.52	0.35	0.35	0.35	0.35	0.35	0.31	0.31	0.31	0.32	0.32
min	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.09	0.09	0.08	0.08	0.08
British Columbia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.90	0.89	0.89	0.88	0.88	0.75	0.74	0.74	0.74	0.74	0.67	0.67	0.67	0.67	0.66
median	0.64	0.64	0.63	0.63	0.62	0.58	0.58	0.58	0.57	0.57	0.55	0.55	0.55	0.55	0.55
25th percentile	0.46	0.46	0.45	0.45	0.44	0.39	0.38	0.38	0.38	0.37	0.32	0.32	0.32	0.31	0.31
min	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.14	0.14	0.13	0.15	0.15	0.15	0.15	0.14
Manitoba															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.89	0.89	0.89	0.89
75th percentile	0.61	0.61	0.60	0.60	0.60	0.58	0.58	0.58	0.58	0.58	0.57	0.57	0.57	0.57	0.56
median	0.47	0.47	0.47	0.47	0.46	0.47	0.47	0.47	0.47	0.46	0.47	0.47	0.47	0.47	0.46
25th percentile	0.41	0.41	0.41	0.41	0.40	0.40	0.40	0.40	0.39	0.39	0.38	0.38	0.38	0.37	0.37
min	0.27	0.27	0.27	0.27	0.27	0.24	0.23	0.23	0.23	0.23	0.24	0.23	0.23	0.23	0.23
New Brunswick															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.79	0.79	0.79	0.79
75th percentile	0.66	0.65	0.65	0.64	0.64	0.63	0.63	0.62	0.62	0.62	0.60	0.59	0.59	0.59	0.59
median	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.52	0.52	0.52	0.51	0.51	0.51	0.51
25th percentile	0.40	0.40	0.40	0.39	0.39	0.43	0.43	0.43	0.43	0.42	0.45	0.44	0.44	0.44	0.44
min	0.20	0.20	0.20	0.20	0.19	0.20	0.20	0.20	0.20	0.19	0.28	0.27	0.27	0.27	0.27
Newfoundland and Labrador															
max	0.97	0.96	0.96	0.96	0.95	0.97	0.96	0.96	0.96	0.95	0.90	0.90	0.91	0.91	0.91
75th percentile	0.57	0.57	0.57	0.56	0.56	0.58	0.58	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.58
median	0.41	0.41	0.40	0.40	0.39	0.46	0.46	0.46	0.46	0.46	0.48	0.48	0.48	0.48	0.48
25th percentile	0.18	0.17	0.17	0.17	0.17	0.31	0.31	0.31	0.31	0.32	0.39	0.40	0.39	0.40	0.40
min	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.21	0.21	0.21	0.21	0.21
Nova Scotia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.90	0.90	0.89	0.89
75th percentile	0.66	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.63	0.62	0.62	0.62	0.62	0.62
median	0.53	0.53	0.53	0.52	0.52	0.53	0.53	0.53	0.52	0.52	0.53	0.53	0.53	0.53	0.53
25th percentile	0.41	0.41	0.41	0.41	0.41	0.43	0.43	0.42	0.42	0.42	0.44	0.44	0.44	0.44	0.43
min	0.18	0.18	0.18	0.05	0.07	0.18	0.18	0.18	0.05	0.07	0.28	0.28	0.28	0.28	0.28
Ontario															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	1.00	1.00	1.00	1.00	1.00	0.84	0.84	0.84	0.83	0.83	0.55	0.55	0.55	0.55	0.55
median	0.84	0.84	0.83	0.83	0.83	0.59	0.58	0.58	0.58	0.58	0.45	0.45	0.45	0.45	0.45
25th percentile	0.65	0.64	0.64	0.64	0.63	0.43	0.43	0.43	0.43	0.43	0.28	0.28	0.28	0.28	0.27
min	0.27	0.27	0.27	0.27	0.26	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Prince Edward Island															
max	1.00	1.00	0.99	0.99	0.98	1.00	1.00	0.99	0.99	0.98	0.91	0.90	0.90	0.90	0.89
75th percentile	0.68	0.67	0.67	0.66	0.66	0.63	0.63	0.63	0.63	0.62	0.58	0.58	0.57	0.57	0.57
median	0.55	0.55	0.54	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.51	0.51	0.51	0.51
25th percentile	0.46	0.46	0.46	0.46	0.45	0.41	0.41	0.40	0.40	0.40	0.36	0.36	0.36	0.36	0.36
min	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.25	0.25	0.25	0.25	0.25
Saskatchewan															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.57	0.57	0.56	0.56	0.55	0.57	0.57	0.57	0.56	0.57	0.57	0.58	0.58	0.58	0.58
median	0.45	0.45	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
25th percentile	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.35
min	0.24	0.24	0.24	0.25	0.25	0.21	0.21	0.21	0.21	0.20	0.21	0.21	0.21	0.21	0.20
Québec															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.84	0.84	0.83	0.83	0.83
75th percentile	0.69	0.69	0.69	0.69	0.69	0.62	0.62	0.62	0.62	0.62	0.56	0.56	0.56	0.56	0.56
median	0.56	0.55	0.55	0.55	0.55	0.52	0.52	0.52	0.52	0.51	0.48	0.48	0.48	0.48	0.48
25th percentile	0.46	0.46	0.46	0.46	0.46	0.42	0.42	0.42	0.42	0.42	0.34	0.34	0.34	0.34	0.34
min	0.18	0.18	0.18	0.18	0.18	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Scenario 3

	Below Median Income Households					All Households					Above Median Income Households				
	0	0.25	0.5	0.75	1	0	0.25	0.5	0.75	1	0	0.25	0.5	0.75	1
Canada															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.87	0.87	0.87	0.87	0.88	0.70	0.70	0.70	0.70	0.70	0.57	0.57	0.57	0.57	0.57
median	0.64	0.64	0.65	0.65	0.65	0.53	0.53	0.53	0.53	0.54	0.46	0.46	0.46	0.46	0.46
25th percentile	0.49	0.49	0.49	0.49	0.49	0.40	0.41	0.41	0.41	0.41	0.32	0.32	0.32	0.32	0.32
min	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.08	0.09	0.09	0.09	0.09
Alberta															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.83	0.82	0.82	0.83	0.82	0.63	0.63	0.64	0.64	0.64	0.51	0.51	0.51	0.51	0.51
median	0.63	0.63	0.64	0.64	0.64	0.48	0.48	0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.41
25th percentile	0.53	0.53	0.54	0.54	0.54	0.35	0.35	0.36	0.36	0.36	0.31	0.32	0.32	0.32	0.32
min	0.09	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.09	0.09	0.08	0.09	0.09	0.09	0.09
British Columbia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.89	0.89	0.89	0.90	0.90	0.74	0.74	0.74	0.74	0.74	0.67	0.66	0.66	0.66	0.66
median	0.63	0.64	0.64	0.64	0.64	0.58	0.58	0.58	0.58	0.58	0.55	0.54	0.54	0.54	0.54
25th percentile	0.45	0.45	0.46	0.46	0.46	0.38	0.38	0.38	0.39	0.39	0.32	0.32	0.32	0.32	0.32
min	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.15
Manitoba															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.89	0.89	0.88	0.88
75th percentile	0.60	0.60	0.60	0.60	0.60	0.58	0.58	0.58	0.58	0.58	0.57	0.57	0.56	0.56	0.56
median	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.46	0.46	0.46
25th percentile	0.41	0.41	0.41	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.38	0.38	0.38	0.38	0.37
min	0.27	0.27	0.27	0.27	0.27	0.23	0.23	0.23	0.24	0.23	0.23	0.23	0.23	0.24	0.23
New Brunswick															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.79	0.78	0.78	0.78
75th percentile	0.65	0.65	0.65	0.65	0.65	0.62	0.62	0.62	0.62	0.62	0.59	0.59	0.59	0.58	0.58
median	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.52	0.52	0.51	0.51	0.51	0.51	0.50
25th percentile	0.40	0.40	0.39	0.39	0.39	0.43	0.43	0.43	0.42	0.42	0.44	0.44	0.44	0.44	0.44
min	0.20	0.20	0.19	0.19	0.19	0.20	0.20	0.19	0.19	0.19	0.27	0.27	0.27	0.27	0.27
Newfoundland and Labrador															
max	0.96	0.96	0.97	0.97	0.97	0.96	0.96	0.97	0.97	0.97	0.91	0.90	0.90	0.90	0.90
75th percentile	0.57	0.57	0.57	0.57	0.58	0.57	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
median	0.40	0.41	0.41	0.41	0.41	0.46	0.46	0.46	0.46	0.46	0.48	0.48	0.48	0.48	0.48
25th percentile	0.17	0.17	0.17	0.18	0.18	0.31	0.31	0.31	0.31	0.31	0.39	0.40	0.40	0.39	0.39
min	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.21	0.21	0.21	0.21	0.21
Nova Scotia															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.89	0.89	0.89	0.89
75th percentile	0.65	0.65	0.65	0.65	0.65	0.64	0.64	0.64	0.64	0.64	0.62	0.62	0.62	0.62	0.62
median	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.52	0.52	0.52	0.53	0.52	0.52	0.52	0.52
25th percentile	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.44	0.44	0.43	0.43	0.43
min	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.28	0.28	0.28	0.28	0.27
Ontario															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	1.00	1.00	1.00	1.00	1.00	0.84	0.84	0.84	0.84	0.84	0.55	0.55	0.55	0.55	0.55
median	0.83	0.83	0.84	0.84	0.84	0.58	0.58	0.58	0.59	0.59	0.45	0.45	0.45	0.45	0.45
25th percentile	0.64	0.64	0.65	0.65	0.65	0.43	0.43	0.43	0.43	0.44	0.28	0.28	0.28	0.28	0.28
min	0.27	0.27	0.27	0.27	0.27	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Prince Edward Island															
max	0.99	0.99	0.99	0.98	0.98	0.99	0.99	0.99	0.98	0.98	0.90	0.90	0.89	0.89	0.89
75th percentile	0.67	0.67	0.66	0.66	0.66	0.63	0.63	0.62	0.62	0.62	0.57	0.57	0.57	0.57	0.57
median	0.54	0.54	0.54	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.51	0.51	0.51	0.51	0.51
25th percentile	0.46	0.46	0.46	0.46	0.45	0.40	0.40	0.40	0.40	0.40	0.36	0.36	0.36	0.36	0.36
min	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.25	0.25	0.25	0.25	0.25
Saskatchewan															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
75th percentile	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.58	0.58	0.58	0.58	0.58
median	0.44	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.45	0.45	0.44	0.44	0.44	0.44	0.44
25th percentile	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.36	0.36	0.36	0.36	0.36
min	0.24	0.24	0.24	0.24	0.24	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Québec															
max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.83	0.83	0.83	0.83
75th percentile	0.69	0.69	0.69	0.69	0.69	0.62	0.62	0.62	0.62	0.62	0.56	0.56	0.56	0.56	0.56
median	0.55	0.55	0.55	0.55	0.55	0.52	0.52	0.52	0.51	0.51	0.48	0.48	0.48	0.48	0.48
25th percentile	0.46	0.46	0.46	0.46	0.46	0.42	0.42	0.42	0.42	0.42	0.34	0.34	0.34	0.34	0.34
min	0.18	0.18	0.18	0.18	0.18	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

APPENDIX C. DEFINING NCAR

CANCEA has developed numerous indicators related to the consumption of "necessary" goods and services – those things deemed to be required for living a "reasonable" lifestyle. (Note that "needs" here can include a portion of a specific good or service, insofar as households may overconsume such things relative to their needs.) Specifically, the *Needs Consumption Affordability Ratio* (NCAR) incorporates the household consumption of necessary goods and services as a portion of disposable income (after paying taxes and debt obligations).

$$NCAR = \frac{Shelter\ related\ needs + other\ needs}{(Discretionary\ income)}$$

C.1. Commodities list

The following lists provide household consumption commodity groups utilized (partially or wholly) for the construction of NCAR. In cases where the group is not entirely used, assumptions are provided. Further, margins (i.e., transportation, wholesale, and retail) are proportionally reduced (i.e., assumes all margins for the group are uniformly distributed per dollar consumed).

Necessary shelter-related commodity groups (including transportation) include (partially or wholly):

Paid and rental fees for housing
materials and services for the maintenance and repair of the dwelling
electricity, gas, and other fuels
water supply and sanitation services
new passenger cars, trucks, vans and sport utility vehicles
used motor vehicles
other vehicles
spare parts and accessories for vehicles
fuels and lubricants
maintenance and repair of vehicles
parking
railway transport, urban transit, and interurban transit
other transport services
insurance related to transport
property insurance

Items where the category is only partially included:

Other services related to the dwelling and property: Excludes: Investigation and security services; Private household services (except babysitting)

New passenger vehicles: assumed to be 17.15%, which is average of spending on new cars by bottom two quintiles in United States (see here) – there are reasons why a new car could be more desirable than a used car, largely pertaining to availability of specific features, fear/risk of sellers, warranties, financing terms, and capital/expense allocation.

Spare parts and accessories for vehicles: assumed to be 50% to reduce overconsumption

Fuels and lubricants: assumed to be 60% (other than Diesel) to reduce social, recreational, and other car trips. See Table 5 in National Household Travel Survey from the US, annual person-miles traveled

Rail transport: assumed to be 10% to remove train travel for vacation purposes. Uses passenger revenues on GO Trains ($437.9m*(54.2/68.7 passengers on GO trains) = $345m) as % of total urban transport.

Interurban bus: Excludes: Scenic and sightseeing tour services. Remaining assumed to be 10% to only include bus travel for commuting purposes ($437.9m GO Transit revenue * (14.5/68.7 passengers on GO trains) = $92m + a little more for other municipalities)

Other necessary commodity groups include (partially or wholly):

food and non-alcoholic beverages
garments and footwear
cleaning of clothing
clothing materials, other articles of clothing and clothing accessories
furniture and furnishings
carpets and other floor coverings
household textiles
major household appliances and small electric household appliances
other non-durable household goods
repair of personal and household goods except vehicles
pharmaceutical products and other medical products
hospital and out-patient services
telecommunication equipment and services
health insurance
personal grooming services
other appliances, articles and products for personal care
child care services

Items where the category is only partially included:

Food: Excludes: live animals; raw furskins; chocolate and confectionary goods; ice cream and frozen desserts; Cookies, crackers and baked sweet goods; Snack food products and Flavouring syrups, seasonings and dressings

Non-alcoholic beverages: Excludes: Bottled water, soft drinks and ice

Clothing/footwear: assumed to be 50% to reduce overconsumption

Cleaning of clothes: assumed to be 50% to limit expenses on dry cleaning

Furniture and furnishings: Excludes: Office furniture; Custom work, other manufacturing production services; remaining items assumed to be 50% to reduce over consumption

Carpets and other floor coverings: assumed to be 50% to reduce over consumption

Household textiles: Excludes: Blinds and shades – which are also included in furniture and furnishings (assumption is that these are more utilitarian than textiles)

Major household appliances: assumed to be 50% to reduce over consumption

Small electric household appliances: assumed to be 50% to reduce over consumption

Other non-durable household goods: Excludes: sand, gravel and clay; paper; paperboard containers and other converted paper products; lubricants; Other basic organic chemicals; Pesticide and other agricultural chemicals; Chemical products not elsewhere classified; numerous plastic goods; Rubber products, not elsewhere classified; Aluminum and aluminum-alloy semi-finished products; Springs and wire products; Threaded metal fasteners and other turned metal products; Industrial and commercial fans and blowers, and air purification equipment; Other miscellaneous general-purpose machinery;

Soaps and cleaning compounds assumed to be 50% to reduce overconsumption

Telecommunication equipment/services: assumed to be 65% to reduce over consumption, based on proportion of landline + 1/2 of cell phone expenditure (CANSIM Table 203-0021)

Personal grooming services: assumed to be 50% to reduce over consumption

Other appliances, articles and products for personal care: Excludes: Other miscellaneous goods

Soaps and cleaning compounds and Hand tools and cutlery assumed to be 50% to reduce overconsumption

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ENDNOTES

[i] See http://www.pco-bcp.gc.ca/aia/index.asp?lang=eng&page=federal&doc=why-pourquoi-eng.htm

[ii] See the Economic Dependency Ratio in CANSIM table 111-0025 for more examples.

[iii] One of the major misconceptions around equalization is that it is in essence transfers between the Provinces themselves. This is wrong – it is a federal expenditure program, controlled entirely – and changed frequently – by the federal government. Perhaps because of this, there are doubts about the effectiveness of the program. For example, Ontario is currently both a recipient and net fiscal contributor to equalization. This is because "the funds available to the federal government to be used for redistribution come disproportionately from the Ontario corporate, personal, and consumption tax bases" (Mendelsohn 2012a). In addition, its defintional issues and focus on budget concerns (see Dalby (2005), Kent (2007)) have limited equalization's ability to meet it stated goals.
That said, as Dalby (2005) correctly points out: "If the commitment to horizontal fiscal equity were paramount, Canadians would have adopted a unitary form of government… It seems clear that the principle of fiscal equity is not backed by a shared ethical preference that it is so strong that it trumps all other considerations in the design of our fiscal system."