THE IMPACT OF CONVERTING FEDERAL NON-REFUNDABLE TAX CREDITS INTO REFUNDABLE CREDITS

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SUMMARY

With economic inequality on the rise in Canada, the federal government needs to consider innovative solutions. One possibility for improving the tax-transfer system involves refundable tax credits (RTCs). Making all tax credits refundable wouldn't require Ottawa to introduce new tax measures; the Canadian tax system already contains a mix of RTCs and NRTCs, so the government could simply continue its practice of designing tax credit programs to be refundable.

Using Statistics Canada's Social Policy Simulation Database and Model, this paper examines the impacts and cost of converting NRTCs to RTCs, with and without an income exemption equal to 25 percent of the before-tax low-income standard for a census family, the Census Family Low-Income Line.

Under the Option Without Exemption (OW/OE), RTC recipients are taxed at a single rate of 15 percent, regardless of family size, right up to the Line. Under the Option With Exemption (OWE), RTC recipients are taxed at zero percent up to 25 percent of the Line and at a single rate of 20 percent, regardless of family size, up to 100 percent of the Line.

The incremental cost of switching NRTCs to RTCs under the OW/OE is $6.6 billion, as additional benefits are provided to 6.4 million families — slightly less than 37 percent of all families. The cost of the OWE is $7.2 billion, as benefits flow to slightly more families — 6.45 million. However, the percentage of benefits reaching low-income families is much higher under the OWE (69 percent vs. 49 percent). Additionally, the OWE provides an average of nine percent more RTC benefits to low-income tax filers, making it clearly the superior option for poverty reduction. Moreover, the paper shows that alternative conversion schemes that set benefit reduction rates to differ by family size can further increase the benefits to low-income families at a lower overall cost.

Such changes would elicit a labour-supply response in terms of a reduction in hours worked, and while the effect is smaller under the less expensive OW/OE, the difference between the two options is slight.

This paper simulates the conversion of NRTCs to RTCs in comprehensive detail, besides providing practical advice on how such a shift would be funded. It offers valuable food for thought on an issue that is increasingly critical to Canadian society.

1. INTRODUCTION

Public perception and concern about trends in the distribution of income have risen in recent years, perhaps most palpably aided by the media coverage of the Occupy Movement in 2011. Researchers have responded with new evidence on rising income inequality across the world, including Atkinson and Morelli[1] and Piketty.[2] In Canada, Fortin et al.[3] corroborate international evidence of rising income inequality in recent decades and consider a variety of policy options to offset this trend, including greater reliance on refundable tax credits (RTCs) to redistribute income to those at the bottom of the income spectrum. Hum and Simpson[4] link the evolution of RTCs in Canada to the more general concept of a negative income tax or guaranteed annual income that permeated academic research and policy discussions in the 1970s and is periodically revived as a prospective comprehensive anti-poverty strategy. That is, a comprehensive system of RTCs could approach, in terms of both design and impact on low-income households, a guaranteed annual income system. In this paper, we consider the potential impact and cost of a proposal of this nature.

In his submission to the House of Commons Standing Committee on Finance, Robin Boadway[5] argues that a major innovation in tax-transfer policy has been the RTC, but that the full potential of the RTC to provide an equitable system has not been realized. Thus, Boadway[6] recommends that the federal government should:

> "... make all tax credits refundable. As it stands, non-refundable tax credits are of no value to persons in a non-taxpaying position, and as such, taxpayers and non-taxpayers are treated asymmetrically. Making all tax credits refundable is feasible, and would turn the tax system into a proper negative income tax system."[7]

Boadway[8] also recommends that all current non-refundable tax credits (NRTCs) should be conditioned on income and that some NRTCs that provide windfall gains to selective taxpayers might be eliminated. The latter two proposals would generate revenue to help pay for the conversion of NRTCs to RTCs, an issue we consider later in this paper.

This proposal is attractive because it does not require the federal government to introduce new tax measures. The proposal simply extends the recent practice of designing tax credit programs to be refundable. What is less clear, however, is just what impact the proposal would have on Canadian households and how much it would cost in terms of dollars and alternative tax arrangements. Our paper investigates these questions using the Social Policy Simulation Database and Model (SPSD/M). In Section 2, we explain the concepts of a NRTC and a RTC and situate federal NRTCs in the current Canadian tax-transfer system. In Section 3, we explain our methodology for converting these NRTCs to RTCs. Section 4 presents simulation results that assess the costs of the conversion and its impact on low-income households and the distribution of income in the absence of any behavioural response. Section 5 provides estimates of the labour-supply response to the conversion and its effect on the income of RTC recipients. Section 6 considers alternative financing

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[1] Atkinson, Anthony B. and Morelli, Salvatore, (2014). "Chartbook of Economic Inequality," *Society for the Study of Economic Inequality* (ECINEQ) Working Paper 2014-324. Also available in an online version at: http://www.chartbookofeconomicinequality.com/

[2] Piketty, Thomas, (2014). *Capital in the Twenty-First Century*, Harvard University Press.

[3] Fortin, Nicole, Green, David A., Lemieux, Thomas, Milligan, Kevin and Riddell, W. Craig, (2012). "Canadian Inequality: Recent Developments and Policy Options," *Canadian Public Policy/Analyse de Politiques* 38(2), 121-145.

[4] Hum, Derek and Simpson, Wayne, (2001). "A Guaranteed Annual Income? From Mincome to the Millennium," *Policy Options/Options Politiques*, January-February, 78-82.

[5] Boadway, Robin, (2013). *Submission to the House of Commons Standing Committee on Finance*, April 25.

[6] Boadway, 2013 op. cit. page 3.

[7] The proposal to convert existing NRTCs to RTCs can also be found in Boadway, Robin, (2011). "Rethinking Tax-Transfer Policy for 21st Century Canada," in Fred Gorbet and Andrew Sharpe (eds.) *New Directions for Intelligent Government in Canada: Papers in Honour of Ian Stewart* (Ottawa: Centre for the Study of Living Standards).

[8] Boadway, 2013 op. cit.

arrangements to pay for the proposed measures, while Section 7 provides a summary and some concluding remarks. A more detailed and technical discussion of our methodology is contained in Appendices I to IV.

2. NON-REFUNDABLE TAX CREDITS IN THE CANADIAN FEDERAL CONTEXT

The Canadian federal tax system contains a mix of non-refundable and refundable tax credits. Several recent benefit programs have already been designed as RTC schemes, most notably the Canada Child Tax Benefit and the accompanying National Child Benefit Supplement, as well as the Goods and Services Tax Credit and the Working Income Tax Credit. These programs determine benefit levels according to family taxable income declared in the most recent income tax filing. Most tax credits remain non-refundable, however, and benefit only those who owe taxes. The Boadway proposal would take these existing non-refundable federal tax credits and make them refundable, such that non-taxpayers would receive a benefit. In this section, we assess current federal NRTCs included in Schedule 1 of the Federal Tax Return that would provide the basis for this initiative. In keeping with the Boadway proposal, we consider only NRTCs and not tax deductions such as union and professional dues, child-care expenses, and business investment losses.[9]

The distinction between non-refundable and refundable tax credits and the implication for the incidence of benefits are straightforward. Perhaps the most familiar example of a NRTC at the federal level is the universal basic personal amount, currently $11,138, of which 15 percent or $1670.70 is the NRTC subtracted from federal tax owing on taxable income.[10] Since the basic personal amount is a NRTC, it can only be used to offset federal taxes owing; if taxes owing are less than $1670.70, such that the difference between taxes owing and the NRTC arising from the basic personal amount is negative, no taxes are paid. If the basic personal amount were a RTC, on the other hand, the tax filer would be entitled to a benefit corresponding to the difference between taxes owing and the tax credit. Thus, for an individual with no taxable income and hence no taxes owing, the RTC would be $1670.70 for the basic personal amount. As taxable income and taxes owing increased, the value of the refundable benefit would decline by the amount of taxes owing, or 15 percent of taxable income, until taxes owing reached $1670.70 at a taxable income of $11,138, at which point no refundable benefit would be paid; that is, the refundable benefit would be fully offset by taxes owing. Beyond a taxable income of $11,138 the individual would be taxed in the current fashion. This refundable benefit is precisely the principle behind the negative income tax or what has been primarily termed a guaranteed annual income in Canadian policy discussions,[11] where the maximum benefit of $1670.70 would be referred to as the guarantee and the rate of 15 percent at which the benefit declines as taxable income rises would be referred to as the benefit reduction rate or negative income tax rate. For additional discussion of the common principles behind the RTC and guaranteed annual income, see Appendix I.

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[9]   While the distinction between tax credits and deductions may be arbitrary at times and is beyond the scope of this paper, we would note that tax deductions typically involve expenses directly incurred in earning income (such as union and professional dues or child-care expenses), whereas NRTCs serve a number of other purposes related to differences in the circumstances of tax filers (related to health conditions or age as well as income levels) or the promotion of meritorious activities (such as employment, charitable giving, saving for retirement, or wage insurance).

[10]   15 percent is the minimum federal tax rate applied to the sum of the basic personal amount and any other applicable NRTCs. Tax credits are generally handled in a comparable manner at the provincial level with rates that vary by province, but assessment of provincial tax policies and how they might respond to changes in the treatment of NRTCs at the federal level is beyond the scope of this paper.

[11]   The 1971 Special Senate Committee on Poverty recommended the implementation of a federally financed and administered negative income tax program to address poverty and referred to it as a Guaranteed Annual Income. The Canadian negative income tax experiment between 1974 and 1979, the Manitoba Basic Annual Income Experiment, also referred to a guaranteed annual income. The 1985 Macdonald Royal Commission on the Economic Union and Development Prospects for Canada endorsed the concept of a negative income tax in its proposal for a Universal Income Security Program. Senator Hugh Segal has advocated a guaranteed annual income and proposed the Yukon as a trial site. See Davidson, Justine, (2010). "Senator promotes guaranteed income model," *Whitehorse Daily Star*, April 12. Accessed February 3, 2015 at: http://whitehorsestar.com/News/senator-promotes-guaranteed-income-model

The SPSD/M package uses individual administrative data from personal income tax returns and unemployment claimant histories, as well as survey data on family incomes, employment and expenditure patterns to provide a micro-statistically representative sample of Canadians.[12] Using SPSD/M version 21.0, we itemize the federal NRTCs, estimate their value for 2013 and calculate the claim frequency for all tax filers and for those tax filers below and above the Statistics Canada Low-Income Cutoff (LICO) after tax. Our results are presented in Table 1.

TABLE 1 **PERCENT OF ADULTS (18+) CLAIMING A NON-REFUNDABLE TAX CREDIT AND THE AVERAGE VALUE OF THE CREDIT BY AFTER-TAX LOW-INCOME STATUS — CANADA, 2013**

Item	Total Value $Billions	All Filers		Low-Income Filers		Non Low-Income Filers	
		% Claiming	Average Value[1]	% Claiming	Average Value[1]	% Claiming	Average Value[1]
Basic	**$46.430**	100%	$1,655	100%	$1,655	100%	$1,655
Demographic-based	**$8.986**						
Age	$4.930	18.8%	$937	8.7%	$1,028	19.7%	$934
Married	$3.971	11.6%	$1,216	20.7%	$1,385	10.8%	$1,185
Equivalent-to-Married	$0.085	0.3%	$1,166	0.7%	$1,144	0.2%	$1,171
Dependency-based	**$2.465**						
Child tax credit	$2.292	13.9%	$588	13.1%	$624	14.0%	$585
Dependant Caregiver	$0.159	0.6%	$987	0.1%	$969	0.6%	$987
Infirm Dependants	$0.014	0.04%	$1,285	0.03%	$1,285	0.04%	$1,285
Employment-based	**$10.281**						
CPP Contributions	$3.988	61.6%	$231	37.0%	$59	63.9%	$240
CPP Self-employed	$1.795	7.2%	$894	9.3%	$326	7.0%	$965
EI Contributions	$1.465	59.6%	$88	32.6%	$28	62.2%	$90
Quebec Plan	$0.117	13.6%	$31	7.2%	$9	14.2%	$32
Employment Income	$2.916	64.1%	$162	39.5%	$156	66.4%	$163
Education-based	**$2.093**						
Tuition	$1.182	7.7%	$546	13.6%	$610	7.2%	$535
Education Allowance	$0.739	8.3%	$319	14.6%	$380	7.7%	$308
Textbook	$0.120	8.3%	$52	14.6%	$62	7.7%	$50
Interest on Student Loans	$0.052	2.1%	$88	0.6%	$60	2.3%	$88
Unclassified	**$13.006**						
Disability	$0.762	2.3%	$1,165	3.0%	$1.164	2.3%	$1.165
Medical Expenses	$1.425	13.2%	$385	7.7%	$295	13.7%	$384
Pension Income	$1.562	19.7%	$283	2.2%	$237	21.3%	$284
Gifts & Charitable Donations	$2.474	17.6%	$501	2.0%	$297	19.1%	$503
Public Transit	$0.179	5.2%	$124	4.7%	$98	5.2%	$126
Fitness	$0.118	5.0%	$85	2.1%	$80	5.2%	$85
Transferred Tax Credits	$1.257	7.0%	$641	8.1%	$720	6.9%	$632
Other Credits	$5.229	22.9%	$816	12.4%	$549	23.8%	$839
Total Tax Credits	**$83.261**	**100.0%**	**$2,969**	**100.0%**	**$2,499**	**100.0%**	**$3,013**
Total Applied Tax Credits	**$69.632**	**94.0%**	**$2,643**	**76.8%**	**$1,246**	**95.6%**	**$2,748**

Source: Statistics Canada, SPSD/M Version 21.0.

1. The average value for those who claimed the credit.

[12] Statistics Canada, (2013). *SPSD/M Product Overview*. Ottawa: Statistics Canada.

NRTCs constitute a substantial federal government tax expenditure. We estimate the value of all federal NRTCs to be $83.3 billion in 2013, of which $69.6 billion was actually used to reduce federal tax payable. As you would expect, the NRTCs are more valuable for those with higher incomes. Not only do those who are not low-income tax filers qualify for 20 percent more NRTCs on average than low-income tax filers ($3013 vs. $2499), but they are able to apply a much larger percentage of those credits (95.6 percent vs. 76.8 percent). As a result, these higher income tax filers realize benefits from NRTCs that are 120 percent higher than their low-income counterparts ($2,748 vs. $1,246), a striking illustration of the asymmetric treatment of tax filers to which Boadway refers.

The most important benefit by far is the basic personal amount, which constitutes $46.4 billion or 55.8 percent of the total value of all NRTCs. Although this benefit is available to everyone, those without taxable income currently receive no benefit from it. Employment based NRTCs —CPP and EI contribution credits plus the employment earnings credit— account for another $10.3 billion or 12.3 percent of the total value of all NRTCs. Other categories of credits include demographic-based NRTCs ($9.0 billion or 10.8 percent), dependent credits ($2.5 billion or three percent), education credits ($2.1 billion or 2.5 percent) and an assortment of other unclassified NRTCs ($13.0 billion or 15.6 percent).

Boadway and others have suggested that some NRTCs are of questionable value from a fairness perspective and might be eliminated to help pay for the conversion of other NRTCs to RTCs. Since we revisit that issue in Section 6 when we discuss financing alternatives, we would only note here that there are substantial differences in the claim frequency of some NRTCs between low-income and higher income tax filers. It is not surprising that higher income tax filers are much more likely to claim the employment-based credits, but they also claim NRTCs for items such as pension income, gifts and charitable donations and medical expenses at much greater rates. Conversely, low-income tax filers are more likely to claim the education-based NRTCs in the current system.[13]

Table 1 illustrates the size and composition of the NRTCs in the Canadian income tax system today, as well as their distribution across low-income and non-low-income tax filers. What would be the impact of converting these NRTCs to RTCs as Boadway has suggested? To what extent would this initiative redistribute income to low-income households in the fashion of a guaranteed annual income? We turn now to our methodology to address these questions.

3. METHODOLOGY TO CONVERT THE FEDERAL NON-REFUNDABLE TAX CREDITS TO REFUNDABLE CREDITS

For each census family in the SPSD/M database, we determined the value of all NRTCs. We then converted the NRTCs to RTCs, based on total income corresponding to line 150 of the Federal Income Tax Return for the tax filer and his/her spouse. The maximum benefit or guarantee is then 15 percent of total NRTCs for all tax filers in the Census Family Unit as defined by the SPSD/M model.[14] For the benefit reduction rate, we consider two alternatives: an Option Without Exemption, which does not exempt any taxable income from benefit reduction as in a classic negative income tax design and an Option With Exemption, which provides an exemption, common in existing RTC plans, that we set at 25 percent of the before-tax low- income standard for a census family, which we refer to as the Census Family Low-Income Line and calculate from

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[13] It is frequently advantageous for students to transfer their education-based NRTCs to their parents in the current system, which would be less likely if the credits were refundable. The shift in the distribution of the credits when they are converted from NRTCs to RTCs would have some unknown but small impact on our results, since the education-based NRTCs are only about two percent of the total NRTCs subject to conversion.

[14] The SPSD/M Census Family consists of a head, a spouse (if there is one), and their children under the age of 25 (including their guardian children), living together in the same dwelling. Unattached individuals are included as census families of size 1 in the SPSD/M.

Statistics Canada's Low-Income Cutoffs.[15] Having established the guarantee level at 15 percent of total NRTCs in the family, we can choose either a benefit reduction schedule or a break-even level to complete our RTC conversion scheme.

We want to establish benefit reduction schedules that direct the RTCs to low-income families. In order to assess appropriate program parameters to achieve this objective, we initially set the benefit reduction rate for each family such that only families below the Census Family Low-Income Line receive a benefit.[16] Since the Census Family Low-Income Line varies by family size, the resulting benefit reduction rate also varies according to family size and the family value of the non-refundable tax credit in our schemes.[17] We refer to these family-specific benefit reduction rates as "individual" benefit reduction rates. Although these simulations, which are reported in Appendix III, provide a benefit that would be very effectively targeted to low-income families, a program for the conversion of NRTCs to RTCs that allows the benefit reduction rate to vary for each family would likely be too administratively complex. Hence, these preliminary simulations primarily allow us to calculate average benefit reduction rates across all families and across families by family size, to provide the basis for simpler and more attractive conversion scenarios we discuss in Section 4.

Since NRTCs are assessed on an individual basis and each individual pays his/her own taxes, the final step in our model is to apportion the value of the RTC to each tax filer in the census family according to the proportion that their NRTC represented of the total family NRTC. Thus, we use family income to claw back the value of total family NRTCs, consistent with current practice for RTCs, but then assign the refundable benefit to each individual tax filer to reflect the Canadian system of individual tax filing.

There are some significant challenges in using SPSD/M to model the conversion of NRTCs to RTCs. One challenge is the discrepancy between the CRA and SPSD/M definitions of the census family unit. The CRA definition effectively includes only dependent children under 18 years and those over 18 with infirmities. By comparison, the SPSD/M model includes all children living in the same dwelling under 25 years of age. CRA would consider children between 18 and 25 to be a separate family unit. Fortunately, these adult children represent only 7.8 percent of all adults 18 and over in the SPSD/M database.

A second discrepancy occurs because the definition of low income used to claw back the refundable tax credits is based on the census family, while the definition of low income used to assess the target efficiency of the refundable credits is based on the broader economic family concept.[18] To define the net benefits, the census family is used because it is most like the family unit that would be used by CRA to deliver a refundable tax credit program. To assess the impact of the program in reducing the incidence and depth of low income, however, the economic family unit is used, as this is the unit used by Statistics Canada to define its Low-Income Cutoffs. To implement our RTC design, we define our Census Family Low-Income Line as the weighted average of the economic family Low-Income Cutoffs encompassed for each census family size.

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[15] The Census Family Low-Income Line was created by calculating the weighted average Before Tax Low-Income Cutoffs (LICO) for each census family size. Appendix II shows the weighted average LICOs for each Census Family size. The Option Without Exemption corresponds to equation [A1] in Appendix I, while the Option With Exemption corresponds to equation [A2] in Appendix I with the turning point T set at 25 percent of the Census Family Low-income Line before tax, L. Alternative, more complex designs might consider different benefit reduction rates for each NRTC, but we are not sure what criteria might be used to set different benefit reduction rates for different credits.

[16] In the vernacular of the guaranteed income literature, we establish the break-even level B of the RTC equal to L. See Appendix I for a more detailed discussion of the relationship between the guarantee, benefit reduction rate schedule and break-even level.

[17] That is, the benefit reduction rate $r = G/(L-T)$, where G is total NRTCs, L is the low-income line for the family, and T is the turning point or exemption level. See Appendix I for additional discussion of these concepts and their interrelationship.

[18] Census family refers to a married or common-law couple and their children, or a lone parent with at least one child, living in the same dwelling. Children may be children by birth, marriage or adoption regardless of their age or marital status who live in the dwelling without their own spouse or child. Grandchildren living with their grandparent(s) but with no parents present also constitute a census family. Economic family refers to a group of two or more persons living in the same dwelling who are related by blood, marriage, common-law or adoption, including foster children. By definition, all persons who are members of a census family are also members of an economic family, but an economic family may contain more than one census family. For a complete definition, see http://www.statcan.gc.ca/concepts/definitions/fam-eng.htm.

These Census Family Low-Income Lines are reported in Appendix II.[19] In cases where the economic family encompasses multiple census families, however, the combined census family units would receive more RTCs than they would if they were assessed as a single economic family unit, which has some implications for the measurement of the re-distributional impact of the conversion scheme.

4. IMPACT OF THE CONVERSION FROM NRTCS TO RTCS

In this section we present impact simulations for the conversion of NRTCs to RTCs, for an option without an income exemption and an option with an income exemption equal to 25 percent of the Census Family Low-Income Line (the Option Without Exemption and the Option With Exemption, respectively). In each option, we set the family income guarantee at 15 percent of the value of all NRTCs currently available to the family, as is current tax practice. Based on the average benefit reduction rates of 15.3 percent for the Option Without Exemption and 20.4 percent for the Option With Exemption determined for individual benefit reduction rates in Appendix III, our first set of simulations uses a "single BRR" of 15 percent for the Option Without Exemption and 20 percent for the Option With Exemption. Our second set of simulations uses the average benefit reduction rates differentiated by family size in Appendix III to set what we term a "BRR by family size" for each option. We describe these results as impact simulations because we do not allow for behavioural response. We then provide simulation results that incorporate labour-supply response in Section 5.

Table 2 presents our estimates of the impact of converting NRTCs to RTCs for a single BRR of 15 percent for the Option Without Exemption and 20 percent for the Option With Exemption. That is, RTC recipients under the Option Without Exemption are taxed at a single rate of 15 percent, regardless of family size from zero taxable income to the Census Family Low-Income Line, while RTC recipients under the Option With Exemption are taxed at zero percent up to 25 percent of the Census Family Low-Income Line and a single rate of 20 percent regardless of family size from that point to 100 percent of the Line.[20] The incremental cost of the Option Without Exemption is $6.6 billion as additional benefits are provided to 6.44 million families (36.9 percent of all families). The incremental cost of conversion of NRTCs to RTCS under the Option With Exemption is $7.2 billion providing benefits to slightly more (6.45 million) families. The percentage of the benefits directed to tax filers from low-income families is higher for the Option With Exemption (69 percent) than the Option Without Exemption (49 percent). Thus, although the Option With Exemption is modestly more expensive than the Option Without Exemption ($0.6 billion or nine percent), it delivers RTC benefits to low-income tax filers at a considerably higher rate. Moreover, the Option With Exemption provides an average of nine percent more in RTC benefits for low-income tax filers (from $1,317 for the Option Without Exemption to $1,436 for the Option With Exemption) but only 0.7 percent more for other filers (from $850 to $856) — further evidence of the superior targeting of benefits to low-income families provided by the income exemption combined with a higher benefit reduction rate. As we would therefore expect, the incidence of poverty falls further under the Option With Exemption (from 15.9 percent currently to 14.8 percent after conversion) than under the Option Without Exemption (from 15.9 percent to 15.0 percent), as does the poverty gap (from 44.3 percent to 35.4 percent under the Option With Exemption compared to 37.2 percent under the Option Without Exemption) and the Gini Index (from 42.64 to 42.09 under the Option With Exemption compared to 42.16 under the Option Without Exemption).

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[19] The bottom row in the Appendix provides a single weighted average census family low-income threshold for each census family size across all economic family sizes without differentiation by urban size or region, which we believe is the most suitable measure for tax implementation at present.

[20] As we note in Appendix III, the BRR for the Option With Exemption should be 4/3 of the BRR for the Option Without Exemption beyond the exemption level or turning point (25 percent of the Census Family Low-Income Line).

TABLE 2   IMPACT OF THE CONVERSION OF NON-REFUNDABLE TAX CREDITS TO REFUNDABLE TAX CREDITS FOR CENSUS FAMILIES, CANADA 2013 — SINGLE BRR

Performance Indicator	NRTC Conversion to RTC: Guarantee is 15% of NRTCs, Break-even is Census Family Low-Income Line	
	Option Without Exemption, BRR=0.15	Option With Exemption, *BRR=0.20*
Total Cost ($Billions)	$6.62	$7.23
Number of Beneficiaries (Millions)	6.44	6.45
% of Low-Income Tax Filers Getting a RTC	70.1%	83.8%
Number of Low-Income Tax Filers Getting a RTC	2.46	2.94
% of Non Low-Income Filers Getting a RTC	16.2%	14.3%
Number of Non-Low-Income Filers Getting a RTC	3.98	3.51
% of Total RTC Going to Low-Income Filers	48.9%	69.3%
Average RTC for All Filers	$1,029	$1,120
Average RTC for Low-Income Filers	$1,317	$1,436
Average RTC for Non-Low-Income Filers	$850	$856
Average BRR for Low-Income Filers	0.15	0.20
Reduction in Low-Income Rate[1,3]	-0.9 (15.9 to 15.0)	-1.1 (15.9 to 14.8)
Reduction in the Poverty Gap[1,2,3]	-7.1 (44.3 to 37.2)	-8.9 (44.3 to 35.4)
Reduction in the GINI Index[3,4]	-0.48 (42.64 to 42.16)	-0.5 (42.64 to 42.09)

Source: SPSD/M Version 21.0 and authors' calculations.

1. The Low-Income Line is the before-tax Low-Income Cutoff (LICO) published by Statistics Canada and used to assess the rate and depth of low income.
2. The poverty gap is the difference between the Low-Income Line and the average income of the low-income person as a percent of the low-income line.
3. The reductions do not include the labour-supply effect on earnings.
4. Economic family before-tax income was used in assessing income inequality.

The second simulation exercise uses the average benefit reduction rates by family size from Appendix III to differentiate the BRR by family size for the Options Without and With Exemption. This is a fairly direct and simple way to differentiate taxpayer circumstances along the lines adopted by the National Child Benefit. Note that the BRR for each family size for the Option With Exemption continues to be about one-third higher than the corresponding BBR by family size for the Option Without Exemption, but that the Option With Exemption has the income exemption set at 25 percent of the Census Family Low-Income Line. The results in Table 3 show that this is a somewhat less expensive option than the single BRR, costing $5.2 billion for the Option Without Exemption and $6.4 billion for the Option With Exemption, as the number of families that benefits declines to 5.26 and 5.35 million (about 30 percent of all families), respectively. The differentiation of the BRR by family size, however, increases the proportion of RTC benefits directed to tax filers from low-income families compared to the single BRR for the Option Without Exemption (58.1 percent when the BRR is adjusted by family size compared to 48.9 percent for the single BRR in Table 2) but not for the Option With Exemption (64.0 percent compared to 69.3 percent). Although the Option With Exemption is $1.2 billion (23 percent) more expensive than the Option Without Exemption, much of that additional expenditure goes to low-income families, increasing the average RTC by 29 percent for low-income tax filers (from $1,013 for the Option Without Exemption to $1,304 for the Option With Exemption) compared to 10 percent for other filers (from $940 to $1,033). As a result, the Option With Exemption continues to outperform the Option Without Exemption in reducing the incidence of poverty, the poverty gap and the Gini Index. Nonetheless, our previous scenario with a single BRR is actually superior on all three of these measures, albeit at a higher cost. Our exercises are only illustrative of a vast array of schemes —that is, the vast range of BRRs for a guarantee set by total family NRTCs— that would result in different program costs, incidence of benefits and consequences for income redistribution.

TABLE 3   IMPACT OF THE CONVERSION OF NON-REFUNDABLE TAX CREDITS TO REFUNDABLE TAX CREDITS FOR CENSUS FAMILIES, CANADA 2013 — BRR BY FAMILY SIZE5

Performance Indicator	NRTC Conversion to RTC: Guarantee is 15% of NRTCs, Breakeven is Census Family Low-Income Line	
	Option Without Exemption [5]	Option With Exemption [5]
Total Cost ($Billions)	$5.17	$6.37
Number of Beneficiaries (Millions)	5.26	5.35
% of Low-Income Tax Filers Getting a RTC	84.4%	89.0%
Number of Low-Income Tax Filers Getting a RTC	2.96 Million	3.12
% of Non-Low-Income Filers Getting a RTC	9.4%	9.0%
Number of Non-Low-Income Filers Getting a RTC	2.30 Million	2.22
% of Total RTC Going to Low-Income Filers	58.1%	64.0%
Average RTC for All Filers	$981	$1,192
Average RTC for Low-Income Filers	$1,013	$1,304
Average RTC for Non-Low-Income Filers	$940	$1,033
Average BRR for Low-Income Filers	15.8%	21.1%
Reduction in Low-Income Rate[1,3]	-0.7 % (15.9% to 15.2%)	-0.9% (15.9% to 15.0%)
Reduction in the Poverty Gap[1,2,3]	-5.8% (44.3% to 38.5%)	-8.1% (44.3% to 36.2%)
Reduction in the GINI Index[3,4]	-0.31 (42.64 to 42.33)	-0.41 (42.64 to 42.23)

Source: SPSD/M Version 21.0 and authors' calculations.

1. The Low-Income Line is the before-tax Low-Income Cutoff (LICO) published by Statistics Canada was used to assess the rate and depth of low income.
2. The poverty gap is the difference between the Low-Income Line and the average income of the low-income person as a percent of the low-income line.
3. The reductions do not include the labour-supply effect on earnings.
4. Economic family before-tax income was used in assessing income inequality.
5. BRRs are the average by family size for each option from Appendix III Table.

Family size	Option Without Exemption	Option With Exemption
1	10.6%	14.3%
2	21.1%	28.1%
3	23.1%	30.8%
4	25.0%	33.3%
5+	27.1%	36.2%

The conversion of NRTCs to RTCs using either a single BRR or BRRs differentiated only by family size targets low-income families well, as the primary beneficiaries are those with limited taxable income and the benefits are clawed back for those with higher incomes. Table 4 summarizes the impact of each of the four conversion scenarios we have analyzed —a single BRR for the Options Without and With Exemption (SBRRWOE and SBRRWE) and a family-size adjusted BRR for the Options Without and With Exemption (FSBRRWOE and FSBRRWE)— on family incomes grouped relative to the Statistics Canada Low-Income Cut Off (LICO) before tax. Our family income categories include less than 50 percent of the LICO, increments of 25 percent of the LICO up to 150 percent, and more than 150 percent of the LICO to assess the effectiveness of the conversion schemes in delivering benefits across the family income spectrum. For each option, the RTC benefits accruing to families decline as family income increases in proportion to the LICO, such that the spillover of benefits to families with higher incomes above the LICO is quite limited under these proposals. For example, new transfers under the single benefit reduction rate for the Option Without Exemption (SBRRWOE) are $2014, or 28.4 percent of family income, for the poorest families with incomes

less than 50 percent of the LICO but this transfer amount and percentage fall steadily to only $139, or 0.1 percent of family income, for the highest income families with incomes exceeding 150 percent of the LICO. A similar pattern is observed for the other three scenarios we have considered.

**TABLE 4   CHANGE IN AVERAGE FAMILY INCOME DUE TO REFUNDABLE TAX CREDITS,[1] VARIOUS RTC DESIGNS**

		Single BRR (as in Table 2)		BRR by Family Size (as in Table 3)	
Before- Tax Income as Proportion of LICO	Average Total Family Income	Increase In Family Income Due to the Option Without Exemption, SBRRWOE (%)	Increase in Family Income Due to the Option With Exemption, SBRRWE (%)	Increase In Family Income Due to the Option Without Exemption, FSBRRWOE (%)	Increase in Family Income Due to the Option With Exemption, FSBRRWE (%)
Under 0.5	$7,082	$2,014 (28.4%)	$2,679 (37.8%)	$2,044 (28.9%)	$2,668 (37.7%)
0.5 - 0.75	$16,252	$1,223 (7.5%)	$1,645 (10.1%)	$1,066 (6.6%)	$1,565 (9.6%)
0.75 - 1.0	$21,760	$724 (3.3%)	$888 (4.1%)	$623 (2.9%)	$829 (3.8%)
1.0 - 1.25	$28,002	$699 (2.5%)	$721 (2.6%)	$403 (1.4%)	$472 (1.7%)
1.25 - 1.50	$35,866	$538 (1.5%)	$467 (1.3%)	$214 (0.6%)	$232 (0.6%)
1.50 +	$93,594	$139 (0.1%)	$113 (0.1%)	$109 (0.1%)	$109 (0.1%)

Source: SPSD/M Version 21.0 and authors' calculations.

Note: The labour-supply effects are not estimated in the average family income due to the RTCs.

The differentiation of BRRs by family size reduces additional program cost at the cost of reducing the benefits paid to those families below the LICO. For the poorest families (under 0.5), the BRR by Family Size option leaves their income slightly higher ($2,044 vs. $2,014) for the Option Without Exemption and slightly lower ($2,668 vs. $2,679) for the Option With Exemption. However, for those with incomes between 0.5 and 1.0 times the LICO, the BRR by Family Size option results in reduced family income. These progressive income transfers results, arising solely from the conversion of existing NRTCs to RTCs targeted to low-income families along the lines of a guaranteed annual income, are summarized in Figure 1.
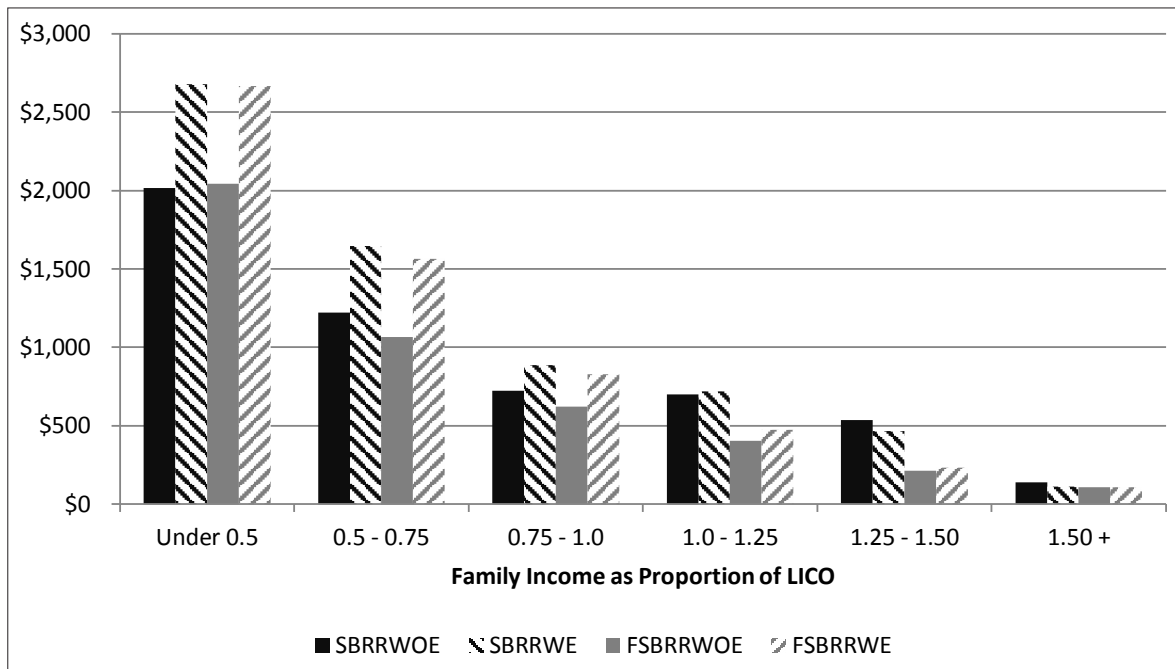
5.   LABOUR-SUPPLY RESPONSE

One important limitation of our analysis to this point is that it does not incorporate a behavioural response. Since the proposed conversion of NRTCs to RTCs reflects a modest policy modification along the lines of a negative income tax, one expected behavioural response would be a reduction in labour supply, since the income effect from the transfer of RTC benefits and the compensated wage or substitution effect from the introduction of a benefit reduction rate reinforce each other. Thus, our impact estimates are likely to represent an upper bound on the amount of income transferred and a lower bound on costs, as the anticipated negative labour-supply response reduces earnings and increases eligibility for RTCs. In this section, we describe our approach to incorporate labour-supply response into our simulations and apply it using recent consensus estimates of the appropriate labour-supply elasticities. A more detailed and technical description of our methodology can be found in Appendix IV.

Each individual in our simulation has initial earnings and income before conversion of NRTCs to RTCs and an effective benefit reduction rate on NRTCs of zero. The conversion produces an increase in the benefit reduction rate and an increase in income. The anticipated labour-supply response to the conversion therefore involves a reductions in hours worked and earnings from two sources. First, there is a reduction in hours worked arising from the increase in the effective tax rate from zero on NRTCs to the benefit reduction rate for RTCs, which reduces the after-tax wage in proportion to the size of the benefit reduction rate. Secondly, there is a reduction in hours worked arising from the increase in RTC benefits. We can calculate the first effect for each individual using an assigned substitution elasticity that will result in reduced hours worked and earnings except for those individuals without earnings, such as individuals in retirement or out of the labour force, and for those low-income individuals in the zone of the income exemption under the Option With Exemption, whose benefit reduction rate remains at zero. We can similarly calculate the second effect for each individual using an assigned income elasticity that will result in reduced hours worked and earnings for anyone who benefits from the conversion. Total (negative) labour-supply response is simply the sum of these substitution and income effects, as in equation [A7] in Appendix IV.

We derive consensus estimates of the substitution and income elasticities from McLelland and Mok.[21] Their review of recent research indicates a likely range for the income elasticity of 0 to 0.1 for men and women and a likely range for the substitution elasticity of 0.1 to 0.3 for men and single women and 0.2 to 0.4 for married women. To evaluate the labour-supply response to our conversion scenarios, we take the midpoint of these ranges and assign an income elasticity of 0.05 and substitution elasticities of 0.2 for men and single women and 0.3 for married women.

Labour-response in terms of reductions in earnings and income to RTC recipients is summarized in Table 5 for our four scenarios for low-income families and for all families receiving RTCs. Labour-supply response to the conversion of NRTCs to RTCs varies from 9.8 percent to 12.5 percent for low-income RTC recipients and from 11.2 percent to 22.3 percent for all recipients of benefits under the conversion schemes. The differences arise primarily from differences in substitution effects, since the income elasticity and consequent income effects are small (about one percent of the average RTC benefit across the board). In turn, the differences in the substitution effects arise from differences in the structure of benefit reduction rates for a given distribution of earnings among affected tax filers. In general, the less costly Option Without Exemption elicits smaller labour-supply response but the difference with the Option With Exemption is small. Note also that the single BRR schemes generate the smallest labour-supply response for low-income recipients (9.8 percent of the average RTC benefit for the Option Without Exemption and 11.2 percent for the Option With Exemption), but they also produce the largest labour-supply response for all recipients (22.3 percent for the Option Without Exemption and 21.6 percent for the Option With Exemption). These results reflect the longer reach outside the low-income population of the single BRR schemes into regions where earnings are higher. Indeed, the labour-supply response as a proportion of individual earnings is similar to the other two schemes with individual and family-size adjusted BRRs (three to four percent), but the earnings base of the single BRR plan is higher for all recipients, as shown in Table 5.[22] In contrast, labour-supply response for the two options with family-size adjusted BRRs is quite similar for low-income and for all recipients and overall labour-supply response for all recipients is smaller than for the other two schemes (12.5 percent for the Option Without Exemption and 12.8 percent for the Option With Exemption).

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[21] McClelland, Robert and Mok, Shannon, (2012). "A Review of Recent Research on Labor Supply Elasticities," *Congressional Budget Office Working Paper* 2012-12, October.

[22] This result is expected, since the substitution effect dominates the labour supply response and is proportional to earnings. See equation [A5] in Appendix IV.

TABLE 5   ESTIMATED LABOUR SUPPLY RESPONSE OF RTC RECIPIENTS IN TERMS OF INCOME

	Single BRR				BRR by Family Size			
	Low-Income Recipients		All Recipients		Low-Income Recipients		All Recipients	
	Option without Exemption	Option with Exemption	Option without Exemption	Option with Exemption	Option without Exemption	Option with Exemption	Option without Exemption	Option with Exemption
Total Income	$11,271	$12,092	$18,291	$15,853	$12,375	$12,611	$15,980	$15,358
Total Earnings	$3,367	$3,281	$6,527	$5,196	$3,033	$3,302	$3,217	$3,358
Average RTC benefit (% of total income)	$1,317 (11.7 %)	$1,436 (11.9%)	$1,029 (5.6%)	$1,120 (7.1%)	$1,013 (8.2%)	$1,304 (10.3%)	$981 (6.1%)	$1,192 (7.8%)
Average BRR for RTC recipients	15%	20%	15%	20%	15.8%	21.1%	14.8%	19.8%
Income elasticity[a]	-0.05		-0.05		-0.05		-0.05	
Income effect ($) (% avg RTC benfit)[b] (% avg earnings)	-$17 (1.3%) (0.5%)	-$19 (1.3%) (0.6%)	-$13 (1.2%) (0.2%)	-$15 (1.2%) (0.3%)	-$12 (1.2%) (0.4%)	-$16 (1.2%) (0.5%)	-$10 (1.0%) (0.3%)	-$13 (1.1%) (0.4%)
Substitution Elasticities[a]	0.20 (men & singles) 0.30 (married women)		0.20 (men & singles) 0.30 (married women)		0.20 (men & singles) 0.30 (married women)		0.20 (men & singles) 0.30 (married women)	
Substitution (tax) effect ($) (% avg RTC benfit)[c] (% avg earnings)	-$112 (8.5%) (3.3%)	-$142 (9.9%) (4.3%)	-$216 (21.0%) (3.3%)	-$227 (20.3%) (4.4%)	-$102 (10.1%) (3.4%)	-$146 (11.2%) (4.4%)	-$101 (10.3%) (3.1%)	-$140 (11.7%) (4.2%)
Total (income+ sub-stitution) effect (% avg RTC benefit) (% avg earnings)	**-$129 (9.8%) (3.8%)**	**-$161 (11.2%) (4.9%)**	**-$229 (22.3%) (3.5%)**	**-$242 (21.6%) (4.7%)**	**-$114 (11.2%) (3.8%)**	**-$162 (12.5%) (4.9%)**	**-$110 (11.2%) (3.4%)**	**-$153 (12.8%) (4.6%)**

Source: SPSD/M Version 21.0 and authors' calculations.

a   Based on recent surveys of labour supply elasticities in McClelland and Mok, 2012 op. cit and Evers, Michiel, de Mooij, Ruud and van Vuuren, Daniel, (2005). "What explains the variation in estimates of labour supply elasticities?" *CESifo Working Papers* No. 1633, Centre for Economic Studies and Ifo Institute, University of Munich, December.

b,c   Both the Income and Substitution effects were calculated for each individual in the SPSDM data base based on their total earnings and total income before and after receipt of the RTC.

b   Substitution effect is based on the actual BRR (benefit reduction rate) for RTC recipients compared to an assumed rate of zero for NRTC recipients applied to earnings and expressed as a percentage of total income. For Option 2, 10.9 percent of total recipients have incomes below the turning point and therefore face a zero BRR, such that there is no substitution effect.

Our results suggest that labour-supply response is neither negligible nor prohibitive for the design of a program to convert NRTCs to RTCs. For our conversion schemes with family-size adjusted BRRs with and without an income exemption, we estimate that one of every nine dollars of RTC benefits is offset by reduced labour supply for low-income recipients and one of every eight dollars is lost to reduced labour supply for recipients at all income levels.[23]   Moreover, as Table 6 and Figure 2 show, our labour-supply estimates have little impact on the pattern of incidence of benefits by family income, as most of the benefits continue to be directed to lower income families. Transfers under SBRRWOE (the single BRR scheme for the Option Without Exemption) are $1972 for the poorest families with incomes less than 50 percent of the LICO, a very modest decline of $42 or 0.6 percent of average family income for this group as a result of their labour-supply response. And this transfer still increases average family income for these poorest families by 27.2 percent. This transfer amount and percentage of income from SBRRWOE falls steadily and sharply to only $96, or 0.1 percent of family income, for the highest income families with incomes exceeding 150 percent of the LICO. A similar pattern is maintained for the other scenarios we have considered, with average family income falling by less than two percent for the poorest families as a result of labour-supply response. The Option With Exemption is more expensive than the Option Without Exemption and has a slightly larger labour-supply response but delivers more benefits to the poorest families. Transfers under schemes SBRRWE and FSBRRWE provide $2564 and $2554, respectively, to the poorest families (under 0.5), which raise average

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[23]   This is not a welfare analysis and thereby ignores any benefits arising from increased time not spent working.

family income by 30 percent relative to their Option Without Exemption counterparts, SBRRWOE ($1972) and FSBRRWOE ($1957).

TABLE 6   CHANGE IN AVERAGE FAMILY INCOME DUE TO REFUNDABLE TAX CREDITS AND LABOUR SUPPLY RESPONSES, VARIOUS RTC DESIGNS

Before Tax Income as Proportion of LICO	Average Total Family Income	Single BRR		BRR by Family Size	
		Increase In Family Income Due to Option Without Exemption, SBRRWOE (%)	Increase in Family Income Due to Option With Exemption, SBRRWE (%)	Increase In Family Income Due to Option Without Exemption, FSBRRWOE (%)	Increase in Family Income Due to Option With Exemption, FSBRRWE (%)
Under 0.5	$7,082	$1,972 (27.2%)	$2,564 (36.2%)	$1,957 (27.6%)	$2,554 (36.1%)
0.5 - 0.75	$16,252	$1,108 (6.8%)	$1,443 (8.9%)	$905 (5.6%)	$1,343 (8.3%)
0.75 - 1.0	$21,760	$597 (2.7%)	$708 (3.3%)	$507 (2.3%)	$636 (2.9%)
1.0 - 1.25	$28,002	$481 (1.7%)	$440 (1.6%)	$347 (1.2%)	$393 (1.4%)
1.25 - 1.50	$35,866	$288 (0.8%)	$223 (0.6%)	$191 (0.5%)	$202 (0.6%)
1.50 +	$93,594	$96 (0.1%)	$83 (0.1%)	$98 (0.1%)	$96 (0.1%)

Source: SPSD/M Version 21.0 and author's calculations.

FIGURE 2   AVERAGE INCOME TRANSFER TO FAMILIES AFTER LABOUR-SUPPLY RESPONSE BY FAMILY INCOME AS PROPORTION OF LICO
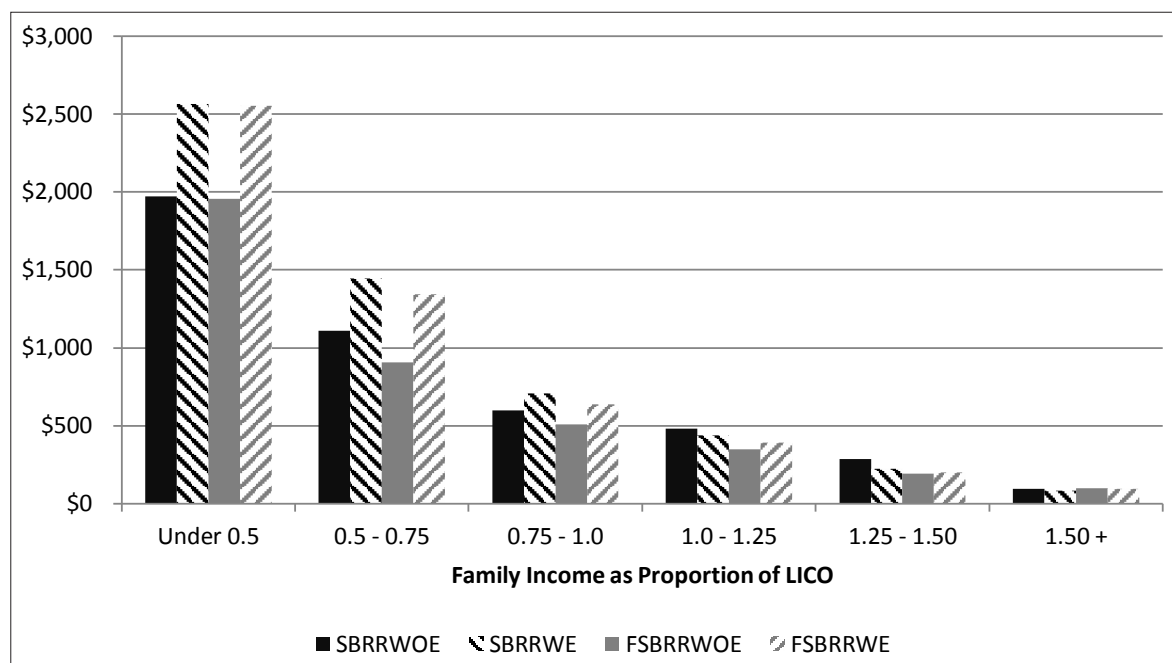
6. FINANCING ENHANCED REFUNDABLE TAX CREDITS

We have examined the costs and impact of specific plans to convert existing NRTCs to RTCs. In this section, we consider four options for financing the proposals: (1) Using some of any emerging budget surplus; (2) Eliminating some of the NRTCs; (3) Applying lower tax credit rates to the NRTCs as taxable income increases; and (4) Raising marginal tax rates for the highest income tax filers.

Use Some of Any Emerging Budget Surplus

The federal government has already indicated that it is prepared to spend some of the projected surplus in 2014-15 and subsequent fiscal years on income transfers to families. A 2011 election promise to allow two-parent families with children below 18 years of age to split up to $50,000 of income for taxation purposes has been estimated to cost around $2.7 billion to the federal treasury.[24] Since the income-splitting proposal would largely benefit well-to-do families and would therefore have an adverse re-distributional impact very different from the Boadway proposal, the federal government has now instituted this proposal with the maximum benefit limited to $2,000 per family and coupled it with an increase to the National Child Benefit to assist more low-income families with children. The *Globe and Mail* has estimated these combined initiatives will cost $4.6 billion per year.[25] While the conversion of NRTCs to RTCs might be considered to be a policy alternative to the current initiatives from the federal government, given its different target and re-distributional properties, it is not clear that the emerging budget surplus will not permit additional tax expenditures, even if the current income-splitting and child benefit proposals are preserved. Indeed, the surplus is now projected to be $6.4 billion in 2015-16, rising to $10.3 billion by 2018-19,[26] although that projected surplus did not account for adverse economic shocks such as declining oil prices. Since the federal government may in any case prefer to use the surplus to reduce its debt or to fund other programs, we consider briefly some other measures to finance the conversion of NRTCs to RTCs.

Eliminate Some of the Non-Refundable Tax Credits

Boadway suggests that some tax credits are of questionable value from a fairness perspective. Looking at the list, the basic tax credit is the same for individuals regardless of family income, but does permit those in the lowest income brackets to avoid taxes altogether. The married, equivalent-to-married and dependency-based credits are intended to reflect the differences across family sizes and structures and likely should be retained to achieve horizontal equity. It is hard to justify the age credit, however, because the poverty rate among the elderly is the lowest of any demographic group. The payroll tax credits, on the other hand, are intended to offset employment costs associated with these taxes, while the employment tax credit provides labour-supply incentives. Boadway and others recommend retaining the tuition, education and textbook tax credits, which we would agree assist students to focus on education rather than working, while Mintz[27] argues that the student loan interest payments are a questionable credit because "tuition fees and other education costs are expensed." Disability and medical expenses tax credits are intended to help offset these costs, thus helping to achieve horizontal equity. It is not clear why there is a tax deduction for pension income, however, while there is no deduction for other forms of income. The tax credit for gifts and charitable donations favours the

[24] Laurin, Alexandre and Kesselman, Jonathan Rhys, (2011). "Income Splitting for Two-Parent Families: Who Gains, Who Doesn't, and at What Cost?," *C.D. Howe Institute Commentary* No. 335.

[25] Curry, Bill and Chase, Steven, (2014). "Harper boosts monthly child benefit, unveils income splitting plan," *Globe and Mail* published online October 30, 2014 and accessed online February 19, 2015 at http://www.theglobeandmail.com/news/politics/harper-unveils-income-splitting-tax-cut-expands-monthly-child-benefit/article21386549/

[26] Finance Canada, (2014). *The Road to Balance: Creating Jobs and Opportunities: Economic Action Plan 2014 (The Budget in Brief),* Ottawa: Government of Canada, February 11. Accessed at http://www.budget.gc.ca/2014/docs/bb/pdf/brief-bref-eng.pdf

[27] Mintz, Jack, (2014). "17 Reasons why Canada needs simple tax reform now," *Financial Post Magazine.* April 3.

non-poor, but it helps sustain the non-profit sector and can be justified on that basis. The presence of other tax credits like the fitness and public transit deductions can be questioned from an efficacy perspective.[28]

Thus, one can make a case for reconsidering such NRTCs as age, interest on student loans, pension income, public transit and fitness tax credits, which are estimated from Table 1 to cost $6.8 billion in federal tax revenues and would fund all or most of any of our conversion scenarios at first glance. Of course, elimination of some or all of these NRTCs would reduce the base for conversion of NRTCs to RTCs as well, resulting in coincident reductions in both costs and benefits transferred under our plans, an issue we do not pursue further here.

Apply a Variable Tax Credit Rate to the Non-Refundable Tax Credits

The current treatment of the NRTCs in determining the net federal tax payable is to apply the lowest marginal tax rate of 15 percent to their total value and deduct the resulting amount from the basic federal tax. To investigate the impact of Boadway's suggestion that the value of the NRTCs should be conditioned on income, we apply a variable tax credit rate that is set at 15 percent for those whose income falls in the lowest tax bracket ($0 to $43,561), but that declines to 13, 11 and nine percent for those in the second, third and fourth tax brackets respectively. This rate adjustment results in the value of the tax credits applied to the basic federal tax dropping by $6.05 billion, thus raising the amount of federal tax collected by close to that amount and again providing sufficient, or nearly sufficient, funding for all the schemes we have simulated.

Raise Marginal Tax Rates for the Highest Income Tax Filers

To help finance the conversion of NRTCs to RTCs, a fifth tax bracket with a marginal tax rate of 34 percent could be created for the top one percent of taxable incomes. As well, the marginal tax rate for the fourth tax bracket could be raised to 30 percent. We estimate that these two measures would increase federal income tax revenues by $3.72 billion.

Of course, these financing options are neither exhaustive nor mutually exclusive. Two or more of the options might be combined in more moderate forms to generate the necessary revenue in the range of $5 billion to $7 billion annually, depending on the conversion scheme chosen. Since our conversion schemes are illustrative, one can also design alternative schemes to achieve a target cost.

7. CONCLUSION

We have analyzed the impact of converting existing non-refundable tax credits to refundable tax credits targeted at low-income households, as proposed by Boadway[29] and others. The RTCs can be represented as a form of negative income tax or guaranteed annual income that is identified by choosing two of its three parameters: the guarantee level, the tax schedule and the break-even level of earnings. We establish a common guarantee at 15 percent of the total value of existing NRTCs for each individual taxpayer and develop two options for each of three schemes with different tax schedules. The Option With Exemption establishes an income exemption based on 25 percent of the Census Family Low-Income Line while the Option Without Exemption has no income exemption, but a benefit reduction rate that is only three-quarters of the rate for the Option With Exemption. Initial simulations with individualized benefit reduction rates are used to determine appropriate benefit reduction rates for each option applied to a single benefit reduction

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[28] For an analysis of the effectiveness and distributional impact of the public transit NRTC, see Chandler, Vincent, (2014). "The Effectiveness and Distributional Effects of the Tax Credit for Public Transit," *Canadian Public Policy/Analyse de Politiques* 40(3), 259-269.

[29] Boadway, 2011 op. cit; 2013 op. cit.

rate and to a benefit reduction rate that differs according to family size, resulting in a total of four illustrative conversion plans.

We use the SPSD/M database and model updated to 2013 to simulate the costs of these four plans and their impact on household incomes. Our methodology addresses issues associated with the difference between the CRA and SPSD/M definitions of the census family unit and the discrepancy between the census family low-income definition used to claw back the RTCs and the economic family low-income definition used to assess their re-distributive impact. We find that our proposed options are effective in delivering modest RTC benefits predominantly to low-income households at fairly low benefit reduction rates and at modest cost to the government. Using recent consensus estimates of labour-response from the literature, we estimate that this behaviour might reduce income transfers by between 11 percent and 22 percent for all benefit recipients, but that schemes such as adjusting benefit reduction rates by family size can limit adverse labour-supply response to the lower end of these estimates for low-income families and for all families who would receive benefits from the conversion.

Converting existing NRTCs to RTCs is a modest but effective step to deliver benefits to low-income households in the fashion of a guaranteed annual income. Our proposed Option Without Exemption with no initial income exemption and benefit reduction rates adjusted for family size delivers an average benefit of $981 at a cost of $5.2 billion while the Option With Exemption with an exemption and benefit reduction rates adjusted for family size delivers an average benefit of $1192 at a cost of $6.4 billion — but the most important part of these and the other conversion plans is that most of the benefits are directed to low-income households. By far the largest benefits are directed to the poorest families with incomes less than 50 percent of the low-income cutoff. After taking account of adverse labour-supply response, the poorest families receive an average benefit of $1957 under the Option Without Exemption and $2554 under the Option With Exemption, using benefit reduction rates that are adjusted for family size. Just as the incidence of benefits declines with rising family income, the average RTC benefit also declines, such that families with an income that exceeds 150 percent of the Low-Income Cutoff receive a benefit of less than $100 under these plans. Reductions in the incidence and depth of poverty and income inequality are evident in our results from this modest change in the structure of tax credits. We therefore see the conversion of existing NRTCs to RTCs as a modest but potentially important step toward fairness in the treatment of tax filers and in addressing Canadian income inequality. Provincial and territorial action along the same lines is beyond the scope of this paper, but would likely have comparable *pro rata* effects.

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REFUNDABLE TAX CREDITS AND THE GUARANTEED ANNUAL INCOME (NEGATIVE INCOME TAX) SCHEME

A refundable tax credit precisely corresponds to a negative income tax, or what has been primarily termed a guaranteed annual income in Canadian policy discussions. The benefit at zero taxable income, corresponding to zero taxes owing before deduction of any tax credits, would constitute the guarantee G in a negative income tax scheme, while the rate of reduction in the guarantee as taxable income increased would constitute the benefit reduction rate, also known as the negative income tax rate, t. In our example in Section 2, G is 15 percent of the total of NRTCs for the individual, or $1670.70 based on the personal amount alone, while t is 15 percent. While our example refers to a single individual, we should note here that a negative income tax scheme would typically define the guarantee G in terms of family rather than individual income, to correspond to definitions of low income or poverty in family terms. Moreover, current RTCs are based on family income (income of the individual and his/her spouse), as we discuss below. Thus, the methodology we develop to convert NRTCs to RTCs that we describe in Section 3 is based on family income.

In a classic negative income tax scheme where the tax rate is linear, the break-even level of income B at which no benefits are paid and transition to the positive tax system occurs is defined by the ratio of the guarantee to the tax rate, so that the benefit payment P to any individual with taxable income Y would be

$$P = \begin{cases} G - tY \text{ if } Y < B = G/t \\ 0 \text{ if } Y \geq B \end{cases} , 0 \leq t \leq 1 \qquad \text{[A1]}$$

In our example above with a linear tax rate of 15 percent, B would be $11,138 or the value of the NRTCs available to the tax filer. Note that this refundable benefit does not supplant the other benefits of the personal amount or other NRTCs, which continue for those who have net federal taxes owing. Thus, an individual with income above B would claim the basic personal amount and pay taxes on income above B, as is now the case when the basic personal amount is an NRTC.

More complex designs are possible. In particular, the benefit reduction rate need not be constant, but might depend on the level of total (before tax) income and/or demographic characteristics Z of the tax filer so that $t = \rho(Y, Z)$. For example, one benefit scheme that we consider allows for an exemption on initial income up to a turning point T, after which a benefit reduction rate r applies, so that the payment scheme becomes

$$P = \begin{cases} G \text{ if } Y \leq T \\ G - r(Y - T) \text{ if } T < Y < B = T + G/r \\ 0 \text{ if } Y \geq B \end{cases} , 0 < r \leq 1 \qquad \text{[A2]}$$

where $\rho(Y, Z) = \begin{cases} 0, Y \leq T \\ r, T < Y < B \end{cases}$.[30] Another benefit scheme that we consider allows the benefit

reduction rate r to depend on family characteristics Z, specifically family size as occurs under the National Child Benefit program, with and without an exemption level or turning point. These examples illustrate that a RTC scheme, like a negative income tax or guaranteed annual income, can be characterized by its

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[30]   In the limiting case where the turning point is $T = 0$, r is just the negative income tax rate t in [1].

design troika —the guarantee, break-even level, and tax schedule [*G*, *B*, and *t*]— where the tax schedule $t = \rho(Y,Z)$ may consist of different marginal negative tax (benefit reduction) rates for tax filers with different income levels and demographic characteristics.

Specification of *G* and *t* is sufficient to define the break-even level of income *B*, which in turn provides a useful indicator of the degree to which the benefit scheme is targeted to the low-income population. Lower marginal rates would result in a higher *B* and a more expensive benefit program, as the benefits of the RTC would be spread across more tax filers at the low end of the income spectrum. Alternatively, if *G* is determined and *B* is set equal to a low-income measure, such that only a certain low-income population receives the benefit, only a specific benefit reduction rate *t* or specific schedules $\rho(Y,Z)$ are possible to achieve the desired [G, B] combination. For example, if the basic personal exemption were converted to a RTC, such that the current NRTC (15 percent of the basic personal exemption) constituted the income guarantee *G*, and if the break-even level *B* of the plan was set at the poverty line as in our scenarios below, then the benefit reduction rate schedules consistent with such a scheme can be determined. We use this simple feature to determine benchmark benefit reduction rates in our initial simulations that are presented in Appendix III.

Many recent benefit programs have been designed as RTC schemes, most notably the Canada Child Tax Benefit and the accompanying National Child Benefit Supplement, the Goods and Services Tax Credit and the Working Income Tax Credit. These programs determine benefit levels according to family taxable income declared in the most recent income tax filing. For the Canada Child Tax Benefit for 2014, for example, the annual basic benefit is $1446 per child for residents of most provinces with an additional $100.92 per child for the third and additional children. This basic benefit applies to families with net incomes up to $43,953 with a benefit reduction rate of two percent of family income above this level for families with one child and four percent for families with two or more children. Thus, the negative tax rate is zero up to a turning point of $43,953 and two percent or four percent thereafter, yielding a break-even level that varies with family size but is $116,253 for a family with one or two children. That is, families with one or two children and net incomes that exceed $116,253 would not receive the Canada Child Tax Benefit. The National Child Benefit Supplement and the Goods and Services Tax Credit operate on the same principles but have much lower break-even levels, which allow the payments to be targeted to lower income households. The Working Income Tax Benefit provides a wage subsidy of 25 percent for low-income households that is phased out at a benefit reduction rate of 15 percent beyond a low-income threshold.[31]

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[31] The 25 percent subsidy is applied to earnings over $3000 per year until net income reaches $11,332 for singles and $15,649 for couples or single parents (in 2014). Benefits are phased out at 15 cents per dollar of income beyond this net income threshold. See, for example, http://www.cra-arc.gc.ca/E/pbg/tf/5000-s6/5000-s6-14e.pdf. The program deviates somewhat from this design in some provinces and territories.

AVERAGE BEFORE-TAX LICO THRESHOLDS BY NUMBER OF ADULTS IN ECONOMIC AND CENSUS FAMILIES – CANADA, 2013

Economic Family Size	Census Family Size						
	1	2	3	4	5	6	7
1	21,856	-	-	-	-	-	-
2	27,153	26,503	-	-	-	-	-
3	33,662	33,420	33,127	-	-	-	-
4	41,781	41,161	41,568	40,293	-	-	-
5	48,297	47,433	47,257	47,862	45,787	-	-
6	54,258	53,816	54,666	54,108	54,816	51,151	-
7+	62,441	61,368	58,487	60,867	59,788	62,732	57,139
Overall Weighted Average	25,553	28,410	34,808	41,207	46,502	52,285	57,139

RESULTS OF CONVERTING NRTCS TO RTCS WITH INDIVIDUALIZED BENEFIT REDUCTION RATES

In order to calculate appropriate benefit reduction schedules to direct the RTC benefits to low-income families, we begin by determining a benefit reduction rate for each family, such that only families below a low-income cutoff receive a benefit.[32] We refer to these family-specific benefit reduction rates as "individual" benefit reduction rates because they vary by family size, corresponding to variation in low-income cutoffs by family size available from Statistics Canada and by total family NRTCs.[33] Since a RTC scheme of this nature would be administratively complex, we have treated these calculations as a calibrating exercise to determine average benefit reduction rates by family size that guide us in establishing reasonable benefit reduction schedules for simpler schemes presented in the paper.

Although these initial simulations are designed to limit benefits to families below the break-even level (the low-income cutoff), it is important to note that some families not classified as low-income will still receive RTCs in these simulations because of the difference between the (census) definition of families used for tax assessment and the (economic) definition of families used to assess re-distributional impact. To define the net benefits, the census family is used because it is most like the family unit that would be used by CRA to deliver a refundable tax credit program. To assess the impact of the program in reducing the incidence and depth of low income, however, the economic family unit is used, as this is the unit used by Statistics Canada to define its Low-Income Cutoffs. In those cases where adult children with their own children or in-laws are living together, the economic family encompasses multiple census families, so that these combined census family units get higher levels of RTCs than they would if they were assessed as an economic family unit. To minimize the discrepancy between the break-even level in our simulations and the economic family Low-Income Cutoff from Statistics Canada, we calculated the low-income cutoff as a Census Family Low-Income Line equal to the weighted average of the Economic Family Low-Income Cutoffs encompassed by each census family size. These Census Family Low-Income Lines, which are the basis for the assignment of the break-even level and income exemption in our initial simulations involving individual benefit reduction rates and the income exemption in subsequent simulations in the paper, are provided in Appendix II. The bottom row in Appendix II provides a single weighted average census family low-income threshold for each census family size across all economic families without differentiation by urban size or region, which we believe is most suitable for tax implementation.

The table below presents the results of our simulation of the impact of the conversion of NRTCs to RTCs for individual BRRs for the two options. Since our primary interest in these results is the average benefit reduction rate, we focus on this question. The average benefit reduction rate across all family sizes under the Option Without Exemption is 15.3 percent, while the effect of introducing the income exemption in the Option With Exemption, keeping the break-even level of income constant at the Census Family Low-Income Line, is to raise the average benefit reduction rate to 20.4 percent. That is, RTC recipients under the Option Without Exemption are taxed at an average rate of 15.3 percent across all family sizes from zero taxable income to the Census Family Low-Income Line, while RTC recipients under the Option With Exemption are taxed at zero percent up to 25 percent of the Census Family Low-Income Line and an average of 20.4 percent from that point to 100 percent of the Line.[34] These results provide us with some benchmark benefit reduction rates to construct the first set of simulations in the paper that use a single benefit reduction rate.

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[32] That is, in the parlance of the guaranteed income literature, we establish the break-even level B of the RTC equal to a low-income cutoff, which we define below and calculate in Appendix II. See Appendix I for more detailed discussion of the relationship between the guarantee, benefit reduction rate schedule, and break-even level.

[33] In a few cases, the total value of the non-refundable tax credit exceeded the low-income line, thus pushing the BRR above 1.0. To avoid this, we set the maximum benefit reduction rate at the 99th percentile. For those few individuals with negative income, we set the value to $0.

[34] With an income exemption of 25 percent of the Line L, the benefit reduction rate from equation [A2] in Appendix I must be $G/(L\text{-}0.25L)$ or 4/3 of G/L, where G/L is the benefit reduction rate of 15.3 percent. when $T=0$, or 20.4 percent.

The table below also calculates average benefit reduction rates by family size, which we use in a second set of simulations in the paper. Note that benefit reduction rates vary considerably by family size. For the Option Without Exemption, they rise from 10.6 percent for single individuals to 27.1 percent for families with five or more persons. For the Option With Exemption, they rise from 14.3 percent for single individuals to 36.2 percent for families of five or more persons.

Finally, we revisit the issue that we discussed above of the discrepancy between the census family used as the basis for tax collection and the economic family used as the basis for calculating the incidence of low incomes. Since the two options in the table below are individually targeted to census families below the Census Family Low-Income Lines, the impact in terms of reduction in the incidence of poverty must be modest and arises from instances where the economic family contains multiple census families with combined RTCs. Thus, the incidence of poverty, measured by the proportion of families below the Statistics Canada Low- Income Cutoff for economic families, does fall modestly from 15.9 percent to 15.2 percent under the Option Without Exemption and falls further to 14.9 percent under the Option With Exemption despite the individual targeting of benefits. The poverty gap, indicating the percentage of income required to bring families to the Low-Income Line, falls from 44.3 percent to 37.5 percent under the Option Without Exemption and further to 35.5 percent under the Option With Exemption.

APPENDIX III TABLE **IMPACT OF THE CONVERSION OF NON-REFUNDABLE TAX CREDITS TO REFUNDABLE TAX CREDITS FOR CENSUS FAMILIES, CANADA 2013 – INDIVIDUAL BRRS**

Performance Indicator	NRTC Conversion to RTC: Guarantee is 15% of NRTCs, Breakeven is Census Family Low-Income Line (as in Appendix II)	
	The Option Without Exemption	The Option With Exemption
Total Cost ($Billions)	$4.92	$6.32
Number of Beneficiaries (Millions)	5.51	5.51
% of Low-Income Tax Filers Getting a RTC	96.0%	96.0%
Number of Low-Income Tax Filers Getting a RTC	3.37	3.37
% of Non-Low-Income Filers Getting a RTC	8.7%	8.7%
Number of Non-Low-Income Filers Getting a RTC	2.13	2.13
% of Total RTC Going to Low-Income Filers	70.0%	70.0%
Average RTC for All Filers	$894	$1,148
Average RTC for Low-Income Filers	$1,020	$1,313
Average RTC for Non-Low-Income Filers	$695	$887
Average BRR for All Low-Income Filers	15.3%	20.4%
Average BRR for Low-Income Families of Size 1	10.6%	14.3%
Average BRR for Low-Income Families of Size 2	21.1%	28.1%
Average BRR for Low-Income Families of Size 3	23.1%	30.8%
Average BRR for Low-Income Families of Size 4	25.0%	33.3%
Average BRR for Low-Income Families of Size 5+	27.1%	36.2%
Reduction in Low-Income Rate[1,3]	-0.7% (15.9% to 15.2%)	-1.0% (15.9% to 14.9%)
Reduction in the Poverty Gap[1,2,3]	-6.8% (44.3% to 37.5%)	-8.8% (44.3% to 35.5%)
Reduction in the GINI Index [3,4]	-0.33 (42.64 to 42.31)	-0.43 (42.64 to 42.21)

Source: SPSD/M Version 21.0 and authors' calculations.

1. The Low-Income Line is the before-tax Low-Income Cutoff (LICO) published by Statistics Canada; it was used to assess the rate and depth of low income.
2. The poverty gap is the difference between the LICO and the average income of the low-income person as a per cent of the low income line.
3. The reductions do not include the labour-supply effect on earnings.
4. Economic family before-tax income was used in assessing income inequality.

The anticipated labour-supply response to the conversion of NRTCs to RTCs involves reductions in hours worked h from two sources. First, there is a reduction in hours worked arising from the increase in the effective tax rate from zero on NRTCs to the benefit reduction rate r for RTCs, which reduces the after-tax wage from w to $w(1-r)$ or by an amount wr.[35] Secondly, there is a reduction in hours worked arising from the increase Δy in RTC benefits to individuals. That is,

$$\frac{\Delta h}{h} = \eta_w \frac{\Delta w}{w} + \eta_R \frac{\Delta y}{y} \qquad\qquad [A3]$$

where η_w and η_R are the substitution and income elasticities with respect to hours worked, respectively.[36, 37] In terms of earnings $E=wh$, this would be

$$\frac{w\Delta h}{wh} = \frac{\Delta E}{E} = \eta_w \frac{\Delta E}{E} + \eta_R \frac{\Delta y}{y} \qquad\qquad [A4]$$

where we can capture the average percentage change in earnings and benefits from our simulated results and the substitution and income elasticities from surveys of the recent literature. That is, each individual in our simulation has earnings E_1 and income y_1 before conversion of NRTCs to RTCs and a benefit reduction rate on NRTCs of $r_1 = 0$. The conversion produces a change in income to y_2 and a new benefit reduction rate for each individual of r_2. Hence we calculate for each individual for assigned (positive) substitution elasticity η_w a substitution effect of

$$\Delta E_s = \eta_w \Delta E, \quad \Delta E = \left[(1-r_2)-(1-r_1)\right]E_1 = -r_2 E_1 \qquad [A5]$$

which will be negative except where $\Delta E = 0$ for those individuals without earnings (where $E_1 = 0$), such as individuals in retirement or out of the labour force, and for those low-income individuals in the zone of the income exemption under the Option With Exemption (where $r_2 = 0$). We also calculate for each individual for assigned (negative) income elasticity η_R an income effect of

$$\Delta E_I = \eta_R \frac{E_1}{y_1}\Delta y, \qquad \Delta y = y_2 - y_1 \qquad\qquad [A6]$$

which will be negative for anyone who benefits from the conversion (that is, where $y_2 > y_1$). This gives us a total (negative) labour-supply response of

$$\Delta E = \Delta E_s + \Delta E_I \qquad\qquad [A7]$$

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[35] See equation [A2] in Appendix I for our general specification of the benefit reduction rate applied to RTCs.

[36] Hum, Derek and Simpson, Wayne, (1994). "Labour Supply Estimation and Public Policy," *Journal of Economic Surveys* 8(1), 57-81.

[37] We assume a single individual. The change in income *Δy* consists of an increase in the income guarantee *ΔR* and a reduction in earnings from the change in after-tax wage *Δw*, measured at hours worked prior to the conversion.

Our simulations in this paper rely on consensus estimates of substitution and income elasticities from McLelland and Mok.[38] Their review of recent research indicates a likely range for the income elasticity of 0 to 0.1 for men and women. They determine a range for the substitution elasticity of 0.1 to 0.3 for men and single women and 0.2 to 0.4 for married women.[39] We take the midpoint of these ranges to assign our labour-supply parameters as follows:

$$\eta_R = -0.05, \qquad \eta_w = \begin{cases} +0.2 & \text{(for men and single women)} \\ +0.3 & \text{(for married women)} \end{cases} \qquad \text{[A8]}$$

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[38]   McLelland and Mok, 2012 op. cit.

[39]   See, in particular, McLelland and Mok (ibid, Table 2, Panel A). These labour-supply estimates include both the intensive (hours) and extensive (participation) margins. McLelland and Mok also provide separate estimates for hours and participation (Table 2, Panel B).

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