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Abstract

An important component of the work to be completed by the British Columbia’s Expert Panel on Basic Income is to design simulations to look at how various basic income (BI) models could work in B.C. (B.C. Poverty Reduction, 2018). The intent of these simulations is to identify the potential impacts and financial implications for B.C. residents of different variants of a BI. Given the poverty reduction targets passed by the B.C. government, detailed in Petit and Tedds (2020d), the potential impacts include those on the incidence and the depths of poverty in the province (B.C. Poverty Reduction, n.d.). The panel ran over 16,000 different BI scenarios to consider in B.C., which were modelled using Statistics Canada’s Social Policy Simulation Database and Model (SPSD/M) program. We evaluate different BI scenarios in terms of their implications for a variety of measures, including cost, number of recipients, rates of poverty, depths of poverty, distributional affects, and inequality impacts. This paper provides details regarding these simulations. Our goal in this paper is simply to consider different versions of a basic income in terms of both their cost implications and their implications for poverty reduction. We believe that identifying the most effective variants of a basic income in terms of these two criteria will help sharpen the conversation about the applicability of a basic income as a policy option for B.C.

Introduction

An important component of the work to be completed by the British Columbia's Expert Panel on Basic Income is to design simulations to look at how various basic income (BI) models could work in B.C. (B.C. Poverty Reduction, 2018). The intent of these simulations is to identify the potential impacts and financial implications for B.C. residents of different variants of a BI. Given the poverty reduction targets passed by the B.C. government, detailed in Petit and Tedds (2020d), the potential impacts include those on the incidence and the depths of poverty in the province (B.C. Poverty Reduction, n.d.).

Building on the BI simulations that already exist and are detailed in Tedds and Crisan (2020), the panel ran over 16,000 different BI scenarios to consider in B.C., which were modelled using Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) program.[1] The SPSD/M is a statistical tool available from Statistics Canada that represents Canadian individuals and their families with detailed information not only on individual and family demographics, but also on their income, transfers received, and taxes to be paid. It incorporates parameters from various federal and provincial tax and transfer program parameters, allowing a user to examine the implications of either modifications existing taxes and transfer programs or of new program proposals (Statistics Canada, n.d.). The SPSD/M includes measures of poverty, including the Market Basket Measure (MBM), against which the models can be evaluated.

In our work with the SPSD/M, we evaluate different BI scenarios in terms of their implications for a variety of measures, including cost, number of recipients, rates of poverty, depths of poverty, distributional affects, and inequality impacts. It is important to note that, as with the SPSD/M itself, we do not consider behavioural responses to the different program features. The potential behavioural responses that may result from a basic income are matters that are individually considered by various other research papers commissioned by the Expert Panel on Basic Income, particularly those related to labour supply.

This paper provides details regarding these simulations. We do not discuss potential revenue sources for the costs we identify, details about exactly how a basic income would be delivered to recipients, or fiscal federalism issues. All of these are considered in other papers commissioned by the panel. Our goal in this paper is simply to consider different versions of a

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[1] We also ran 33 scenarios using administrative tax records; however, we only present the results from the SPSD/M program. This is for three reasons. First, the results across the two sources of data are very similar. Second, SPSD/M is a publicly available tool, meaning that anyone can replicate our results. Administrative tax records, on the other hand, are not publicly available and are only available confidentially through the B.C. Ministry of Finance. Third, administrative tax records are only representative of those who file their taxes, and the data source is known to underrepresent low-income individuals (Cameron et al., 2020). Cameron, A., Tedds, L. M., Robson, J., & Schwartz, S. (2020, February 12, 2020). Tax Policy Trends: The Merits of Automatic Income Tax Assessments for Low-Income Canadians. *SPP Research Papers*, 1. https://www.policyschool.ca/wp-content/uploads/2020/02/Tax-policy-Trends-Feb-2020.pdf The SPSD/M is an integrated database, constructed from many different data sources, and is meant to provide a statistically representative sample of all Canadians and not just tax filers. However, there is an important limitation to note: the SPSD/M provincial sample is fairly small, resulting in a lack of precision in the results.

basic income in terms of both their cost implications and their implications for poverty reduction. We believe that identifying the most effective variants of a basic income in terms of these two criteria will help sharpen the conversation about the applicability of a basic income as a policy option for B.C.

Overview of Modelling Choices

There are almost innumerable basic income proposals. Tedds et al. (2020) provide a thorough examination of many of these proposals and, based on that, arrives at 13 key elements that define a basic income. We specify the basic income variants we examine in our simulations in terms of specific choices about those 13 elements as follows:

- **Objective:** While a wide range of objectives are possible, we focus on two measurable objectives: reductions in rates and depths of poverty in B.C. as set out in the mandate for the expert panel (B.C. Poverty Reduction, 2018).
- **Form:** We consider two main forms for the BI: one we will call a universal basic income (UBI), which involves sending a cheque for one of the basic guarantee amounts specified under the Sufficiency heading to all units (households or individuals); and one in which the payment is conditioned on income. The latter can take different forms (see, for example, Boadway et al. (2018a, 2018b); Koebel and Pohler (2019); Simpson et al. (2017); Simpson and Stevens (2019); Stevens and Simpson (2017). We model it as a refundable tax credit (RTC) based on annual income. This is because the SPSD/M data used for the simulations provides annual income data. A BI dependent on income can also be delivered monthly through a negative income tax (NIT) arrangement based on monthly fluctuations in income (Kesselman, 2020). We do not model an NIT, as the data used for the simulations precludes this.
- **Sufficiency (G):** We consider basic guarantee amounts ranging from $1,000 to $20,000 annually, in increments of $1,000. The maximum of $20,000 is chosen as matching the poverty line for a single individual in B.C.
- **Beneficiary unit:** We consider delivering the BI to either individuals or to family units, where the family unit is defined as a nuclear family.
- **Equivalence scale:** We consider two equivalence scales: a per capita scale and the square root scale. The latter is a common approach to taking account of economies of scale in consumption in households. For example, for a per capita scale, a two-adult family will receive twice the BI basic guarantee (e.g., $20,000 if the BI basic guarantee [G] is $10,000). And, if the square root scale is used, a two-adult family would be paid the square root of two times the BI basic guarantee (e.g., $14,000 for a BI basic guarantee of $10,000). We do not include children in the household for the purposes of calculating the BI, given our assumption that their consumption is covered by the Canada Child Benefit.
- **Universality and exclusivity:** Based on existing analysis that demonstrates that existing income support programs for children and seniors are already robust and

poverty rates low (Petit & Tedds, 2020d), the basic income is intended to be delivered to those between the ages of 18 and 64, a group for whom poverty rates are much higher (Petit & Tedds, 2020d), with existing programs for children and seniors remaining largely intact.

- **Conditionality:** For the RTC, we simulate a BI based on income (the concept of income used here is discussed in more detail below). We do not incorporate conditionality, such as on job search, since that is not an element of most basic income proposals. We also do not include variations by disability status—a common form of conditionality.
- **Duration:** The basic income is modeled as a permanent benefit.

Elements that are not considered either at all or in their entirety include the following:

- **Exclusivity:** While we state that existing programs for children (e.g., the Canada Child Benefit and the B.C. Child Opportunity Benefit) and seniors (e.g., Guaranteed Income Supplement, Old Age Security, and Canada Pension Plan) would remain intact, we do not consider the degree to which existing programs targeting persons ages 18–64 (e.g., provincial Income Assistance) would be substituted for or complement a BI program. That is considered in separate work.
- **Frequency:** We work with annual income but do not consider the frequency of payments, whether annual, sub-annual, or some combination.
- **Funding:** As mentioned earlier, we consider funding in separate work.
- **Administration:** We do not address the manner in which the payments are delivered to the household or individual.

Two final aspects to consider with respect to modelling choices are:

- defining the benefit reduction rate (BRR)
- what definition of income would be used to determine when the BRR rate is applied, a matter often overlooked in its importance in the existing literature

Both of these aspects require a more detailed discussion than the other elements.

A key parameter in the RTC form is the BRR, alternatively called the tax-back rate or clawback rate. It is the reduction of the BI benefit for each dollar of additional income from other sources for the beneficiary unit. It is expressed as a percentage of the additional income. Thus, if the BI benefit is reduced by 50 cents for each additional dollar of other income, then the BRR is 50%. As we will see, higher BRRs imply lower impacts in terms of reducing poverty, but also imply a lower cost program. For a UBI, the BRR is zero: there is no clawback. BRRs greater than zero are only applicable to the RTC scenarios. For the RTC scenarios, we test BRRs ranging from 5% to 100%, increasing in increments of 5%. Within the simulation literature, BRRs of 15%, 30%, and 50% are common.[2]

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[2] These are identical to or similar to rates that were tested in the Mincome and U.S. basic income negative income tax experiments and are often applied in Canada to benefit reductions (e.g., Guaranteed Income Supplement payments are subject to a 50% BRR). See Simpson et al. (2017) and Kesselman (2018) for greater discussion of the choice of BRRs.

The different BRRs correspond to different “break-even” levels of income—the amount of income (other than the BI benefit) at which the BI benefit amount is zero. For the UBI scenarios, the break-even income is in theory infinity: all persons receive the UBI regardless of income. For the RTC scenarios, holding the basic guarantee of the RTC constant, the break-even income decreases as the BRR increases. In other words, for a specific RTC base amount, the lower the BRR, the higher the break-even income and the more units that receive the RTC.

Given that the BRR reduces the BI (specifically, the RTC) for each additional dollar of income, we next must define what we mean by “income.” The definition of income should be considered in the context of the whole system, as detailed in Petit and Tedds (2020b, 2020c). Various programs use different definitions of income and lead to complex interactions for the beneficiary and unintended consequences, especially behavioural ones. As it has yet to be determined what programs a BI could replace and what programs and in what form would complement a BI, there is not enough detail to consider these implications. This is a matter that would need to be returned to by B.C.’s Expert Panel on Basic Income and those implementing a BI once these aspects are better known.

For our purposes and the purposes of the simulations, we define “income” as:

Total Income (line 15000 of a T1)
Minus Registered Pension Plan contributions
Minus union dues
Minus child-care expenses
Minus the disability supports deduction
Minus the support payments deduction
Minus any social benefits repayment
Minus net Canada Pension Plan/Quebec Pension Plan and Employment Insurance contributions
Minus medical expenses

This definition of income best approximates discretionary income. In the calculation of the RTC benefit amount, income was calculated at both the individual and family level. That is, we considered the clawback of the BI based on either individual income or (nuclear) family income. The use of one or the other has policy implications. Consider as an example a couple where both partners have earned income, one with low annual earnings and the other with high annual earnings. If income for the RTC benefit assessment is calculated using individual income, then the lower earner may receive a BI payment while the higher earner may not. If, instead, the benefit assessment is calculated using family income, and if the combined annual income of the couple makes them ineligible for the BI, then no payment would be made to either family member. Note that for the UBI, there is no need to differentiate between individual and family income, as the BRR does not apply to the UBI (and thus income is not used in the calculation of the UBI).

In summary, for our simulations, the BI is calculated as

$$\text{BI} = [G - (\text{BRR} * \text{Income})] * \text{Equivalence Scale}$$

where G is the basic guarantee, BRR is the benefit reduction rate, income is as defined above and is either the individual or (nuclear) family income, and the equivalence scale is either per capita or square root. In the UBI simulations, the BRR is treated as a zero. The following table sets out the parameter values for our simulations:

Table 1

Parameters Defining Basic Income Scenarios

Parameter	BI Type	
	UBI	RTC
Basic guarantee (G)	$1,000–$20,000, increasing in increments of $1,000	$1,000–$20,000, increasing in increments of $1,000
Equivalence scale	Per capita or square root	Per capita or square root
Benefit reduction rate (BRR)	0%	5%–100%, increasing in increments of 5%
Income unit	n/a	Individual or family

Overview of Evaluations of Scenarios

After the BI simulations are run, we evaluate the different scenarios. To do this, we take two different approaches. First, we compare a set of measures for each scenario (examined in more detail below). Second, we conduct an optimization exercise that uses the simulation results to compute the optimal combination of parameters in terms of reducing the poverty rate for specified cost levels varying between $100 million and $50 billion. This is the exercise we would want to carry out if we were serious about implementing a BI and viewed reducing the poverty rate as our main goal.[3]

To compare the scenarios, we compare a set of measures. The set of measures we examine is as follows:

1. Number of people who would receive the BI: for the UBI, this will be equal to the number of adults between ages 18 and 64 in B.C., as all adults receive the UBI. Comparatively, for the RTC, the number of recipients depends on the number of units (either individuals or families, depending on the parameters used) with income over the break-even level.
2. Cost: the total cost of the BI benefits paid out under the scenario defined by the parameters in Table 1.
3. Poverty rate (and changes in the poverty rate): the number of people living in households with economic family disposable income below the MBM income threshold divided by the population ages 18–64. We discuss the concept of economic family

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[3] Results for reducing the depth of poverty point to similar conclusions, though using the depth of poverty as an outcome measure is not straightforward, since the depth of poverty can move in counterintuitive directions with increases in spending. For example, if there were a group near the poverty line and another in much deeper poverty, then increased spending that lifted the first group over the poverty line would cause the average depth of poverty to increase.

disposable income and the MBM in further detail below. For the analysis, we examine specifically the percentage change in the poverty rate as a result of a BI.

4. Poverty efficiency: calculated as the number of persons lifted out of poverty divided by billions of dollars spent. The higher the poverty efficiency, the more efficient the scenario is at reducing poverty. For example, if poverty efficiency is 500,000, this says that 500,000 persons per $1 billion spent are lifted out of poverty. Comparatively, a poverty efficiency of 10 says that only 10 persons are lifted out of poverty per $1 billion spent.
5. Poverty depth (and changes in poverty depths): the gap between the MBM income threshold and the average disposable income of those who live in economic families with economic family disposable income below the MBM. Specifically, we look at the percentage change in the poverty depths as a result of a BI.
6. Gini coefficient (and changes in the gini coefficient): the gini coefficient is a measure of the extent of income inequality that varies between 0 and 1, where 0 corresponds to perfect equality (all households have the same income) and 1 corresponds to perfect inequality (all income is owned by one household). The gini coefficient is calculated using both individual income and family income, based on the definition of income above (as used for the BI calculations), plus BI payments. Specifically, we look at the percentage change in the gini coefficient as a result of a BI.
7. Distribution of a BI across income quartiles: the proportion of BI benefits going to individuals or families in each quartile of the pre-tax and transfer income distribution. To understand quartiles, think of ordering 100 households by their income, from the household with the lowest income to the one with the highest income. The first quartile are the first 25 households—the 25% with the lowest incomes. The second quartile contains the next 25 households, with incomes that rank above the bottom 25% but below the 50th household in line. The third and fourth quartiles are defined in the same way. We can expand our example to all households in B.C. such that the bottom quartile is the 25% of households with the lowest income. For our calculation of quartiles, we compute quartiles based on both individual and family total income (line 15000 of a T1).

For the poverty measures above (e.g., poverty rates and poverty depths), a person is defined as living in poverty if they are in an economic family (or a single person not in an economic family) with an economic family disposable income (or disposable income if single) below the MBM income threshold.[4] The MBM income threshold is calculated by Statistics Canada and involves costing out a basket of goods and services associated with a modest standard of consumption. It takes into consideration costs of specified qualities and quantities of food, clothing, footwear, transportation, shelter, and other expenses adjusted not only for family size but also for geographical region. Disposable income is compared to the MBM income threshold to determine poverty. Disposable income is defined as the amount of income available to purchase goods and services and is calculated by taking total income and deducting income

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[4] This is in alignment with the definition of income poverty used by Statistics Canada.

taxes and non-discretionary spending.[5] Disposable income, as calculated for the MBM, is aggregated at the level of an economic family. An economic family refers to a group of two or more persons living in the same dwelling who are related by blood, marriage, common-law status, or adoption, including foster children.[6] Only children under the age of 18 who have never been married and children over 18 who have a serious disability are included. That is, the economic family disposable income is compared to the MBM income threshold.[7] For our purposes, to compare poverty rate and depths before and after a BI, we add BI benefit payments to this measure of disposable income.

Simulation Results

Universal Basic Income Scenarios

We first report the BI scenarios based on an annual UBI. For a UBI, there is no BRR or income test to consider. All persons ages 18–64 in the province receive the UBI benefit. If the square root equivalence scale is used, a nuclear family with two non-elderly adults receives a UBI benefit of 1.4 times the basic guarantee (G). For example, when the basic guarantee is $1,000 and the square root equivalence scale is used, a nuclear family with two adult members receives a UBI of $1,400.

Figure 1 presents the results of our UBI scenarios. The first three columns present the parameter choices: the first column shows the basic guarantee (G), the second column shows the income unit (either the family or the individual), and the third column shows the equivalence scale. The BRR is 0% in all UBI scenarios and there is no break-even income, as all persons receive the UBI regardless of income. The remaining five columns present the outcomes from these modelling choices. Panel A of Figure 1 shows the results for the UBI scenarios if a square root equivalence scale is used. Panel B of Figure 1 shows the results for the UBI scenarios if a per capita equivalence scale is used.

Under the UBI scenarios, approximately three million British Columbians between the ages of 18 and 64 would receive the benefit; however, the costs and impact of these benefits depend greatly on the size of the benefit. Costs vary from $2.5 billion annually, for a $1,000 benefit with a square root equivalence scale, up to $60.9 billion, for a $20,000 annual benefit with a per capita equivalence scale. To put these costs into context, $2.5 billion is equivalent to the amount raised by the province in 2018/19 through the provincial component of the property tax (i.e., the School Tax) or the amount raised by natural resource revenues (B.C. Ministry of

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[5] Non-discretionary spending includes EI and CPP/QPP contributions, employer-mandated payroll deductions, child support, alimony payments, child-care expenses, and non-insured medical expenses.

[6] It is important to note that the official MBM statistics presented here are based on the economic family. It is possible to generate poverty statistics based on other measures of the family, including census family and nuclear family. However, statistics based on different family types are not directly comparable. This is a point that is important to keep in mind when poverty measures are based on different family definitions, as occurs in studies that use either tax filer data or the SPSD/M to model various income support policies like a basic income.

[7] For more information on the MBM measure of poverty, see Petit and Tedds (2020d).

Finance, 2019). Comparatively, the cost of $60.9 billion is more than the total revenue raised by the province in 2018/19 (when revenues were about $55 billion).

From Figure 1, some basic patterns can be noted in costs and poverty impacts. As the basic guarantee increases, the cost of the UBI increases, and, if a per capita equivalence scale is used, costs are greater than if a square root equivalence scale is used. Despite the increasing costs, as the basic guarantee increases, the poverty rate and poverty depths are reduced. Both the poverty rate and poverty depths are reduced by more if a per capita equivalence scale is used than if a square root equivalence scale is used. Ultimately, with respect to poverty efficiency, as the basic guarantee increases, the poverty efficiency declines: a $20,000 UBI using a square root scale raises about 8,398 persons out of poverty per $1 billion spent. A $1,000 UBI using a square root scale raises about 41,803 persons out of poverty per $1 billion spent: about five times more persons are raised out of poverty per billion spent under a $1,000 UBI than under a $20,000 UBI. One reason for this is that a UBI does not target those who are experiencing poverty: a UBI is given to all residents of B.C. regardless of poverty status, thereby reducing its efficiency at raising persons out of poverty.

Looking at the distributional impacts of a UBI, Figure 2 shows the impact of a UBI on the gini coefficient and the distribution of a UBI across income quartiles. Column 7 shows the percentage change in the gini coefficient where the gini coefficient is constructed using individual income. Column 8 shows the percentage change in the gini coefficient where the gini coefficient is constructed using family income. Column 9 shows how a UBI is distributed across income quartiles where the income quartiles are constructed using family income. Finally, column 10 shows how a UBI is distributed across income quartiles where the income quartiles are constructed using individual income. Panel A of Figure 2 shows a UBI using a square root equivalence scale. Panel B of Figure 2 shows a UBI using a per capita equivalence scale.

In Figure 2, we see that as the basic guarantee amount of the UBI increases, the gini coefficient decreases (becomes closer to zero and therefore equality). To understand the intuition, think of it this way: there are five people ("the population") with the following amounts of income: $6, $18, $30, $46, $100. The person with $100 holds 50% of the total income. The remaining four people (80% of the population) hold 50% of the total income. Now suppose a UBI of $20 is given to each person, so that the new income of each person is $26, $38, $50, $66, and $120, respectively. With the UBI, the person with the highest income holds 40% of the total income (down from 50% with no UBI). The remaining four persons (80% of the population) holds 60% of the income (up from 54% with no UBI). That is, the total income is more evenly spread among the population even though each person received the same UBI base amount. The gini coefficient under the UBI moves closer to zero as the total income becomes more evenly spread among the population. As the UBI base amount increases, the gini coefficient moves closer and closer to zero, resulting in a more equitable distribution of income.

Further, in Figure 2, we see that the UBI is relatively equally distributed across income quartiles. When income quartiles are constructed based on family income, families in the highest income quartile receive a slightly higher proportion of the overall UBI payments. However, when quartiles are constructed using individual income, the UBI is distributed across quartiles evenly (e.g., 25% to each). This result holds whether a square root or a per capita equivalence scale is used. This is to be expected, as with a UBI everyone receives the same basic amount, except for couples when the square root equivalence scale is used (they receive a slightly lower amount than singles).

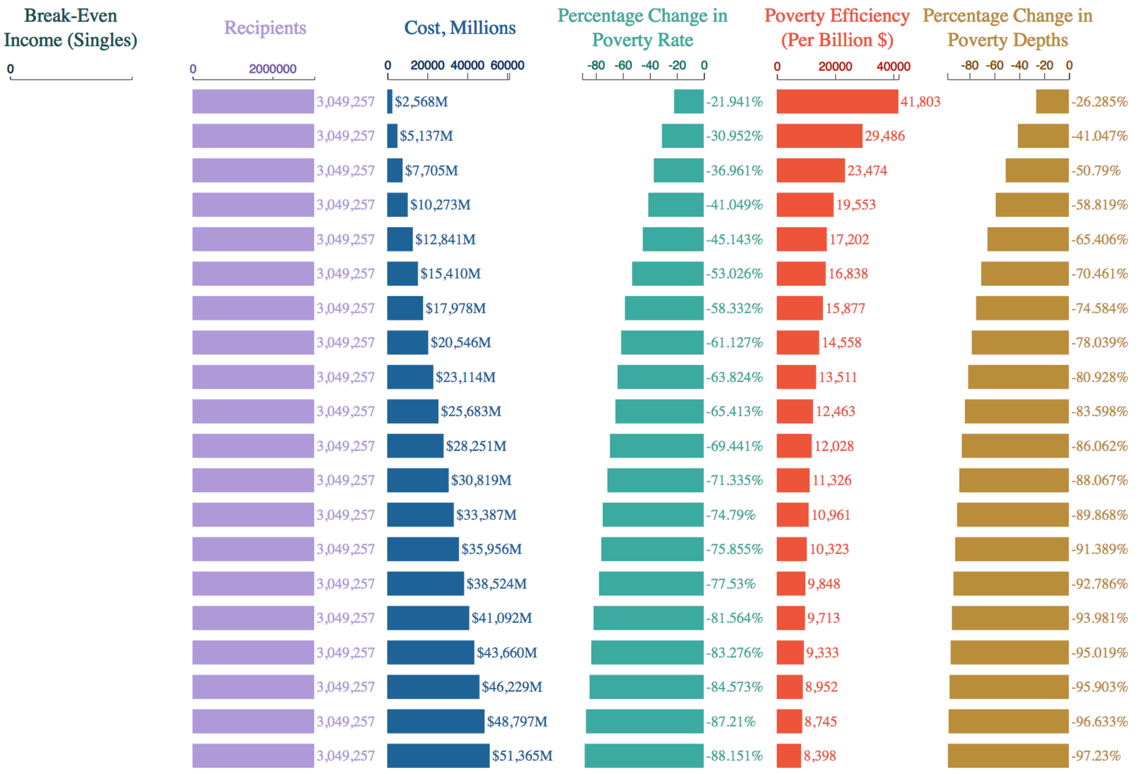
Overall, it is not surprising that a UBI basic guarantee amount of $20,000 has a bigger impact on poverty rate, poverty depths, and the gini coefficient than more modest amounts; however, the cost of doing so is quite high. The question then becomes whether a similar outcome could be achieved with a BI program targeting lower-income beneficiaries—namely an RTC, where the benefit is reduced as a family's other income rises. We turn to these scenarios next.

Figure 1

Results of Universal Basic Income Scenarios: Poverty and Cost

Panel A: UBI With a Square Root Equivalence Scale

BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	Recipients	Cost, Millions	Percentage Change in Poverty Rate	Poverty Efficiency (Per Billion $)	Percentage Change in Poverty Depths
UBI	$1,000	N/A	SQRT(2)	0%		3,049,257	$2,568M	-21.941%	41,803	-26.285%
UBI	$2,000	N/A	SQRT(2)	0%		3,049,257	$5,137M	-30.952%	29,486	-41.047%
UBI	$3,000	N/A	SQRT(2)	0%		3,049,257	$7,705M	-36.961%	23,474	-50.79%
UBI	$4,000	N/A	SQRT(2)	0%		3,049,257	$10,273M	-41.049%	19,553	-58.819%
UBI	$5,000	N/A	SQRT(2)	0%		3,049,257	$12,841M	-45.143%	17,202	-65.406%
UBI	$6,000	N/A	SQRT(2)	0%		3,049,257	$15,410M	-53.026%	16,838	-70.461%
UBI	$7,000	N/A	SQRT(2)	0%		3,049,257	$17,978M	-58.332%	15,877	-74.584%
UBI	$8,000	N/A	SQRT(2)	0%		3,049,257	$20,546M	-61.127%	14,558	-78.039%
UBI	$9,000	N/A	SQRT(2)	0%		3,049,257	$23,114M	-63.824%	13,511	-80.928%
UBI	$10,000	N/A	SQRT(2)	0%		3,049,257	$25,683M	-65.413%	12,463	-83.598%
UBI	$11,000	N/A	SQRT(2)	0%		3,049,257	$28,251M	-69.441%	12,028	-86.062%
UBI	$12,000	N/A	SQRT(2)	0%		3,049,257	$30,819M	-71.335%	11,326	-88.067%
UBI	$13,000	N/A	SQRT(2)	0%		3,049,257	$33,387M	-74.79%	10,961	-89.868%
UBI	$14,000	N/A	SQRT(2)	0%		3,049,257	$35,956M	-75.855%	10,323	-91.389%
UBI	$15,000	N/A	SQRT(2)	0%		3,049,257	$38,524M	-77.53%	9,848	-92.786%
UBI	$16,000	N/A	SQRT(2)	0%		3,049,257	$41,092M	-81.564%	9,713	-93.981%
UBI	$17,000	N/A	SQRT(2)	0%		3,049,257	$43,660M	-83.276%	9,333	-95.019%
UBI	$18,000	N/A	SQRT(2)	0%		3,049,257	$46,229M	-84.573%	8,952	-95.903%
UBI	$19,000	N/A	SQRT(2)	0%		3,049,257	$48,797M	-87.21%	8,745	-96.633%
UBI	$20,000	N/A	SQRT(2)	0%		3,049,257	$51,365M	-88.151%	8,398	-97.23%



Panel B: *UBI With a Per Capita Equivalence Scale*

BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	Recipients	Cost, Millions	Percentage Change in Poverty Rate	Poverty Efficiency (Per Billion $)	Percentage Change in Poverty Depths
UBI	$1,000	N/A	Per Capita	0%		3,049,257	$3,049M	-23.293%	37,378	-27.053%
UBI	$2,000	N/A	Per Capita	0%		3,049,257	$6,099M	-33.239%	26,670	-42.164%
UBI	$3,000	N/A	Per Capita	0%		3,049,257	$9,148M	-37.15%	19,872	-52.234%
UBI	$4,000	N/A	Per Capita	0%		3,049,257	$12,197M	-45.88%	18,406	-60.439%
UBI	$5,000	N/A	Per Capita	0%		3,049,257	$15,246M	-53.469%	17,161	-66.7%
UBI	$6,000	N/A	Per Capita	0%		3,049,257	$18,296M	-57.388%	15,349	-71.588%
UBI	$7,000	N/A	Per Capita	0%		3,049,257	$21,345M	-59.661%	13,677	-75.609%
UBI	$8,000	N/A	Per Capita	0%		3,049,257	$24,394M	-63.24%	12,685	-79.087%
UBI	$9,000	N/A	Per Capita	0%		3,049,257	$27,443M	-65.178%	11,621	-82.019%
UBI	$10,000	N/A	Per Capita	0%		3,049,257	$30,493M	-68.456%	10,985	-84.673%
UBI	$11,000	N/A	Per Capita	0%		3,049,257	$33,542M	-72.685%	10,604	-87.118%
UBI	$12,000	N/A	Per Capita	0%		3,049,257	$36,591M	-74.723%	9,992	-89.069%
UBI	$13,000	N/A	Per Capita	0%		3,049,257	$39,640M	-78.11%	9,642	-90.813%
UBI	$14,000	N/A	Per Capita	0%		3,049,257	$42,690M	-79.861%	9,154	-92.257%
UBI	$15,000	N/A	Per Capita	0%		3,049,257	$45,739M	-81.35%	8,703	-93.574%
UBI	$16,000	N/A	Per Capita	0%		3,049,257	$48,788M	-82.827%	8,307	-94.733%
UBI	$17,000	N/A	Per Capita	0%		3,049,257	$51,837M	-84.456%	7,972	-95.772%
UBI	$18,000	N/A	Per Capita	0%		3,049,257	$54,887M	-87.11%	7,766	-96.609%
UBI	$19,000	N/A	Per Capita	0%		3,049,257	$57,936M	-89.024%	7,519	-97.272%
UBI	$20,000	N/A	Per Capita	0%		3,049,257	$60,985M	-90.14%	7,232	-97.822%

Source: Statistics Canada (2020). Social Policy Simulation Database and Model (SPSD/M). Version 28 database year 2016.

Figure 2

Results of Universal Basic Income Scenarios: Gini Coefficients and Distribution

Panel A: UBI With a Square Root Equivalence Scale

BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	% Change: Gini Coefficient (Family Inc.)	% Change: Gini Coefficient (Individual Inc.)	Distribution Across Family Income Quartiles	Distribution Across Individual Income Quartiles
UBI	$1,000	N/A	SQRT(2)	0%		-20.62%	-23.47%		
UBI	$2,000	N/A	SQRT(2)	0%		-22.27%	-25.54%		
UBI	$3,000	N/A	SQRT(2)	0%		-23.92%	-27.62%		
UBI	$4,000	N/A	SQRT(2)	0%		-25.56%	-29.69%		
UBI	$5,000	N/A	SQRT(2)	0%		-27.2%	-31.77%		
UBI	$6,000	N/A	SQRT(2)	0%		-28.83%	-33.84%		
UBI	$7,000	N/A	SQRT(2)	0%		-30.45%	-35.92%		
UBI	$8,000	N/A	SQRT(2)	0%		-32.06%	-38%		
UBI	$9,000	N/A	SQRT(2)	0%		-33.67%	-40.07%		
UBI	$10,000	N/A	SQRT(2)	0%		-35.27%	-42.15%		
UBI	$11,000	N/A	SQRT(2)	0%		-36.86%	-44.23%		
UBI	$12,000	N/A	SQRT(2)	0%		-38.45%	-46.31%		
UBI	$13,000	N/A	SQRT(2)	0%		-40.03%	-48.39%		
UBI	$14,000	N/A	SQRT(2)	0%		-41.6%	-50.46%		
UBI	$15,000	N/A	SQRT(2)	0%		-43.17%	-52.54%		
UBI	$16,000	N/A	SQRT(2)	0%		-44.73%	-54.62%		
UBI	$17,000	N/A	SQRT(2)	0%		-46.28%	-56.7%		
UBI	$18,000	N/A	SQRT(2)	0%		-47.82%	-58.78%		
UBI	$19,000	N/A	SQRT(2)	0%		-49.36%	-60.85%		
UBI	$20,000	N/A	SQRT(2)	0%		-50.89%	-62.93%		

Panel B: UBI With a Per Capita Equivalence Scale

BI Type	**Basic Guarantee**	**Income Unit**	**Equivalence Scale**	**Benefit Reduction Rate**	Break-Even Income (Singles) 0	% Change: Gini Coefficient (Family Inc.) -40 -20 0	% Change: Gini Coefficient (Individual Inc.) -60 -40 -20 0	Distribution Across Family Income Quartiles	Distribution Across Individual Income Quartiles
UBI	$1,000	N/A	Per Capita	0%		-20.65%	-23.76%		
UBI	$2,000	N/A	Per Capita	0%		-22.33%	-26.11%		
UBI	$3,000	N/A	Per Capita	0%		-23.99%	-28.47%		
UBI	$4,000	N/A	Per Capita	0%		-25.62%	-30.83%		
UBI	$5,000	N/A	Per Capita	0%		-27.24%	-33.18%		
UBI	$6,000	N/A	Per Capita	0%		-28.84%	-35.54%		
UBI	$7,000	N/A	Per Capita	0%		-30.42%	-37.9%		
UBI	$8,000	N/A	Per Capita	0%		-31.98%	-40.25%		
UBI	$9,000	N/A	Per Capita	0%		-33.52%	-42.61%		
UBI	$10,000	N/A	Per Capita	0%		-35.04%	-44.97%		
UBI	$11,000	N/A	Per Capita	0%		-36.55%	-47.32%		
UBI	$12,000	N/A	Per Capita	0%		-38.03%	-49.68%		
UBI	$13,000	N/A	Per Capita	0%		-39.5%	-52.03%		
UBI	$14,000	N/A	Per Capita	0%		-40.95%	-54.39%		
UBI	$15,000	N/A	Per Capita	0%		-42.38%	-56.75%		
UBI	$16,000	N/A	Per Capita	0%		-43.79%	-59.1%		
UBI	$17,000	N/A	Per Capita	0%		-45.19%	-61.46%		
UBI	$18,000	N/A	Per Capita	0%		-46.57%	-63.82%		
UBI	$19,000	N/A	Per Capita	0%		-47.93%	-66.17%		
UBI	$20,000	N/A	Per Capita	0%		-49.28%	-68.53%		

Source: Statistics Canada (2020). Social Policy Simulation Database and Model (SPSD/M). Version 28 database year 2016.

Refundable Tax Credit (RTC) Basic Income Scenarios

In this section, we look at the BI scenarios based on a refundable tax credit (RTC) type of BI guarantee. Referring back to Table 1, we create simulations with different BRR rates that apply to additional income (other than the BI benefit where income is previously defined) assessed at either the individual or family level (e.g., the "income unit"). The BI benefit amount can be calculated using a square root equivalence scale or a per capita equivalence scale. Figures 3–7 present the impact of these RTC scenarios using the same format as with the UBI figures. For ease of viewing, we present a relatively limited set of the RTC results. The full set of results is available on the Expert Panel on Basic Income's website.

Costs and Poverty Results for an RTC

To begin with, in Figure 3, we look at the RTC scenario for a 15% BRR and a basic guarantee of $1,000, $5,000, $10,000, and $20,000 in order to understand how changing the basic guarantee amount and the income unit changes the costs and reduction in poverty rate and poverty depths. Panel A of Figure 3 reports the results using the square root equivalence scale, and Panel B of Figure 3 shows the results for the per capita equivalence scale.

Figure 3 shows that, holding all else constant, an increase in the RTC basic guarantee amount increases the number of recipients of the RTC. For example, an RTC of $10,000 with a 15% BRR assessed using family income and using a square root equivalence scale reaches 1.6 million recipients, compared to an RTC of $20,000 with the same parameters that reaches 2.5 million recipients. This is because as the base guarantee increases the break-even income where the RTC reaches zero increases, making more units eligible for the RTC. In turn, this increase in the base guarantee also increases the costs of the program, but it also increases the reduction in the poverty rate. For example, an RTC of $10,000 with a 15% BRR assessed using family income and using a square root equivalence scale has a cost of $8.34 billion (about as much as B.C. receives in transfers from the Government of Canada) and reduces the poverty rate by 56%. Comparatively, a $20,000 RTC with the same parameters has a cost of $27 billion (just over three-quarters of what the province of B.C. receives as taxes) and reduces the poverty rate by 86%. Finally, the higher the RTC base guarantee, all else being equal, the lower the poverty efficiency.

In Figure 3, we see that, holding all else constant, an RTC that is assessed based on family income is delivered to fewer recipients and costs less than an RTC that is assessed based on individual income. For example, a $20,000 RTC assessed using family income and a square root equivalence scale is delivered to 2.495 million recipients at a cost of $27 billion, compared to a $20,000 RTC assessed using individual income and a square root equivalence scale that is delivered to 2.879 recipients at a cost of $34 billion (about as much as the province of B.C. receives as taxes).

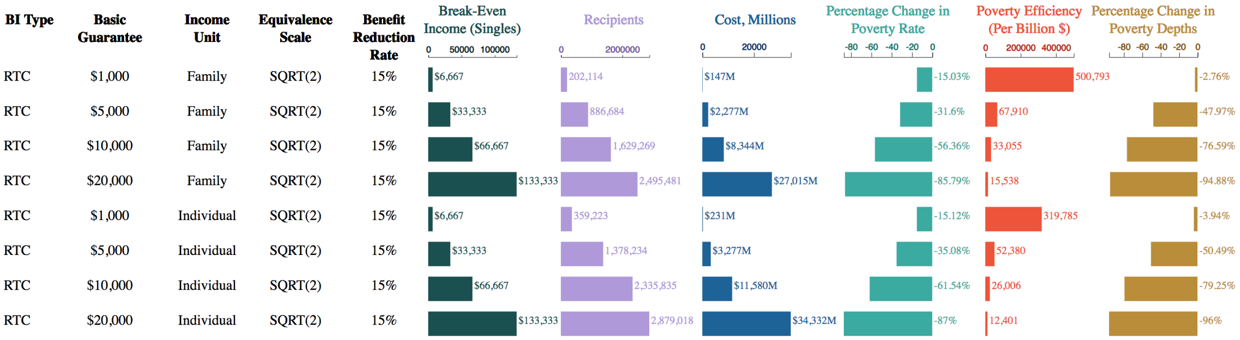
Although using individual income results in increased RTC costs, it also results in a larger decrease in the poverty rate and poverty depths than using family income. However, the declines in poverty rates and depths are similar regardless of the income unit used. For example, a $20,000 RTC assessed using family income and a square root equivalence scale results in a decline in the B.C. poverty rate of 85.8%, whereas with the same RCT based on individual income, the poverty rate declines by 87%. Ultimately, an RTC based on family income as the income unit has higher poverty efficiency than an RTC based on individual income.

Finally, when comparing a square root equivalence scale to a per capita equivalence scale, the results are similar to what was observed under a UBI. Under either scale, there are the same number of recipients; however, the costs are higher, the poverty decline is greater (for both poverty rate and poverty depths), and the poverty efficiency under a per capita scale when compared to a square root equivalence scale is marginally higher.

Figure 3

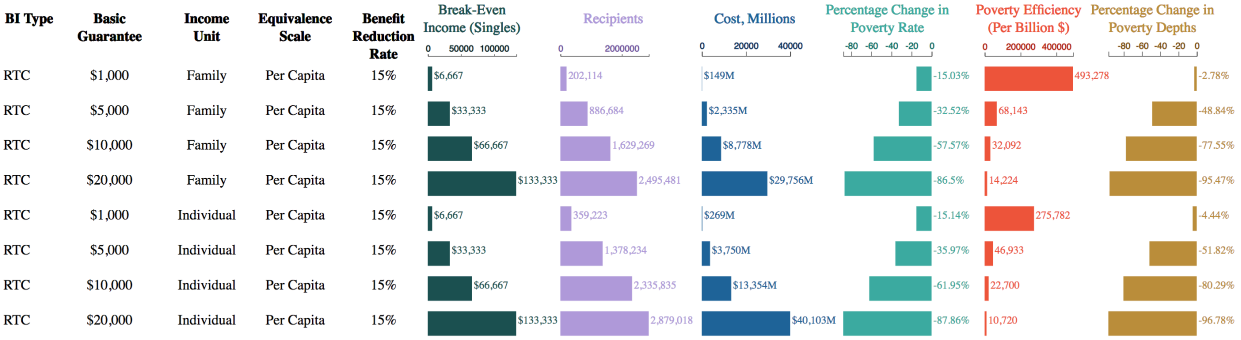
Results of Refundable Tax Credit Basin Income Scenarios: Poverty and Cost at 15% BRR

Panel A: RTC With a Square Root Equivalence Scale (15% BRR)



BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	Recipients	Cost, Millions	Percentage Change in Poverty Rate	Poverty Efficiency (Per Billion $)	Percentage Change in Poverty Depths
RTC	$1,000	Family	SQRT(2)	15%	$6,667	202,114	$147M	-15.03%	500,793	-2.76%
RTC	$5,000	Family	SQRT(2)	15%	$33,333	886,684	$2,277M	-31.6%	67,910	-47.97%
RTC	$10,000	Family	SQRT(2)	15%	$66,667	1,629,269	$8,344M	-56.36%	33,055	-76.59%
RTC	$20,000	Family	SQRT(2)	15%	$133,333	2,495,481	$27,015M	-85.79%	15,538	-94.88%
RTC	$1,000	Individual	SQRT(2)	15%	$6,667	359,223	$231M	-15.12%	319,785	-3.94%
RTC	$5,000	Individual	SQRT(2)	15%	$33,333	1,378,234	$3,277M	-35.08%	52,380	-50.49%
RTC	$10,000	Individual	SQRT(2)	15%	$66,667	2,335,835	$11,580M	-61.54%	26,006	-79.25%
RTC	$20,000	Individual	SQRT(2)	15%	$133,333	2,879,018	$34,332M	-87%	12,401	-96%

Panel B: ***RTC With a Per Capita Equivalence Scale (15% BRR)***



BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	Recipients	Cost, Millions	Percentage Change in Poverty Rate	Poverty Efficiency (Per Billion $)	Percentage Change in Poverty Depths
RTC	$1,000	Family	Per Capita	15%	$6,667	202,114	$149M	-15.03%	493,278	-2.78%
RTC	$5,000	Family	Per Capita	15%	$33,333	886,684	$2,335M	-32.52%	68,143	-48.84%
RTC	$10,000	Family	Per Capita	15%	$66,667	1,629,269	$8,778M	-57.57%	32,092	-77.55%
RTC	$20,000	Family	Per Capita	15%	$133,333	2,495,481	$29,756M	-86.5%	14,224	-95.47%
RTC	$1,000	Individual	Per Capita	15%	$6,667	359,223	$269M	-15.14%	275,782	-4.44%
RTC	$5,000	Individual	Per Capita	15%	$33,333	1,378,234	$3,750M	-35.97%	46,933	-51.82%
RTC	$10,000	Individual	Per Capita	15%	$66,667	2,335,835	$13,354M	-61.95%	22,700	-80.29%
RTC	$20,000	Individual	Per Capita	15%	$133,333	2,879,018	$40,103M	-87.86%	10,720	-96.78%

Source: Statistics Canada (2020). Social Policy Simulation Database and Model (SPSD/M). Version 28 database year 2016.

Next, in Figure 4, we look at how changing the BRR affects the results. Figure 4 shows the cost of and changes in poverty rates and depths for the RTC scenarios for a base guarantee of $10,000, while increasing the BRR rates in 5% increments. In Figure 4, we see that as the BRR increases, holding all else constant, the break-even income decreases, as do the number of recipients and the costs. All of these (break-even income, recipients, and costs) decrease at a decreasing rate as the BRR increases. For example, increasing the BRR from 5% to 10% (a

100% increase) decreases the break-even income by $100,000 (a 50% decrease), decreases the number of recipients by 710,648 (a 25% decrease), and decreases costs by $5.5 billion (a 33% decrease). Likewise, increasing the BRR from 95% to 100% (a 5% increase) decreases the break-even income by $526 (a 5% decrease), decreases the number of recipients by 19,489 (a 6.6% decrease), and decreases the cost by $52 million (a 2.9% decrease).

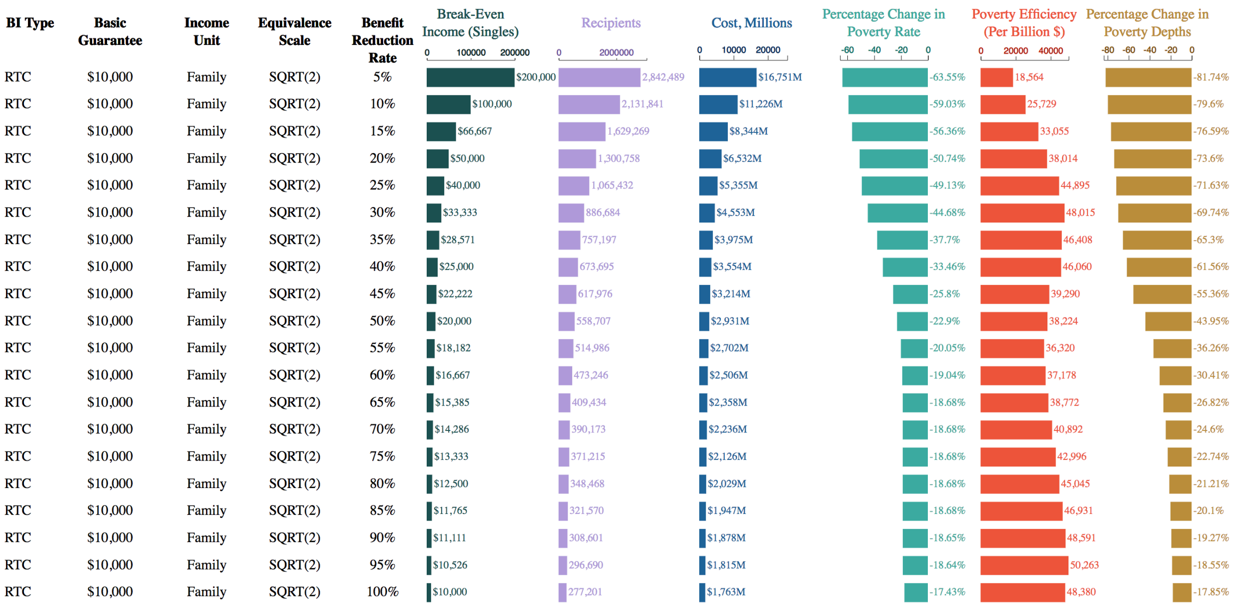
Looking at the change in the poverty rate in Figure 4, as the BRR increases (holding all else constant), the poverty rate decreases by a smaller amount. When the BRR reaches about 60%, from about 60% to 100%, the decline in the poverty rate is about the same across all BRRs—around 18%–19%. This has an effect on poverty efficiency: after about a 60% BRR, since the poverty rate decreases slowly and the cost also decreases, but at a slightly higher rate, poverty efficiency increases from about a 60% BRR to a 100% BRR. For BRRs between 5% and 30%, the poverty efficiency increases until it reaches a maximum of 48,015 at a BRR of 30%, after which it declines before increasing again at the 60% BRR. This suggests that there is an optimal BRR (holding all other parameters constant), and this will be explored in further detail in the optimization portion of this paper.

Finally, Figure 5 looks at BRRs of 15%, 30%, and 50% (the most often used in the literature) for a $1,000, $5,000, $10,000, and $20,000 RTC base guarantee for both family and individual as the income unit using a square root equivalence scale. In Figure 5, we see that, regardless of the base guarantee amount, as the BRR increases, holding all else constant, the break-even income where the RTC is zero decreases. This in turn decreases the number of recipients and the costs associated with the RTC. This is consistent with Figure 4.

Figure 5 is useful for pointing out how poverty depths are affected as the BRR and the base guarantee change: for small base guarantee amounts, there is very little change in the poverty rate as the BRR increases. For larger base amounts, there are relatively larger changes in the poverty rate as the BRR increases. For example, for an RTC of $1,000, increasing the BRR has hardly any effect on the poverty rate: all BRRs result in a decline in the poverty rate of 15%. For an RTC of $20,000, a BRR of 15% reduces the poverty rate by 86%, and a BRR of 50% reduces the poverty rate by 78%.

Figure 4

Results of Refundable Tax Credit Basic Income Scenarios: Poverty and Cost Across BRR for a $10,000 Base Guarantee



BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	Recipients	Cost, Millions	Percentage Change in Poverty Rate	Poverty Efficiency (Per Billion $)	Percentage Change in Poverty Depths
RTC	$10,000	Family	SQRT(2)	5%	$200,000	2,842,489	$16,751M	-63.55%	18,564	-81.74%
RTC	$10,000	Family	SQRT(2)	10%	$100,000	2,131,841	$11,226M	-59.03%	25,729	-79.6%
RTC	$10,000	Family	SQRT(2)	15%	$66,667	1,629,269	$8,344M	-56.36%	33,055	-76.59%
RTC	$10,000	Family	SQRT(2)	20%	$50,000	1,300,758	$6,532M	-50.74%	38,014	-73.6%
RTC	$10,000	Family	SQRT(2)	25%	$40,000	1,065,432	$5,355M	-49.13%	44,895	-71.63%
RTC	$10,000	Family	SQRT(2)	30%	$33,333	886,684	$4,553M	-44.68%	48,015	-69.74%
RTC	$10,000	Family	SQRT(2)	35%	$28,571	757,197	$3,975M	-37.7%	46,408	-65.3%
RTC	$10,000	Family	SQRT(2)	40%	$25,000	673,695	$3,554M	-33.46%	46,060	-61.56%
RTC	$10,000	Family	SQRT(2)	45%	$22,222	617,976	$3,214M	-25.8%	39,290	-55.36%
RTC	$10,000	Family	SQRT(2)	50%	$20,000	558,707	$2,931M	-22.9%	38,224	-43.95%
RTC	$10,000	Family	SQRT(2)	55%	$18,182	514,986	$2,702M	-20.05%	36,320	-36.26%
RTC	$10,000	Family	SQRT(2)	60%	$16,667	473,246	$2,506M	-19.04%	37,178	-30.41%
RTC	$10,000	Family	SQRT(2)	65%	$15,385	409,434	$2,358M	-18.68%	38,772	-26.82%
RTC	$10,000	Family	SQRT(2)	70%	$14,286	390,173	$2,236M	-18.68%	40,892	-24.6%
RTC	$10,000	Family	SQRT(2)	75%	$13,333	371,215	$2,126M	-18.68%	42,996	-22.74%
RTC	$10,000	Family	SQRT(2)	80%	$12,500	348,468	$2,029M	-18.68%	45,045	-21.21%
RTC	$10,000	Family	SQRT(2)	85%	$11,765	321,570	$1,947M	-18.68%	46,931	-20.1%
RTC	$10,000	Family	SQRT(2)	90%	$11,111	308,601	$1,878M	-18.65%	48,591	-19.27%
RTC	$10,000	Family	SQRT(2)	95%	$10,526	296,690	$1,815M	-18.64%	50,263	-18.55%
RTC	$10,000	Family	SQRT(2)	100%	$10,000	277,201	$1,763M	-17.43%	48,380	-17.85%

Figure 5

Results of Refundable Tax Credit Basic Income Scenarios: Poverty and Cost Across BRR for Various Base Guarantees

BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	Recipients	Cost, Millions	Percentage Change in Poverty Rate	Poverty Efficiency (Per Billion $)	Percentage Change in Poverty Depths
RTC	$1,000	Family	SQRT(2)	15%	$6,667	202,114	$147M	-15.03%	500,793	-2.76%
RTC	$1,000	Family	SQRT(2)	30%	$3,333	146,520	$119M	-15.03%	618,624	-2.4%
RTC	$1,000	Family	SQRT(2)	50%	$2,000	125,681	$109M	-15.03%	676,443	-2.3%
RTC	$5,000	Family	SQRT(2)	15%	$33,333	886,684	$2,277M	-31.6%	67,910	-47.97%
RTC	$5,000	Family	SQRT(2)	30%	$16,667	473,246	$1,253M	-18.13%	70,826	-16.99%
RTC	$5,000	Family	SQRT(2)	50%	$10,000	277,201	$882M	-16.89%	93,758	-10.16%
RTC	$10,000	Family	SQRT(2)	15%	$66,667	1,629,269	$8,344M	-56.36%	33,055	-76.59%
RTC	$10,000	Family	SQRT(2)	30%	$33,333	886,684	$4,553M	-44.68%	48,015	-69.74%
RTC	$10,000	Family	SQRT(2)	50%	$20,000	558,707	$2,931M	-22.9%	38,224	-43.95%
RTC	$20,000	Family	SQRT(2)	15%	$133,333	2,495,481	$27,015M	-85.79%	15,538	-94.88%
RTC	$20,000	Family	SQRT(2)	30%	$66,667	1,629,269	$16,687M	-80.01%	23,461	-92.22%
RTC	$20,000	Family	SQRT(2)	50%	$40,000	1,065,432	$10,710M	-77.52%	35,415	-87.47%
RTC	$1,000	Individual	SQRT(2)	15%	$6,667	359,223	$231M	-15.12%	319,785	-3.94%
RTC	$1,000	Individual	SQRT(2)	30%	$3,333	259,824	$191M	-15.12%	387,076	-3.29%
RTC	$1,000	Individual	SQRT(2)	50%	$2,000	230,099	$177M	-15.11%	416,874	-3.12%
RTC	$5,000	Individual	SQRT(2)	15%	$33,333	1,378,234	$3,277M	-35.08%	52,380	-50.49%
RTC	$5,000	Individual	SQRT(2)	30%	$16,667	750,193	$1,889M	-25.92%	67,128	-23.09%
RTC	$5,000	Individual	SQRT(2)	50%	$10,000	479,507	$1,370M	-24.67%	88,139	-16.02%
RTC	$10,000	Individual	SQRT(2)	15%	$66,667	2,335,835	$11,580M	-61.54%	26,006	-79.25%
RTC	$10,000	Individual	SQRT(2)	30%	$33,333	1,378,234	$6,554M	-51.44%	38,402	-73.15%
RTC	$10,000	Individual	SQRT(2)	50%	$20,000	879,904	$4,343M	-30.98%	34,905	-51.48%
RTC	$20,000	Individual	SQRT(2)	15%	$133,333	2,879,018	$34,332M	-87%	12,401	-96%
RTC	$20,000	Individual	SQRT(2)	30%	$66,667	2,335,835	$23,159M	-85.31%	18,025	-94.83%
RTC	$20,000	Individual	SQRT(2)	50%	$40,000	1,616,951	$15,262M	-82.1%	26,323	-91.01%

Source: Statistics Canada (2020). Social Policy Simulation Database and Model (SPSD/M). Version 28 database year 2016.

Comparing the Cost and Poverty Results for the RTC and UBI

Next, it is useful to compare these RTC results to the UBI results: we compare the RTC scenarios in Figures 3, 4, and 5 to the UBI scenarios in Figure 1. In terms of costs, a UBI is much more expensive than an RTC. For example, a UBI with a base guarantee of $10,000 and a square root equivalence scale would cost $25.7 billion. An RTC with a base guarantee of $10,000, a square root equivalence scale, a BRR of 30%, and income assessed at the family level would cost $4.6 billion. A large reason for this difference is in the number of eligible recipients: the $10,000 UBI would be received by just over 3 million adults, whereas the $10,000 RTC would be received by 886,684 adults (and many would receive only a portion of the RTC, not the entire base guarantee, due to the BRR).

Regardless of the large costs of a UBI, a UBI has a larger impact on the poverty rate and poverty depths; however, the difference in poverty rate reduction between a UBI and an RTC becomes smaller as the basic guarantee increases. For example, a UBI of $1,000 using a square root equivalence scale would reduce the poverty rate by 22% and poverty depths by 26%. An RTC of $1,000 with a 15% BRR based on family income with a square root equivalence scale would reduce the poverty rate by 15% and would reduce poverty depths by 3%. This is a difference of 7 percentage points and 23 percentage points for poverty rate and poverty depths, respectively. Comparatively, a UBI of $20,000 using a square root equivalence scale would reduce the poverty rate by 88% and reduce poverty depths by 97%. An RTC of $20,000 with a 15% BRR based on family income with a square root equivalence scale would reduce the poverty rate by 86% and reduce poverty depths by 96%. This is a difference of 2 percentage points and 1 percentage point for poverty rate and poverty depths, respectively. The poverty rate reductions are lower under the RTC approach because the basic guarantee is partly taxed back for the working poor, so they get lower disposable income (and therefore a lower probability of being raised over the poverty line) than they would with a UBI. This effect becomes unimportant if the basic guarantee amount is at or near the poverty rate (e.g., $20,000), since recipients will be at or above the poverty line even before they add earned income. Thus, the RTC basic guarantee of $20,000 achieves reductions in poverty rates and poverty depths similar to a UBI, albeit at much lower cost. This has implications for poverty efficiency.

With respect to poverty efficiency, comparing Figure 1 and Figure 3, we see that an RTC is more efficient than a UBI. For example, comparing a UBI of $20,000 to an RTC of $20,000 with a 15% BRR based on family income, both with a square root equivalence scale, we see that the RTC has a poverty efficiency of 15,538 and the UBI has a poverty efficiency of 8,398. That is, the RTC lifts more units out of poverty per $1 billion spent than a UBI of the same basic guarantee, for the reasons explained above. This result holds across all basic guarantee amounts, all equivalence scales, and all BRRs.

Distribution Results for the RTC

In this section, we look at the distributional results of an RTC. To begin with, Figure 6 is analogous to Figure 3. Figure 6 looks at the RTC scenario for a 15% BRR and a basic guarantee of $1,000, $5,000, $10,000, and $20,000 in order to understand how changing the basic guarantee amount and the income unit changes the gini coefficient and how the RTC payment is allocated across quintiles. Panel A of Figure 6 reports the results using the square root equivalence scale, and Panel B of Figure 3 shows the results for the per capita equivalence scale. As with previous results, as the basic guarantee of an RTC increases (all else held constant), the gini coefficient decreases and gets closer to equality. Using a square root equivalence scale of a per capita equivalence scale has relatively the same effect; regardless, the per capita equivalence scale has a slightly larger impact on reducing the gini coefficient than the square root equivalence scale.

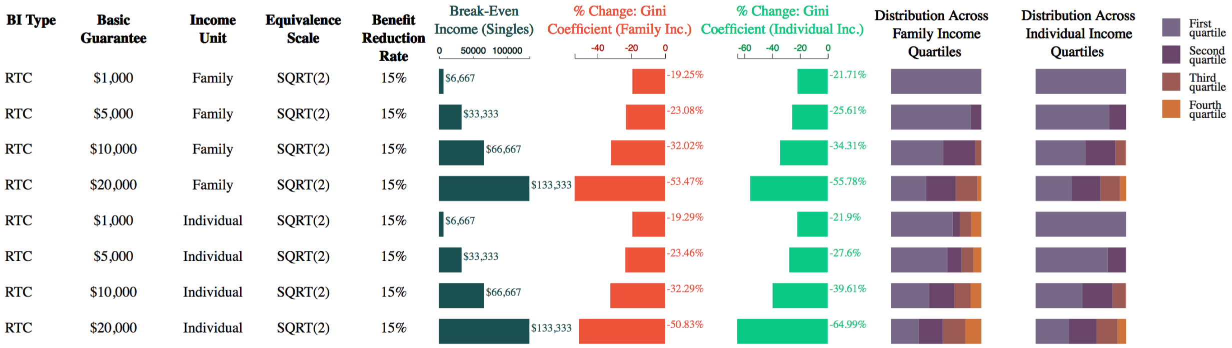
In Figure 6, we also see that for a low basic guarantee and a BRR of 15%, the majority of the RTC benefits are received by units in the lowest quartile of income. As the basic guarantee increases, units in higher income quartiles receive larger and larger proportions of the RTC. Further, when we use the individual as the income unit, some of the benefit goes to individuals whose family income puts them in the highest income quartile. This outcome is not surprising, but has important gender impacts that need to be considered in more detail (see Cameron and Tedds (2020); Petit and Tedds (2020a); Tedds and Crisan (2020); Tedds et al. (2020).

This distributional impact differs significantly from what was seen under the UBI: with the UBI, the benefits were distributed more or less proportionally across quartiles for all basic guarantee levels. This is a feature of the RTC: it targets those with lower (pre-BI) income, with those with lower income receiving larger RTC payments and thus a larger proportion of the overall RTC benefits than with a UBI, where benefit amounts are independent of (pre-BI) income.

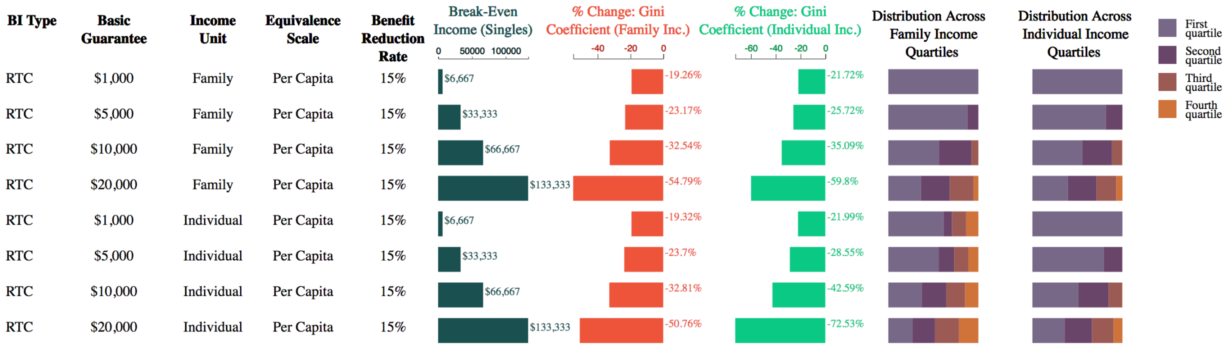
Figure 6:

Results of Refundable Tax Credit Basic Income Scenarios: Poverty and Cost at 15% BRR

Panel A: RTC With a Square Root Equivalence Scale (15% BRR)



Panel B: RTC With a Per Capita Scale (15% BRR)



BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	% Change: Gini Coefficient (Family Inc.)	% Change: Gini Coefficient (Individual Inc.)	Distribution Across Family Income Quartiles	Distribution Across Individual Income Quartiles
RTC	$1,000	Family	Per Capita	15%	$6,667	-19.26%	-21.72%		
RTC	$5,000	Family	Per Capita	15%	$33,333	-23.17%	-25.72%		
RTC	$10,000	Family	Per Capita	15%	$66,667	-32.54%	-35.09%		
RTC	$20,000	Family	Per Capita	15%	$133,333	-54.79%	-59.8%		
RTC	$1,000	Individual	Per Capita	15%	$6,667	-19.32%	-21.99%		
RTC	$5,000	Individual	Per Capita	15%	$33,333	-23.7%	-28.55%		
RTC	$10,000	Individual	Per Capita	15%	$66,667	-32.81%	-42.59%		
RTC	$20,000	Individual	Per Capita	15%	$133,333	-50.76%	-72.53%		

Source: Statistics Canada (2020). Social Policy Simulation Database and Model (SPSD/M). Version 28 database year 2016.

Next, we look at how changing the BRR affects the distribution results. Figure 7 shows the change in the gini coefficient and the distributional results for the RTC scenarios for a base guarantee of $10,000, while increasing the BRR rates in 5% increments. Figure 7 is similar to Figure 4.

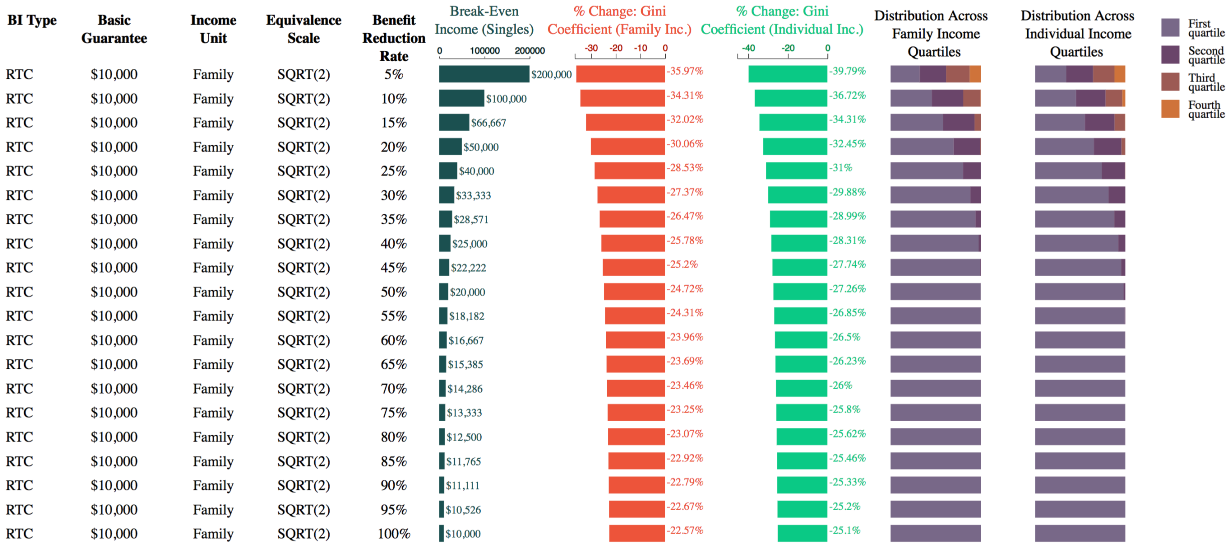
In Figure 7, we see that as the BRR increases, the decline in the gini coefficient decreases. That is, income distribution moves closer to equality for lower BRRs. Further, as the BRR increases, the distribution across income quartiles becomes more concentrated in the first quartile. This is because as the BRR increases, the break-even income decreases. As the break-even income decreases, persons with lower income in lower income quartiles are eligible for the RTC.

Comparing the Distribution Results for the RTC and UBI

We begin by looking at gini coefficients: for the most part, a UBI decreases the gini coefficient by more than a comparative RTC, although there are exceptions. For example, a $20,000 UBI using a square root scale reduces the gini coefficient (calculated using family income) by 51%. Comparatively, an RTC of $20,000 based on a square root scale and family income decreases the gini coefficient (based on family income) anywhere from 53% (at a 5% BRR) to 31% (at a 100% BRR). If instead the RTC is based on individual income, an RTC of $20,000 based on a square root scale and individual income decreases the gini coefficient (based on family income) anywhere from 51% (at a 5% BRR) to 32% (at a 100% BRR). This example suggests that an RTC only lowers the gini coefficient (calculated using family income) by more than a UBI if the BRR rate is sufficiently small.

Figure 7

Results of Refundable Tax Credit Basic Income Scenarios: Distribution Results Across BRRs for $10,000 Base Guarantee



BI Type	Basic Guarantee	Income Unit	Equivalence Scale	Benefit Reduction Rate	Break-Even Income (Singles)	% Change: Gini Coefficient (Family Inc.)	% Change: Gini Coefficient (Individual Inc.)
RTC	$10,000	Family	SQRT(2)	5%	$200,000	-35.97%	-39.79%
RTC	$10,000	Family	SQRT(2)	10%	$100,000	-34.31%	-36.72%
RTC	$10,000	Family	SQRT(2)	15%	$66,667	-32.02%	-34.31%
RTC	$10,000	Family	SQRT(2)	20%	$50,000	-30.06%	-32.45%
RTC	$10,000	Family	SQRT(2)	25%	$40,000	-28.53%	-31%
RTC	$10,000	Family	SQRT(2)	30%	$33,333	-27.37%	-29.88%
RTC	$10,000	Family	SQRT(2)	35%	$28,571	-26.47%	-28.99%
RTC	$10,000	Family	SQRT(2)	40%	$25,000	-25.78%	-28.31%
RTC	$10,000	Family	SQRT(2)	45%	$22,222	-25.2%	-27.74%
RTC	$10,000	Family	SQRT(2)	50%	$20,000	-24.72%	-27.26%
RTC	$10,000	Family	SQRT(2)	55%	$18,182	-24.31%	-26.85%
RTC	$10,000	Family	SQRT(2)	60%	$16,667	-23.96%	-26.5%
RTC	$10,000	Family	SQRT(2)	65%	$15,385	-23.69%	-26.23%
RTC	$10,000	Family	SQRT(2)	70%	$14,286	-23.46%	-26%
RTC	$10,000	Family	SQRT(2)	75%	$13,333	-23.25%	-25.8%
RTC	$10,000	Family	SQRT(2)	80%	$12,500	-23.07%	-25.62%
RTC	$10,000	Family	SQRT(2)	85%	$11,765	-22.92%	-25.46%
RTC	$10,000	Family	SQRT(2)	90%	$11,111	-22.79%	-25.33%
RTC	$10,000	Family	SQRT(2)	95%	$10,526	-22.67%	-25.2%
RTC	$10,000	Family	SQRT(2)	100%	$10,000	-22.57%	-25.1%

Source: Statistics Canada (2020). Social Policy Simulation Database and Model (SPSD/M). Version 28 database year 2016.

Further, these results become more unclear when looking at the gini coefficient calculated using individual income. For example, a $20,000 UBI using a square root scale reduces the gini coefficient (calculated using individual income) by 62%. Comparatively, an RTC of $20,000 based on a square root scale and family income decreases the gini coefficient (based on individual income) anywhere from 61% (at a 5% BRR) to 33% (at a 100% BRR). If the RTC is instead based on individual income unit, an RTC of $20,000 based on a square root scale and individual income decreases the gini coefficient (based on individual income) anywhere from 64% (at a 5% BRR) to 40% (at a 100% BRR). This example suggests that an RTC only lowers the gini coefficient (calculated using individual income) by more than a UBI if the RTC is calculated using the individual income unit and if the BRR is sufficiently small.

There are two points we can make from this. First, there will be gendered impacts of an RTC based on family income. These implications should be considered. Second, although a UBI for the most part lowers the gini coefficient by more than a comparative RTC, it can only be done at a higher cost. These trade-offs should be considered by policy-makers.

Looking at the distributional impacts of a UBI versus a RTC, we can say that, again, UBI benefits are distributed more or less proportionally across quartiles for all basic guarantee levels. In comparison, an RTC is more concentrated at lower quartiles, but it can reach into higher quartiles as the basic guarantee increases and/or the BRR deceases. This is a key feature of the RTC, which targets those with lower income, as opposed to a UBI, where everyone receives the same amount.

Summary

The takeaways from the UBI/RTC results can be summarized as follows:

- Although a UBI decreases poverty rates and poverty depths by more than an RTC does, it does so at a higher cost and thus has a lower poverty efficiency than an RTC.
- Factors that increase costs include a higher base guarantee, lower BRR, using individual income as opposed to family income, and using a per capita equivalence scale as opposed to a square root equivalence scale.
- Factors that decrease poverty rates and poverty depths are opposite to those that increase costs. That is, a higher base guarantee, lower BRR, using individual income as opposed to family income, and using a per capita equivalence scale as opposed to a square root equivalence scale reduces the poverty rate and poverty depths by larger amounts.
- Both the decline in the reduction of the poverty rate and an increase in costs decrease poverty efficiency. How they affect poverty efficiency is dependent on their relative sizes (and is better assessed using an optimization analysis).
- Factors the decrease the gini coefficient (move it towards income equality) are the same as the factors that decrease the poverty rates and poverty depths.
- A UBI is proportionally distributed across income quartiles, whereas an RTC is more concentrated in the lower quartiles.

Optimization Exercise

Finding an Optimum System Under Fixed Costs

To this point, we have shown a wide variety of permutations of program design parameters, with accompanying wide variations in both effectiveness in reducing poverty and in costs. In this section, we highlight some of the trade-offs among parameters by searching for the optimal combination of parameters under an assumed total fixed cost for the basic income system. This is also potentially a more practical exercise, since governments might well operate by first figuring out how much to spend on a basic income system and then determining how best to spend that money. We assume that in choosing the parameter values, the government's goal is to reduce poverty and consider both the poverty rate and poverty depth measures of such an outcome.

Framework

It is helpful to set out the problem analytically in order to highlight the choices that would have to be made in selecting an optimal (cost-constrained) system. We will consider the UBI and RTC forms separately and then compare them to see which is better given the cost constraints and the goals.

We will denote the poverty rate as PR, and write it as being determined as a function of policy parameters and other features of the economy. Thus, under a UBI, we can write

$$PR = g(G, FI/P; X) \qquad (1)$$

where g is a (likely nonlinear) function, G is the amount of the guarantee, FI/P denotes whether the payment is made based on a scaled household basis or an individual basis, and X are conditioning variables that include, importantly, the distribution of pre-tax and transfer income in the economy, but also other policy parameters such as tax rates not related to the basic income and factors such as the distribution of individuals across households. This function simply says that governments can affect the poverty rate by adjusting G and whether the payment is individual or family based. We treat the factors in X as fixed, which is the direct reflection of our decision not to incorporate behavioural responses to basic income parameter changes.

At the same time, we can write the cost of the UBI system as

$$C = f(G, FI/P; X) \qquad (2)$$

That is, the total cost of the UBI system will also depend on the UBI policy parameters and the other factors captured in X. We are interested in finding the values of the UBI policy parameters (G and FI/P) that generate the lowest value of PR for a given value of C, which we will call C*.

We can amalgamate the two elements of our problem by first inverting (2) to express G as a function of C*:

$$G = f^{-1}(C^*, FI/P; X) \qquad (3)$$

This simply says that for a given total cost of the UBI system, C*, different choices of FI/P will imply different possible values of G. If, for example, it is more expensive to deliver a UBI to individuals rather than to families, then the maximum possible guarantee amount, G, will be smaller. The extent to which this is true will depend on the distribution of individuals across households and the shape of the income distribution, as captured in X and the shape of the $f^{-1}(.)$ function.

The result of this exercise is given as

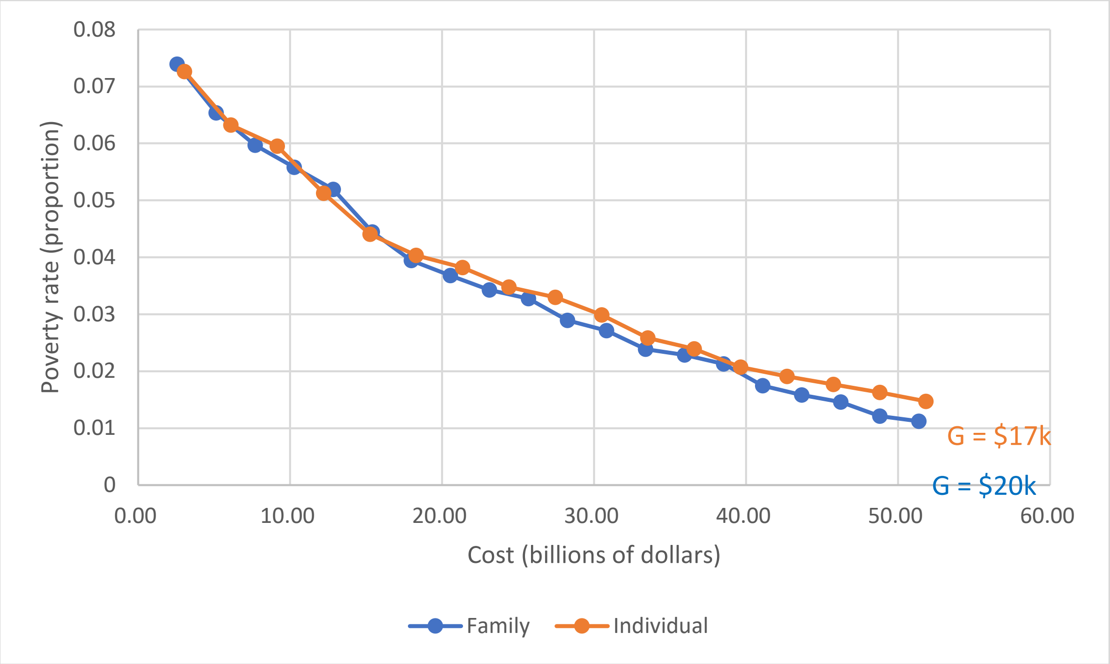
$$PR = g(f^{-1}(C^*, FI/P; X), FI/P; X)(4)$$

Notice that (4) states that with the factors in X held constant, the PR is determined by C* and FI/P since, from equation (3), when these two are determined, G follows automatically. We could, equivalently, express the problem with G varying and FI/P fully determined by C* and G but, as we will see, the fact that FI/P is discrete makes our exercise easier to implement when we express the problem as in (4).

The payment unit parameter, FI/P, can only take two values—household or individual payment. From Figure 8, we can see that PR is always lower under the individual payment scheme—regardless of the value of G. On the other hand, individual payment is more expensive, so choosing it with a fixed C* implies a lower level of G. Since increases in G reduce the poverty rate, these two effects work against one another. This is the sense in which we cannot talk about an optimal value of FI/P in isolation: choosing a value of FI/P for a fixed C* directly implies choosing a value for G, and so what we are really obtaining is an optimal value for the combination of FI/P and G.

Figure 8

UBI Costs and Associated Poverty Rates by Recipient Type



We consider optimal UBI systems under a set of values of total cost (C*). For each value, we compute the maximum possible G under both the family and individual payment schemes and the associated poverty rate, PR. We then choose the scheme with the lowest associated poverty rate. In Figure 8 we plot the optimal PR against C* for each of the payment options (household and individual). Of course, higher C* necessarily implies a higher G and, therefore, lower poverty rates, but the figure allows us to see both whether increasing expenditures on a UBI reduces poverty rates at an increasing or decreasing rate and whether one type of UBI system is always preferred at any cost level. We can see from the figure that the way benefits are paid has little impact at low expenditures on UBI. This must imply that the people near the current poverty line (who can be moved over the line with small expenditures) are disproportionately single adults, for whom it doesn't matter whether we deliver the benefits to the household or the individual. Once the poverty rate is cut by half (which comes at a total cost of about $20 billion), the cost advantage of paying benefits to households emerges such that the poverty rate is lower at any given cost when benefits are paid out to households. At the upper end of our cost range (with total costs of just over $50 billion dedicated to the UBI), the guarantee amount, G, that can be afforded is $20,000 under the household payment model but $17,000 under the individual payment model. It is also interesting to note that the decline in the poverty rate with extra expenditures is faster up to the point where the poverty rate is cut in half (at the 4% level). Reducing poverty past that point is somewhat less easy to accomplish.

We can repeat the same exercise for the RTC form of a basic income. The approach is the same but is more complicated because there are more parameters determining the RTC system. Thus, in this case, we have

$$PR = h(G,FI/P,BRR,FI/A;X) \qquad (5)$$

where BRR is the benefit reduction rate and FI/A denotes whether income assessment is done at the family or individual level.

As before, we can write cost as a function of the basic income system parameters and X:

$$C = d(G,FI/P,BRR,FI/A;X)$$

And, again, we can invert this for a specified cost level, C*, to express G as a function of the other parameters and C*:

$$G = d^{-1}(C^*,FI/P,BRR,FI/A;X) \quad (6)$$

And, finally, substituting (6) into (5), we get:

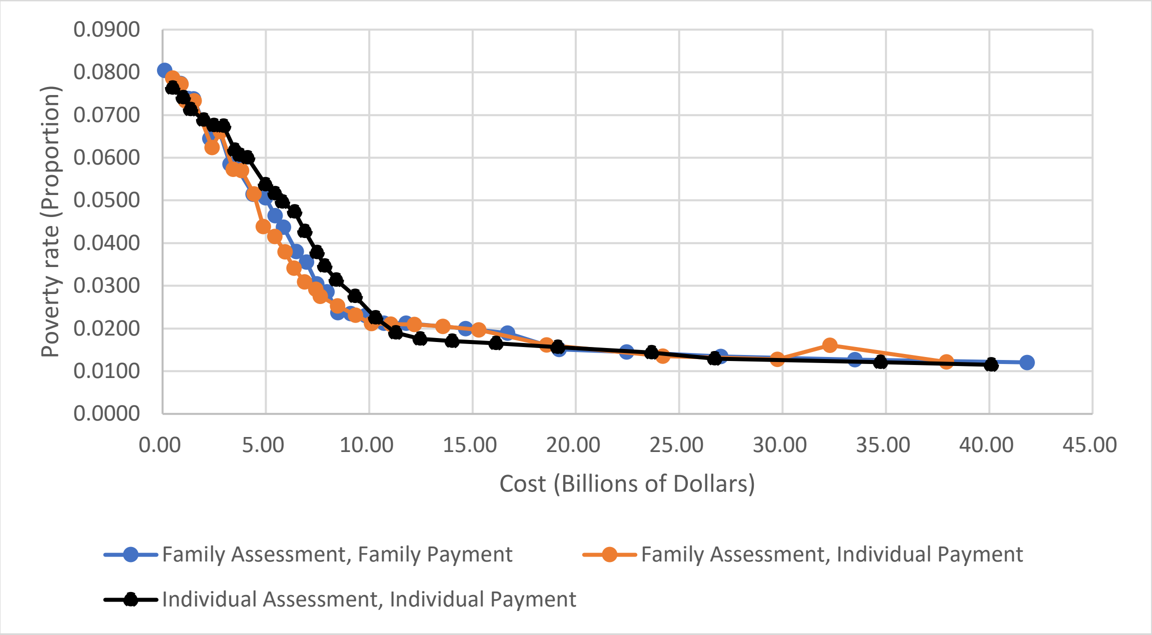
$$PR = h(d^{-1}(C^*,FI/P,BRR,FI/A;X), FI/P,BRR,FI/A;X)$$

We can, again, consider a set of discrete values of FI/P and FI/A. In particular, the combination of these two parameters can take a total of three possible payment/assessment scheme sets: a) FI/A = I and FI/P = I; b) FI/A = F and FI/P = I; and c) FI/A = F and FI/P = F (where I indicates individual and F indicates family). For each of these scheme sets and given C* and X, we can find the BRR that minimizes PR. We then choose the scheme set that has the minimum PR. Finally, from (6), we can calculate the implied value of G.

In Figure 9, we plot the poverty rate against C* for the three payment/assessment schemes. As with UBI, there is little difference based on the income recipient unit in the low expenditure range (up to about $5 billion). Between $5 billion and $7.5 billion, the family assessment/individual payment approach yields the best results, but outside of this range, there is little difference. Essentially, with an extra policy parameter (BRR) relative to the UBI case, adjustments can be made under the two different payment systems to yield similar minimized poverty rates for a given expenditure. On the other hand, the income assessment unit (for purposes of deciding how much of the benefit to tax back) does make a difference through most of the range, up to $10 billion in expenditures. Assessing at the individual level is more costly and so leads to a smaller poverty reduction for a given expenditure in this range. Beyond $10 billion in expenditure, all three systems lead to small incremental decreases in the poverty rate. Lowering the poverty rate below about 2% is very difficult and costly. As we will see, this is likely related to the fact that we did not allow for a G larger than $20,000 in our simulations. Overall, the best system in terms of poverty reduction is the one with family assessment and individual payment. This is somewhat surprising, given the economies of scale available in paying benefits to the household, but reflects both the high proportion of single adults near the current poverty line[8] and the advantages of having more than one margin to adjust in finding optimal policy combinations.

Figure 9

Poverty Rates Under Different Family Income Assessment and Payment Types: Minimizing Poverty Rates at Different Total Costs by Choosing BRR and the Associated G



In Figure 10, we present the depth of poverty measure at each cost level when choosing BRR (and G) to minimize the poverty rate. The effects show the same non-linear shape as in Figure 9, with strong declines up to just over $5 billion in expenditure and slow declines thereafter. The implication is that reducing the depth of poverty by about two-thirds is more amenable to new expenditures than reducing the poverty rate, but beyond that, further reductions are even harder to accomplish. As with the poverty rate, the two schemes with household income assessment yield very similar results, but the approach with individual income assessment is more expensive and therefore much less effective. It is worth keeping in mind in examining this figure that depth of poverty is a difficult measure to use as a goal. As spending increases and the poverty rate declines, one could see the depth of poverty move very little because it is an average among a selected, remaining group. Indeed, it would even be

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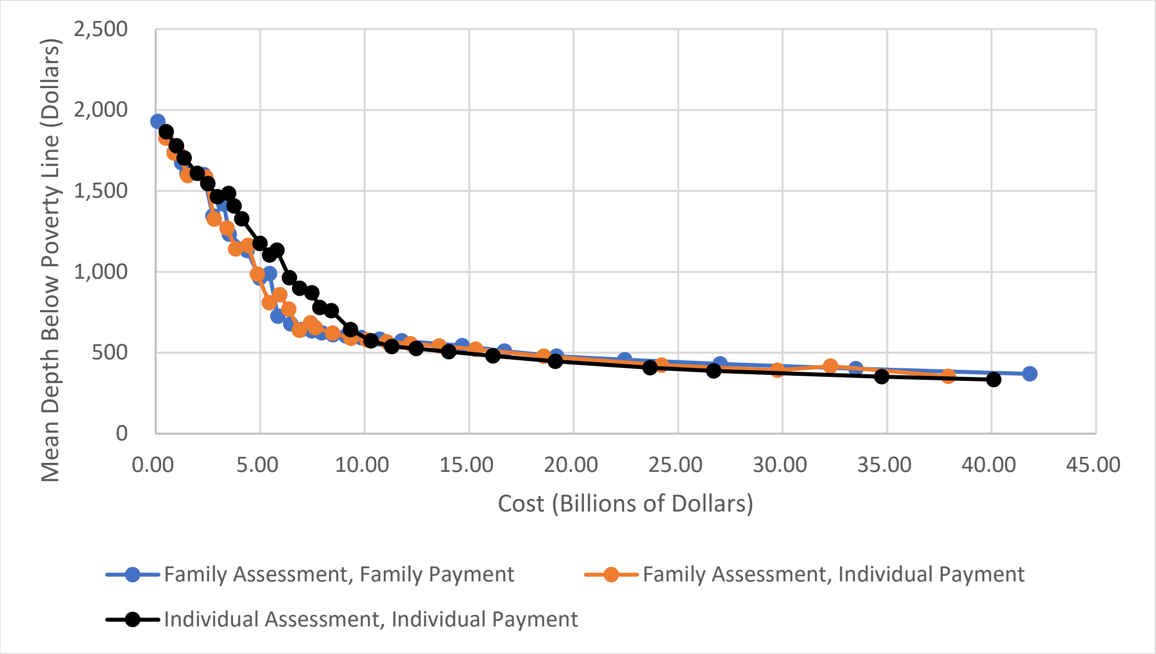
[8] For lowest expenditure under the family assessment/individual payment scheme, 11% of recipients are in couples and the average age is 30. At $10 billion in expenditures, under the same scheme, 20% are in couples and the average age is 35. For the overall sample, 55% of people are in couples and the average age is 41. Thus, the people affected by the smallest expenditures are younger and more likely to be single.

conceptually possible for the mean depth of poverty to increase with increased expenditures over some ranges.

Figure 10

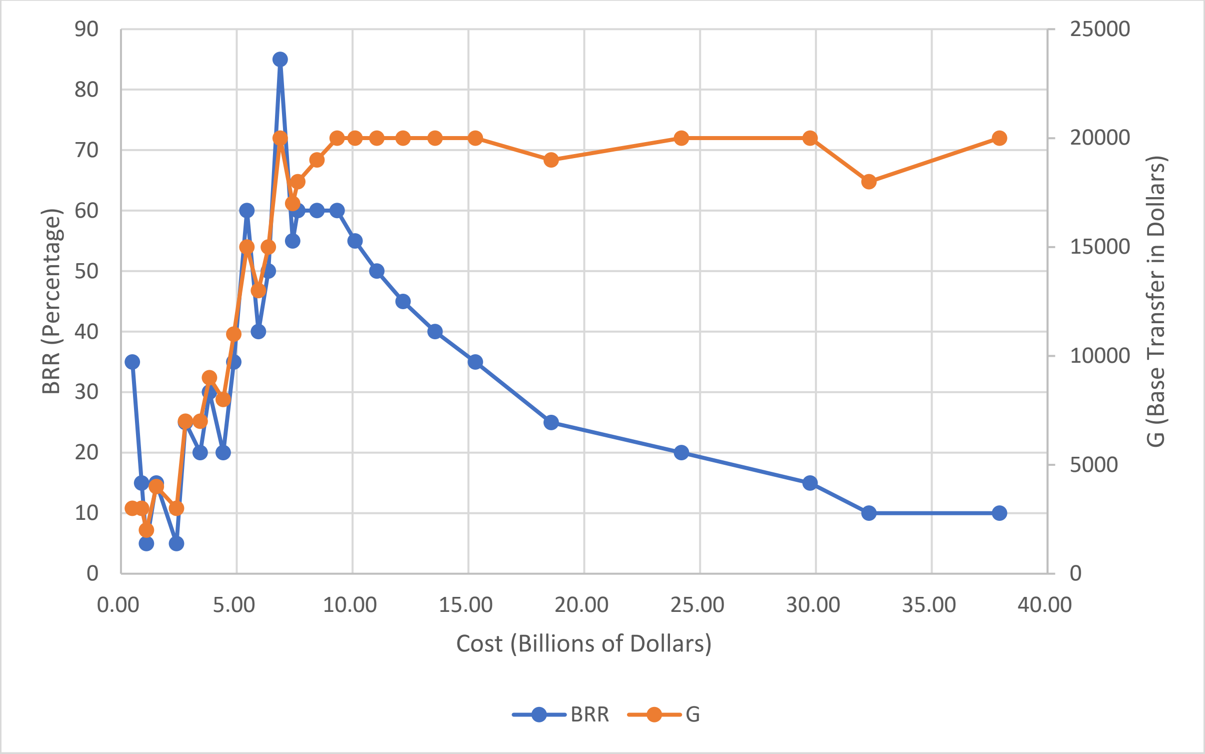
Depth of Poverty Under Different Family Income Assessment and Family Payment Types: Minimizing Poverty Rates



In Figure 11, we present the BRR and G associated with the optimal reduction in the poverty rate for each level of expenditure for the family assessment/individual payment scheme (the preferred scheme in the relevant sub-$10 billion expenditure range in Figure 9). The optimal BRR is referenced to the left vertical axis, while the associated optimal G is referenced to the right vertical axis. The figure shows a continual increase in G up to the $20,000 level we set as our maximum, with the BRR increasing at the same time in order to meet the cost restriction at each level. Once we reach G = $20,000, the only possibly adjustment is to reduce the BRR. This allows for benefits to be paid to households with higher and higher incomes. Because the extra money is being spent in this way, the impact in terms of reducing the poverty rate and, especially, the depth of poverty is limited. This pattern combined with the rise in G and BRR together over the start of the cost range indicates that it is increases in G that do the real work in reducing the incidence and depth of poverty. The increase in BRR that accompanies it is just needed to meet the cost target. Note that this does not have to be the case—it is conceptually possible for the BRR to do the real work such that decreases in the BRR (with accompanying decreases in G in order to meet cost targets) yield decreasing poverty rates. Instead, the message from this figure is clear: reducing poverty requires increases in G and accepting higher BRRs (a higher welfare wall) in order to pay for it. This matches some of the arguments about high BRRs and their incentive effects in keeping more people out of the transfer system in order to be able to pay higher benefits to those who are receiving benefits.

Figure 11

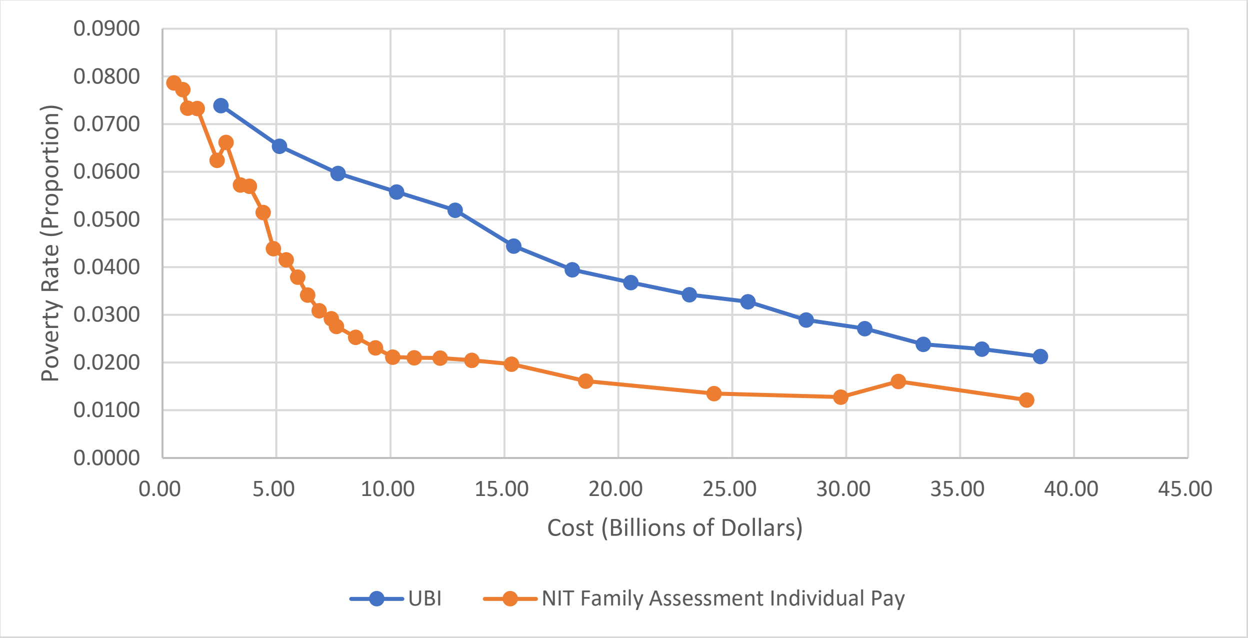
BRR and Income Guarantee When Minimizing Poverty at Each Cost Level, Family Assessment and Individual Payment Type



Finally, in Figure 12, we plot the minimized poverty rate for the UBI option (using household payments, since that was the best approach within that option) with the RTC option (using the combination of family assessment and individual payment, since that was generally the best approach with the RTC option). The figure makes it clear that the RTC approach is a much more efficient way to achieve poverty reduction goals. The two approaches are actually not very different at low expenditure levels. Even at $2.5 billion expenditure, the RTC approach yields poverty rates that are only about 1 percentage point lower than for the UBI approach. But by $10 billion (i.e., when G is nearing $20,000 in the RTC approach) the poverty rate under an RTC would be approximately 4 percentage points lower than under a UBI.

Figure 12

Minimized Poverty Rates for Given Cost Levels, UBI (Household Pay) and NIT (With Household Assessment of Income and Individual Pay)



In summary, searching for optimum parameters brings us to several key conclusions. First, given that the people near the poverty line tend to be younger and single, there is little difference in the effectiveness of expenditures in lowering poverty rates between paying benefits to individuals or paying them to households at low expenditure levels. Above the lowest levels, household payments are more efficient in meeting poverty goals for the UBI approach. Second, it is more efficient in terms of lowering poverty rates to assess income for the purpose of reducing benefits under the RTC approach at the family level.

Third, taken together, the results point to an important conclusion. If our goal is to reduce poverty then an RTC is the preferred BI approach—especially as total spending on the BI increases. But within the RTC approach, to reduce poverty as much as possible, as expenditures in the system increase, both G and BRR increase—that is, a welfare wall is built. As shown in Figure 5, the optimal BRR rises from 10% at $1 billion in expenditures to over 80% at a $7 billion expenditure level. It is not clear whether this is known among BI proponents, who often decry the welfare walls inherent in current conditional transfer systems and argue that a BI would be much better in this regard. If they want to spend more than a small amount on the BI program and their goal is to reduce poverty, then this is not true—the distance between a BI and current conditional transfer systems is small. In both cases, consideration of how to reduce poverty while minimizing disincentive (welfare wall) effects of the transfer system is needed. This points to the importance of considering wide sets of policy goals (including, for example, maintaining opportunities to have the dignity of work) rather than focusing on just one goal, such as reducing poverty rates.

Self-Financing Potential

As detailed in Tedds and Crisan (2020), most of the existing simulation literature presents self-financing options. For the most part, this is achieved by eliminating a suite of existing refundable and non-refundable tax credits. What is the potential for self-financing a basic income in B.C. using a similar method? Eliminating the following tax credits, along with Income Assistance, would provide about $4 billion in funds to redirect to a basic income program:

- basic amount
- age amount
- married and equivalent-to-married tax credit
- caregiver tax credit
- charitable donations
- disability tax credit
- infirm dependants 18 or older tax credit
- education tax credit
- interest on student loans tax credit
- medical expenses tax credit
- pension income tax credit
- tuition tax credit
- EI contributions tax credit
- climate action tax credit
- early childhood tax benefit
- sales tax credit

As we have seen, $4 billion could fund an annual universal basic income benefit of $1,000 delivered to the individual or an annual negative income tax basic income benefit of $5,000 delivered to the individual with a BRR of 15%. The resulting poverty reduction from these benefits is marginal at best.

Where does the $4 billion come from? About half these funds come from the elimination of Income Assistance, and in no case do the potential benefit options described above come close to providing as much support as Income Assistance programs currently do in B.C. The remaining $2 billion comes from the elimination of most of the provincial tax credits. Why does the elimination of the tax credits not provide more funding to put toward a basic income in B.C.? Tedds and Crisan (2020) show that for the scenarios they present, most of the funding comes from the elimination of the basic amount, also known as the basic person exemption. The basic personal exemption is the amount of income that every person can earn free from tax. The amount of tax savings from the basic personal exemption depends on the size of the exemption and the tax rate applied. For example, in 2020 the federal personal exemption was $13,229, and the tax rate applied is the lowest statutory tax rate of 15%, for a tax savings of $1,984.35 per person. In B.C., however, the personal exemption is currently (2020) set at $10,949 and the tax rate applied is the lowest statutory tax rate of 5.06%, for a tax savings of $554.02 per person. As a result, a self-financing basic income in B.C., while possible, provides a smaller benefit to many of the most vulnerable residents in B.C. than the current system does. Given the province's goal of reducing the rates and depths of poverty, pursuing a self-financing basic income program in B.C. seems to require an undesirable trade-off.

Conclusion

Overall, these simulations demonstrate that a means-tested basic income is a much more efficient way to address poverty than a universal basic income. In addition, if addressing poverty is the main objective, that is best served by basing the benefit on the household and not the individual. Finally, and most importantly, despite claims to the contrary, a means-tested basic income benefit builds a welfare wall, just as existing social assistance programs do.

There are a few things to consider. First, despite the fact that we ran 16,000 simulations, the simulations are not exhaustive. For example, a simulation that we didn't conduct is what would it cost to lift everyone in B.C. above the MBM threshold; however, the isolated simulations presented here provide some indication of optimal design given objectives. Second, these simulations consider only a "plain vanilla" basic income scheme. It is possible to consider other variants, including one that incorporates earnings exemptions (Expert Committee on the Guaranteed Minimum Income, 2018; Koebel & Pohler, 2019), consider simply delivering social assistance as a negative income tax benefit to address stigma concerns (Expert Committee on the Guaranteed Minimum Income, 2018), or even targeted basic income programs (e.g., for persons with disabilities, persons experiencing homelessness, persons fleeing domestic violence, and children living in poverty). Third, there are other parameters that could be considered for modelling, particularly the break-even or exit level income (Boadway et al., 2018a, 2018b). This is the ratio of the benefit amount to the clawback rate, and it would be useful to illustrate how "wide" the basic income net is cast. The wider the net and the more people benefit, the higher the cost, but also the less stigma associated with it (e.g., Canada Child Benefit). Fourth, we do not consider these basic income scenarios within the context of the remaining system, mostly because what programs would be replaced by the basic income has not been considered. That will have to be considered within the context of the recommended scenario. What could be replaced would change considerably if the benefit amount were $1,000 a year versus $18,000. Finally, we do not yet consider fiscal federalism considerations, notably the concerns about a basic income that is provincially based rather than federally based. These are all important considerations for subsequent work.

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