The Progressivity of the Canadian Personal Income Tax

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1. Introduction

The graduated rate system distinguishes the income tax from most other forms of taxation. The capacity to calibrate the individual tax burden with some precision makes it the premier tax tool available to governments for influencing the distribution of wellbeing across individuals in a society. People have differing views, however, about how closely the government should attend to the distribution of wellbeing. Adherents to a minimal view of government might prefer that government act only to address poverty alleviation without action to adjust the relative wellbeing of the rich versus the middle. Others believe government ought to be more active in shaping the entire distribution of wellbeing, with as much attention to balancing the top and middle as to lifting those at the bottom. Because of these diverging views, motivating a broadly-based interest in the progressivity of the income tax presents some challenge.

The income tax has a unique position within the tax system. This can be seen with reference to fiscal incidence studies, which attempt to categorize the overall impact of government on the distribution of wellbeing in society.\(^1\) In these studies, the fiscal system overall is often found to be no more than proportional—meaning that the well-off pay approximately the same proportion as those lower down. If true, then a progressive income tax is necessary to ensure the system overall stays at least proportional. That is, if one’s standard for optimal redistribution is only to ensure proportionality of tax burdens, a progressive income tax is necessary to neutralize the regressivity inherent in other tax measures. So, even those without strong redistributionist

\(^1\) Crisan, McKenzie, and Mintz (2015) provide the most recent evidence and review of fiscal incidence in Canada. See also Kesselman and Cheung (2004) for a thorough review of fiscal incidence studies in Canada. Whalley (1984) shows that fiscal incidence analyses can produce starkly varying results when the underlying incidence assumptions are changed. This suggests some caution in the interpretation of the results of fiscal incidence studies.
inclinations should be motivated to pay some attention to the progressivity of the income tax if only to ensure proportionality of overall burdens.

This paper provides a comprehensive analysis of the progressivity of the Canadian personal income tax, historically, theoretically, and empirically. I begin with a review of the recommendations of the 1966 Royal Commission on Taxation. I then discuss the recent refocusing of the academic literature on optimal income taxation in the direction of policy-relevant considerations. Next, I turn to empirical analysis of the Canadian personal income tax system. I begin the empirics with some historic context on how progressivity has evolved over the past fifty years in Canada, followed by a thorough examination of the progressivity within the current personal income tax. The final section of the paper provides some policy options that can shift the income tax in a more progressive direction through either tax cuts in the middle or tax increases at the top. I show the impact of each on the distribution of tax burdens, and provide an approximate costing to give a sense of proportions.

I have three major findings. First, a progressive income tax finds substantial support in recent theoretic advances, and the modern optimal tax framework is found to provide a much better base for analysis of progressivity than the 1966 Royal Commission on Taxation. Second, the evolution of the Canadian personal income tax over the past fifty years reveals the complete elimination of progressivity within the top one percent of taxfilers in the 1980s, only reversed in the recent 2016 tax changes. The other dominant long-run trend is a broad and large increase in tax-based transfers to the bottom quartile of taxfilers. Finally, I study several possible reforms
that could increase the progressivity of the tax system through the middle and top of the income distribution.

2. Setting the scope: What is the personal income tax?

The progressivity of a tax depends on how average tax burdens (taxes as a share of resources) change across those with different levels of wellbeing. In a progressive system, the average burdens increase as wellbeing rises, while in a regressive system those average burdens would be decreasing. If everyone paid the same share of their wellbeing in taxes, the system is described as proportional. The choice of measure of wellbeing is sometimes controversial—some prefer to use annual income while others prefer lifetime income or consumption. For the most part, the analysis in this paper uses annual income to index wellbeing.

The focus is the personal income tax, so I define the object of my analysis in the following ways. First, I ignore other forms of taxation, the spending side of the budget, and payroll-tax funded programs like Employment Insurance and the Canada/Quebec Pension Plan. Second, I limit myself to the federal personal income tax and ignore the provinces and territories. Third, I incorporate Canada’s system of refundable tax credits (such as the Canada Child Tax Benefit and the GST/HST Credit) as part of the personal income tax, but I leave out spending programs (such as the old Family Allowance or the Universal Child Care Benefit). These decisions allow me to make coherent statements about the progressivity of the federal personal income tax.
Of course, any attempt to isolate a discussion of personal income taxation from other elements of the fiscal system runs the risk of missing related shifts in other parts of the budget. To take one example, the National Child Benefit Supplement was part of a joint federal-provincial initiative in which provinces were encouraged to substitute the new federal benefit for part of the provincial social assistance benefits. In the analysis here, the National Child Benefit Supplement makes the income tax system more progressive at the bottom of the income distribution, but for those on social assistance in many provinces there was not much actual change in their wellbeing as provincial social assistance cheques decreased when the new benefit was implemented, dollar for dollar. Similar switches between the spending and tax side of the budgets occurred with the change from the Family Allowance to the Canada Child Tax Benefit in 1993 and in the opposite direction from the non-refundable Child Tax Credit to the Universal Child Care Benefit in 2015.

Moreover, a complete fiscal incidence analysis would include the spending side of the government budget. Not only do spending on education and health have potential consequences for redistribution, but also there are other major spending programs providing income transfers like Employment Insurance and the Old Age Security pension. The limitations inherent in a focus on the personal income tax system alone mean that one should be careful in making inferences about the progressivity of the fiscal system as a whole based on the analysis presented here.

3. The Carter Commission’s ‘ideal’ for rates and brackets

Mid-twentieth century thinking about income taxation reached its apogee in the Royal Commission on Taxation (Canada 1966; commonly known as the ‘Carter Commission’). The Carter Commission’s motivation for and articulation of the ‘comprehensive income tax’ concept
is its most well-known legacy. Less well-known, the Carter Commission also developed an approach to define and achieve a desired level of progressivity through a systematic design of tax rates and brackets. In this section I examine the Carter Commission’s framework and assess its relevance for current policy discussions.

This is important because the Carter Commission’s framework provided much of the motivation for the major tax reform of 1972—a reform that drastically changed the rate-and-bracket structure of the Canadian personal income tax. Previous to 1972, the federal tax structure featured 17 brackets with the last two bracket thresholds at $225,000 and $400,000. Federal rates reached 57.6 per cent at the top. After 1972, the top bracket dropped to $60,000 with a top federal rate of 47 per cent. As will be seen below, these moves are consistent with the structure laid out in the Carter Commission.

At the core of the Carter Commission’s advocacy of the progressive income tax is a particular way of assessing a household’s ability to pay. In order to generate tax brackets, the Carter Commission developed a framework centred on an idiosyncratic distinction between ‘discretionary’ and ‘non-discretionary’ uses of income. The Commission emphasized this distinction did not relate just to bare physical subsistence, but instead it “denotes the provision of the services necessary to maintain the appropriate standard of living of the family...relative to others.” In the Carter framework, at some low and basic level of income, all of one’s spending is non-discretionary. Then, as one’s income rises, the amount of non-discretionary spending also increases, but at a rate slower than the increase in income. At some ultimate level of income

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2 See page 5, Chapter 7 of Volume 3 in Canada (1966). Also, on page 21 the report declares that attention to “subsistence” is not well conceived, since it “has no absolute meaning.”
there was no further non-discretionary benefit from further income. Once this upper limit has been hit, all additional spending is assumed to be discretionary and therefore should be taxed at the same rate.

The Carter Commission recommended that tax brackets should span the income range between the lower and upper limit. The income thresholds between the lower and upper limit should increase by a constant proportion, and the tax rates for each bracket should increase with a constant increment. The top rate should be chosen so as to raise the amount of revenue required, with the rest of the tax rate and bracket system following from that decision. A top rate of 50% was chosen to meet the revenue requirements, but also because the Commission argued there was a “psychological barrier” to the state taking more than half of one’s income, and because of worries about efficiency effects of rates higher than 50%.  

The Commission’s ‘ideal’ tax bracket system as reported in the original report is reproduced in Table 1, with an extra column to update the dollar values to 2016. Each bracket’s income threshold is double the previous bracket, while the increment to the tax rate is 5% between brackets. The final recommendation for rates and brackets differed somewhat from this ideal

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3 The Commission report argued on the basis of psychology: “[w]e think there would be great merit in adopting a top marginal rate no greater than 50 per cent. With such a maximum marginal rate, taxpayers would be assured that at least half of all gains would be theirs after taxes. We think there is a psychological barrier to greater effort, saving and profitable investment when the state can take more than one half of the potential gain.” See Canada 1966, 3: 163). It also argued on the basis of efficiency: “[W]e are confident that with lower marginal rates of tax on wages and salaries to encourage labour and managerial effort, with little change in the rate of capital formation and with a much improved allocation of capital, the future output of the goods and services Canadians want would be increased” (ibid., 1: 48).

4 I use the annual All-items CPI in this paper from CANSIM 326-0021. For 2016, I use January since that is the most recent available at the time of writing.

5 The actual rate and bracket structure in the Commission’s recommendation differed somewhat from this ‘ideal’ schedule, out of a concern to compensate lower and middle income households for the lack of progressivity in municipal and provincial sales and property taxes. (Canada 1966; Vol. 3, Ch. 11, p. 167)
system. Concerns for the regressivity of property and sales taxes led the Commission to adjust lower rates downward to increase the progressivity of the income tax as a counter to those other regressive taxes.

The Carter Commission’s recommendations provided the background for the federal tax reform of 1972. That 1972 reform saw the rate and bracket structure move toward the ideal discussed in the Commission’s report in three ways: the top income bracket fell from $400,000 to $60,000, income thresholds were set to rise at a multiple of approximately 1.5, and tax rates rose at a constant increment of 4% over the upper range of brackets.

The high income tax threshold has never again approached that pre-1972 level of $400,000. Since the Carter Commission’s thinking on rates and brackets was arguably part of the motivation for this change away from high-income brackets, it is worth revisiting the coherence of that thinking. That is, if today’s rate and bracket structure is based in some part on Carter’s thinking, we should examine how we get where we are. Two elements of the Carter “non-discretionary” construct seem odd; one theoretical and one empirical.6

First, the idea that non-discretionary spending rises as income rises is difficult to grasp. Someone earning above the basic level is assumed to be spending at least some of his or her money on discretionary uses. Yet, when this person gains an extra $10,000 in income, some of this extra income is now spent on what are to be considered non-discretionary uses which were only discovered to be non-discretionary following the arrival of new income. However, if there is no

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6 See Bittker (1968) for an extended criticism of the “non-discretionary” framework.
discretion on spending for those purposes, the question is raised why this incremental non-discretionary spending was not occurring before the new income arrived.

The resolution to this puzzle appears to be in the words “relative to others” in the concept’s description. Those with an increase in income may, because they now compare themselves to others in their new income group, believe that more spending (such as a bigger car or house in order to ‘keep up with the Joneses’) is now non-discretionary, given their now-higher income. Implicit in this framework, then, is that these new increments to non-discretionary spending don’t bring wellbeing to the household, but simply allow them to keep up with their now-higher income neighbours. That is, having higher incomes makes them worse off unless they spend more to keep up with their now-higher income neighbours.

In the years since the Carter Commission, economists have worked out this kind of reference-dependent preference framework in some detail. These kinds of preferences may explain individual decisions and indicators of utility quite well. However, by necessity, any basis for determining the ‘ability to pay’ in a tax system must rely on interpersonal comparisons—across not within households. Spending to ‘keep up with the Joneses’ may bring no incremental utility to a household relative to their own utility in an alternative lower income position. But when comparing two households with different consumption levels, few people would discount the extra expenditures of the higher-consuming household just because their spending was motivated by keeping up with the spending of some higher-income neighbours. That is, if the higher-

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7 See, for example, Koszegi and Rabin (2006), who develop the most-cited theoretical framework for reference dependent preferences. The model centres around a so-called personal equilibrium, which is not a particularly relevant concept for inter-personal comparisons of ability-to-pay.
consuming household goes on fancier vacations because they felt they needed to keep up with high-consuming neighbours, they are still better off than a household that couldn’t afford the fancy vacations. That incremental ‘non-discretionary’ spending based on reference to others makes the household better off compared to others who don’t have the income necessary to afford that spending, whether the household actually appreciates it or not.

The second, empirical oddity of the Carter Commission’s non-discretionary framework comes from the values chosen for the lower and upper limits of annual income. The lower limit, below which all spending is non-discretionary and above which some spending becomes partially discretionary, was set at $300 per year. In 2015 dollars, this is about $2,300. It is hard to understand how the goods that would be purchased with an extra $1,000 above that income level would be anything but non-discretionary. On the other end, the upper limit was set at $100,000, or about $755,000 in 2016 dollars. In the Carter Commission’s definition, those with incomes of only $745,000 who received an extra $10,000 would be spending some of that money in uses classified as non-discretionary. It is hard to understand what might be non-discretionary at that level of income. Even if one took the reference-dependent preferences idea explored above to heart, it is difficult to understand why these reference-dependent preferences would stop at $755,000—do millionaires not consume competitively too? If they do, Carter’s motivation for taxing everyone above the upper threshold at the same marginal rate disappears.

In summary, the Carter Commission’s ‘ideal’ structure for rates and brackets seems difficult to justify—yet the removal of tax brackets for very high-earners in the 1972 tax reform likely drew at least some motivation from Carter’s ideal structure. Other concerns such as tax avoidance
behaviour of high earners or differing notions of fairness may also have motivated the 1972 tax reform. However, in considerations of the best rate and bracket structure for Canada, the clear shortcomings of the Carter approach should raise questions about the extent to which we should continue to use it as a model for our rate and bracket structure.

4. Practical insights from optimal tax theory

Shortly after the Carter Commission’s report, a landmark academic paper (Mirrlees 1971) proposed an income tax framework grounded on rigorous microeconomics. In the Mirrlees framework, the tax authority could observe the incomes of individuals, but not their efforts. The tax authority must set income tax rates to balance the need to raise revenue with the disincentive effect of pushing some people to exert less effort so as to avoid unwanted taxation. This framework remains at the core of how modern academic economists view income taxation.

Over the last twenty years, the influence of optimal tax theory on economic policy has shifted decisively from being dismissed derisively as “highly unproductive” in 1997 to a position at the centre of practical tax policy, as exemplified in the U.K. Mirrlees Review.8 Pivotal contributions from Emmanuel Saez and others in the late 1990s made this change possible.9

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8 Boadway (2012, page 1) quotes IMF tax policy expert Vito Tanzi as saying in 1997 that “in terms of concrete results, optimal tax theory must be considered a highly unproductive activity. Its recommendations often conflict with what governments want to do or what taxpayers expect them to do.” More recently, the Mirrlees Review (Mirrlees et al. 2011, page 36) defends an optimal tax based approach because “it provides a way of thinking rigorously about these trade-offs, and ensuring that value judgements reflecting concerns about income distribution and well-being are made explicit while the efficiency costs of achieving that redistribution are properly taken into account…”

9 Piketty (1997) contributed the ‘perturbation’ approach to optimal tax derivation. Diamond (1998) reversed the long-standing understanding that optimal tax rates should be U-shaped; showing they could reasonably feature progressivity over the mid-high ranges. Saez (2001) generalized, extended, and simulated this new approach to optimal taxation.
was published, theoretical optimal tax schedules often had odd, impractical upside-down U-shapes, with higher rates in the middle than the top. The work of Saez and others allowed optimal tax theory to be expressed in terms of empirically-relevant elasticities and measurable features of income distributions. Moreover, their formulations produced tax schedules that reversed the odd shapes of the 1970s theoretical work. These contributions made optimal tax theory much more directly relevant for policy.

Many of the policy insights of the modern optimal tax framework can be explored through examination of the optimal tax formulae derived from a basic version of the framework. Working through a simplified example of the now-standard optimal tax derivation (based on Salanié 2011, chapter 4) delivers several policy-ready prescriptions.

The derivation of the optimal income tax begins with a tax schedule that satisfies society’s taste for redistribution. Any small change in tax rates at a given point on that schedule will have two effects. First, the tax change will raise more revenue from those who have that level of income or higher. For example, in increase in the tax rate by 1 percent between incomes of $40,000 and $40,001 will raise an extra penny of revenue from everyone who earns $40,001 or higher. This is called the ‘mechanical effect.’ The second effect is on labour supply: those who are on the margin of working more (or not) at the $40,000 point will reconsider their labour supply given the new higher tax rate. The higher rate will lead to lower labour supply by some, and thus lower revenue. This is called the ‘behavioural effect.’ The important policy insight here is that we need to always consider both revenue potential and behavioural effects at each point of the tax

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10 This particular derivation requires a Rawlsian social preference function, and assumes away income effects through a quasi-linear utility specification.
schedule. Put another way, higher marginal tax rates do hurt by lowering work effort, but the higher marginal tax rates perform an essential role by making sure that overall tax burdens are distributed appropriately.

4.1 Exploring the optimal income tax formula

We can use this conception of behavioural and mechanical effects to solve for the precise form of the optimal income tax schedule. The analysis begins with a tax schedule presumed to be optimal and examines perturbations away from this optimal schedule. If the original tax schedule were already optimal, then for any small change away from the original schedule, the mechanical and behavioural effect must exactly cancel each other out. If that were not true, the original schedule would not have been optimal. The optimal tax formula resulting from these manipulations is built from three pieces.

i) The wage rate: \( w \)

The wage rate reflects someone’s ability. It is assumed to be distributed with a cumulative distribution function \( F(w) \), which represents what proportion of people are below any given wage rate \( w \), and a probability density function \( f(w) \), which gives the proportion of the population having a wage rate exactly equal to \( w \).

ii) The elasticity: \( \varepsilon \)

The elasticity reflects how much labour supply changes when the wage rate changes. When \( \varepsilon \) is high, there are large efficiency effects of taxing income. When \( \varepsilon \) is low, the efficiency effects are low because labour supply is little changed.
iii) The marginal tax rate: $T'$

The marginal tax rate reports how much of the wage $w$ the person must pay to the government.

Putting these three pieces together, the optimal tax schedule satisfies the following equation. The full derivation appears in the Appendix.

$$
\frac{T'}{(1 - T')} = \left(1 + \frac{1}{\varepsilon}\right)\frac{(1 - F(w))}{wf(w)}
$$

The left-hand side of the equation has the ratio of the marginal tax rate to one minus the marginal tax rate. Changes in the right-hand side of the equation must be satisfied by adjusting the marginal tax rate. When the right-hand side gets bigger, the marginal tax rate on the left-hand side must grow to maintain the equality.

The right-hand side of the equation has several terms of interest, each of which has a particular and practical interpretation for tax policy discussions.

- The larger is the elasticity of labour supply ($\varepsilon$) the lower will be the optimal tax rate. This tells us that efficiency demands lower tax rates if people respond strongly to higher tax rates.
- The higher is the wage rate $w$ the lower will be the marginal tax rate. The formula suggests that revenue needs require us to pay more attention to the marginal tax rates of more productive workers.
• The more people there are at any particular wage level \( w \) (which is the \( f(w) \) term), the lower should be the tax rate. This results from the magnitude of the labour market distortion—the more people are distorted at any particular level of income, the bigger the consequences.

• The fewer people there are above any particular wage level \( w \) (which is the \( 1 - F(w) \) term), the lower the tax rate should be. This underscores the idea that the tax revenue benefit we get from raising marginal taxes at any level comes from the mechanical revenue impact above that point. If there aren’t many people above a given point, the revenue benefit is smaller.

Simulations and analysis of this type of optimal tax formula have delivered two important lessons that have a direct impact on policy considerations.

First, high marginal tax rates at the bottom should not be given undue concern. The optimal income tax framework allows for transfers to be made to those earning nothing. As earnings rise, these transfers are taxed back, like a negative income tax. Large transfers become costly if transfers extend very far up the income distribution because so many people are receiving them. The purpose of high marginal tax rates at the bottom is to allow these transfers to be targeted more precisely by taxing them away quickly as incomes rise. Importantly, in the presence of fixed costs of work, it is much more important to consider the extensive labour market choice (the decision to work vs. not working) than the intensive labour market choice (how many hours to work, if working). These extensive labour market decisions depend critically on the average
tax rates, not the marginal tax rates. This means that high marginal tax rates at the low end don’t matter as much for efficiency as the average tax rates.

Second, the old 1970s work on optimal income taxation led to concerns that optimal tax theory required low tax rates on high earners. However, the new framework emphasizes the role of the shape of the income distribution at the top in generating non-decreasing tax rates for high earners. For example, Saez (2001) shows that the ratio of \( \frac{(1-F(w))}{w f'(w)} \) is quite stable at the top of the income distribution. This implies that the lower marginal tax rates at the top of the income distribution generated by the 1970s literature are not required by theory, and opens the door to a theoretically-grounded progressive income tax.

4.2 Application: How high can rates go?

The tax rate on high earners has attracted heightened attention in recent years, owing to the increase in income concentration at the top of the income distribution. Of course, any discussion of taxing high earners more must balance notions of fairness about the income distribution with notions of fairness about enjoying the fruits of one’s own labour. Diamond and Saez (2011) argue that the United States should push high-income taxation until the point when higher rates would produce no extra revenue. Feldstein (2012) reacts against this target of taxing the rich to the utmost, arguing that at least some social weight must be put on the consumption of high earners.

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11 See Brewer, Saez, and Shephard (2011) for an extensive discussion and illustrations of the importance of the extensive margin in designing tax policy for lower-income workers.
Beyond academic writing, the experience of the U.K. and France reveals the nature of the debate about taxing high earners. In the UK, the top tax rate was moved from 40% to 50% on those earning more than £150,000 in 2010, then back down to 45% in 2013. As noted by Johnson and Phillips (2014), there were evidence-based concerns that the higher rate raised almost no revenue because many high earners responded by shifting income out of the tax base. In France, President François Hollande’s 75% tax rate on those earning more than €1 million lasted from 2013 to 2014 before it was discontinued on similar concerns. These recent examples point out the tension between the desire to adjust the tax system to account for higher levels of income concentration among high earners and the constraints put on those desires by the response of taxpayers.

The optimal tax framework discussed above can be applied to the particular case of high earners, with only a few changes. The basis of the analysis remains the same—the optimal tax rate will be the one that balances revenue gained through a mechanical effect with revenue lost through behavioural responses. One key difference is that the behavioural response by high earners is more likely to be tax avoidance through shifting income out of the tax base than through a decrease in labour supply.12

The focus of the analysis is the revenue-maximizing tax rate on high earners. Imposing the revenue-maximizing rate may not be desirable, but it is still interesting because it provides an informative upper bound to high-earner tax rates. The revenue-maximizing tax rate depends on two key parameters. The first parameter is the elasticity of taxable income to changes in the tax

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12 The derivation that follows is drawn from Saez, Slemrod, and Giertz (2012). See Piketty, Saez, and Stantcheva (2014) for a discussion of how high earners respond to higher tax rates.
rate, \( e \). This includes the labour supply elasticity in the general optimal tax framework above, but also captures non-labour supply responses to higher taxes, such as tax avoidance undertaken by high income taxpayers. If the elasticity parameter \( e \) grows, then the increased behavioural response of taxpayers will push down the optimal top tax rate.

The second parameter is \( \alpha \), which depends on the shape of the income distribution. This parameter \( \alpha \) comes from looking at how much income is reported above a given threshold. For example, in 2013, the average income in Canada above $250,000 was $538,392. The \( \alpha \) parameter can be easily calculated using these two numbers (see the appendix for details), and comes to 1.87. Atkinson, Piketty, and Saez (2011) argue that these \( \alpha \) parameters are fairly stable within-country across high income distributions around the world. Higher \( \alpha \) parameters mean that there is less income available to be taxed above any given threshold, and will push optimal tax rates on high earners lower.

I derive the revenue-maximizing tax rate for high earners in the appendix and present the main result here. The optimal tax rate on high earners takes the following form:

\[
\tau^* = \frac{1}{1 + e \cdot \alpha}
\]

In words, the revenue-maximizing top tax rate varies inversely with the degree of behavioural response \( (e) \) and the income distribution parameter \( \alpha \) (which takes smaller values when income is more concentrated at the top).

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13 The source is the 2013 tax year Final Statistics (T1 data) produced by the Canada Revenue Agency: [http://www.cra-arc.gc.ca/gncy/stts/t1fnl-eng.html](http://www.cra-arc.gc.ca/gncy/stts/t1fnl-eng.html).
This formula comes to life by providing some examples of the revenue-maximizing tax rate that results from different parameter values. These calculations are presented in Table 2. For Canada, the \( \alpha \) parameter for 2013 is 1.87. To give some context, Saez, Slemrod, and Giertz (2012) use 1.5 for the United States, and Brewer, Saez, and Shephard (2011) use 1.67 for the United Kingdom. The table makes clear, however, that the \( \alpha \) parameter doesn’t have a really large impact on revenue-maximizing tax rates.

In contrast, the behavioural response parameter \( e \) has a large impact on the revenue-maximizing tax rates. For Canada, Milligan and Smart (2015) estimate \( e \) to be 0.69 for high earners, although this estimate is applicable to provincial changes in tax rates more than federal government changes. That is, since high-income taxpayers may have some flexibility to shift income across provincial borders, the Milligan and Smart (2015) 0.69 elasticity estimate based on provincial variation may overstate the elasticity of a federal tax change since interprovincial shifting has no impact on federal tax liability. In related work, Milligan and Smart (2013) account for cross-provincial shifting and find estimates for the avoidance elasticity of around 0.4. To compare, Saez, Slemrod, and Giertz (2012) and Diamond and Saez (2011) use 0.25 as their central case for the U.S., while Brewer, Saez, and Shephard (2011) found an elasticity of 0.46 for the U.K.

As an important caveat, none of these elasticities should be considered as unchangeable and fixed behavioural parameters. Instead, as emphasized by Kopczuk (2005), the elasticities reflect the nature of the underlying tax system and tax base. If a tax system allows taxpayers to shift income out of the tax base easily, the elasticity will be high. Similarly, a tightly administered tax
system without many discretionary tax preferences would make it harder to avoid taxes and should feature a lower elasticity. In this way, tax authorities have the power to influence the elasticity through enforcement efforts and curtailing tax shelters and avoidance opportunities.

Putting all this together, the most relevant range of Table 2 for a federal tax change is likely to be around a value of 1.8 for \( \alpha \) and between 0.25 and 0.50 for \( e \), under the existing tax system for Canada. This suggests that the revenue-maximizing tax rate (including both federal and provincial income taxes) lies in the range of 53\% to 69\%. Top rates currently prevailing in Canada for 2016 are close to 54\% in several provinces, touching the bottom edge of the possible revenue-maximizing range. Of course, as noted in the caveat above, this particular revenue-maximizing range depends on the assumption that administrative and legislative efforts to combat tax avoidance by high earners remain unchanged. The analysis make clear that substantial increases in the high-earner rate above prevailing levels would become increasingly likely to yield little extra revenue in the absence of successful new measures to curtail tax avoidance.

5 Current rate and bracket structure

In this section I detail the current shape of the income tax schedule in Canada in 2016.\textsuperscript{14} In this analysis, I focus on the federal system only. I start with a single person, and then build an example for a taxfiler with kids. Having a spouse matters for several items on the tax form, but

\textsuperscript{14} I assume the taxfiler is based in BC. There are some differences across provinces in the federal Working Income Tax Benefit. However, these differences are not substantial enough to drive the main results presented here. The analysis includes the new brackets and rates confirmed in the 2016 budget, along with the new Canada Child Benefit.
complicates the analysis. I keep the example as clean as possible so that the parts of the tax system driving the observed patterns can be seen clearly. I do not include the Canada Pension Plan or Employment Insurance premiums in this analysis, nor the spending-side measures like the Universal Child Care Benefit. In the results below, I first show the pattern of marginal tax rates (the tax paid on the next dollar of income), followed by average tax rates (how much tax is paid on average over all income).

5.1 Description of the 2016 system

The basic structure of the income tax system in Canada starts with a credit for the basic personal amount of $11,474 and the Canada Employment amount of $1,161, which means the first $12,635 are effectively taxed at a rate of 0%. Taxable income above the level of the basic personal amount is taxed in five brackets of 15%, 20.5%, 26%, 29%, and 33%. This basic structure of rates and brackets is readily understandable to most Canadians.

Superimposed on this basic structure is another, less obvious layer of tax rates. Refundable tax credits delivered as part of the income tax system drive the ultimate shape of the income tax system—in particular those below median income levels. These refundable tax credits have different roles and purposes from the GST/HST sales tax credit meant to compensate for the impact of the GST and HST on lower earners to child-based benefits like the Canada Child Benefit. All of these refundable tax credits consist of a basic amount that is phased out as income rises. Some of these refundable tax credits are initially phased in, while others are given to

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15 The thresholds are: 15% up to 45,282; 20.5% up to 90,563; 26% up to $140,338; 29% up to $200,000, and 33% thereafter.
families with no income at all and then phased out as incomes rise. These refundable credits effectively impose another set of marginal tax rates on top of the basic tax bracket structure.

5.2 Analysis of Marginal and Average Tax Rates in 2016

I graph the marginal tax rates faced by a single taxfiler with no children in Figure 1. It is worth going through this graph in detail to build a thorough understanding of what drives the patterns observed. Starting from zero taxation on the first few dollars of earnings (owing to the basic personal amount), the marginal tax rate dips to negative 20.4 percent at $4,750 because of the Working Income Tax Benefit, which is phased in at $0.204 for each dollar of earnings past that threshold in British Columbia. At $8,948 a similar $0.02 per dollar earnings subsidy begins, through the GST supplement for single adults. At $10,765, the Working Income Tax Benefit is fully phased in, taking the marginal tax rate to reflect only the 2 percent GST benefit. However, at $12,635 the basic amount and Canada employment amount is exceeded and marginal earnings begin to be taxed in the first bracket at 15 percent, almost simultaneous to this, the Working Income Tax Benefit begins to be phased out at $12,786 at a rate of $0.165 per dollar of earnings. This takes the marginal tax rate to 29.5 percent. The GST supplement for single adults is done phasing in at $16,198, knocking the marginal tax rate up by 2 percent. The Working Income Tax Benefit is fully phased out by $20,319, which brings the marginal tax rate back down to 15 percent, reflecting only the income tax rate. The full GST tax credit is then phased out at 5 percent between $35,926 and $44,334. The remaining features of the marginal tax rate schedule reflect the tax brackets beginning at $45,282, $90,563, $140,338, and $200,000.
Three features of this marginal tax rate schedule stand out. First, the phase-in and phase-out of the Working income Tax Benefit create symmetric ‘bubbles’ on the schedule, providing first a marginal incentive to work more, then less. Second, the marginal tax rates in the low to middle income range where refundable tax credits are being phased out are higher than anywhere else in the schedule. Third, it is very complicated. If one were to add in provincial taxation and provincial refundable tax credits, all three of these features would be magnified.

In Figure 2, I repeat the analysis but for a single person with two children. The marginal tax rate schedule here is made more complex through the additional consideration of the Canada Child Benefit, which is phased out starting at income of $30,000 at a rate of 13.5%; with the phaseout rate lowered to 5.7% at $65,000. Like with singles, there is also the 5% phaseout of the GST tax credit between $35,926 and $52,742. The Canada Child Benefit is finished phasing out at $189,123, so the marginal effective rate drops down by 5.7 percentage points at that income level. The last upward shift is the 33% tax rate at $200,000. Adding a spouse to this example would shift the range over which benefits are phased out, as the income of both spouses is used in the phase-out calculation. However, the basic patterns seen here would remain. Like with the childless single person, this marginal tax rate schedule is complex and not monotonically progressive.

The optimal tax theory discussion suggested these marginal tax rates are important for two reasons. First, they determine the marginal work disincentive at each point of income. Second, they determine how much the overall tax burden will be for people at or above any income point—for a given marginal tax rate, people with incomes below that point will not pay it, but
people above that point do pay that marginal rate as they pass that income level. So, to see the overall impact on tax burdens requires an analysis of the average tax rate at each level of income.

The average tax rate is calculated by dividing the overall tax burden (income tax less refundable credits) by the income. I graph the average tax rate for the single individual with no children in Figure 3. To get a more complete view of how the average tax rate progresses, I extend the x-axis to $300,000.\textsuperscript{16} The average tax rate schedule increases sharply to about $50,000, at which point it begins a gentler upward curve. The notch at lower income levels—with the average tax rates first rising then falling—is due to the Working Income Tax Benefit. The average tax rate becomes positive at an income level of $18,000.

The final example presents the average tax rate schedule for the single person with two children. Figure 4 displays the results. The y-axis in this figure is now drastically stretched compared to the previous examples, reaching down to negative 200 percent at income levels below $1,000. This negative rate results from the very large size of the transfers made to families with children in the Canadian tax system through refundable tax credits—in this case the Canada Child Benefit. Because of these refundable tax credits, this taxfiler does not reach a positive average tax rate until an income level of $64,600.

The child benefits that make up most of the refundable tax credits have expanded a great deal since the demise of the old Family Allowance. When the Family Allowance was discontinued

\textsuperscript{16} Because the marginal tax rate is 33 percent for the highest earners, the average tax rate will slowly approach 33 percent at income levels above $300,000.
after 1992, it paid just under $35 per month for each child. The system that has grown over the past 20 years has magnified the payments tremendously.

The importance of refundable tax credits can best be illustrated in an example in Figure 5. Imagine a single parent with two children aged 5 and 8, working a full-time full-year job at $12 an hour. Annual earnings would come to $24,960. This person would just be over the threshold where federal taxes begin to be paid. But, much more importantly, the taxfiler in 2015 would receive a total of $8,067 from the National Child Benefit Supplement, the Canada Child Tax Benefit, and the GST tax credit. This amounts to $681 per month—which would then be supplemented in 2016 with $220 in monthly Universal Child Care Benefit payments that aren’t included in this analysis. The $672 represents a supplement of 32 percent over the monthly wage earnings of $2,080; a substantial tax subsidy. Of note, the Working Income Tax Benefit is zero here, as it is completely phased out by approximately $20,000 for a BC single parent.

Figure 5 also shows the new Canada Child Benefit, implemented on July 1st, 2016. This new benefit replaces the National Child Benefit Supplement and the Canada Child Tax Benefit, along with the Universal Child Care Benefit. The new amount for this family would be $11,800 annually, an increase of more than $2,000 per year over the sum of the previous benefits.

The analysis of the 2016 personal income tax system in this section shows the overwhelming impact of refundable tax credits on the patterns both of marginal and average tax rates across the population. The refundable credits contribute substantially to improved progressivity at the

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17 This taxfiler would receive the basic personal amount, the equivalent-to-spouse amount, and the Canada Employment Credit. These total $24,109 in 2016.
bottom of the income distribution, but at the cost of some complexity and higher marginal tax rates in the low-middle income range when they are being phased out. The steps of progressivity in the core rate and bracket structure look small in comparison to the massive hills and valleys generated by the refundable tax credits.

6 Historic context of rate structure

To give context for today’s observed tax bracket and rate schedule, I provide in this section an historical retrospective of the tax bracket and rate structure of the Canadian personal income tax from 1962 to 2016. In making comparisons across years, it is necessary to keep in mind the differences in tax base across years. As one example, capital gains were excluded from taxable income prior to 1972. A high earner may have found a way to receive remuneration through capital gains rather than as wage income. This kind of tax avoidance means that the tax rate actually paid may differ from the statutory tax tables. Moreover, evidence suggests that capital income was much more important as a share of total income among high earners in previous decades. Veall (2012) shows that the share of earned income among high earners is much higher in the 2000s than previously.18 These differences in the composition of income should also be kept in mind when making cross-year comparisons.

I begin with a brief overview of the three main eras covered by this 1962 to 2016 timespan. Following that I present simulations of the marginal and average tax rate faced by earners at different percentiles of the income distribution across years.

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18 Veall (2012) shows the share of wage income for the top 1% in 1946 was 45.5%. By 2009 this had increased to 64.9%. In the top 0.1% and 0.01% this shift toward earned income is even larger.

In 1962, the federal and provincial governments entered into tax collection agreements similar to what exists to this day, replacing the ‘tax rental agreements’ in place since 1941. That transition marks a natural beginning point for the analysis. The personal income tax system in Canada over the past 55 years has gone through three distinct eras. I describe the salient features of each in turn.\(^{19}\)

i. 1962 to 1971

There were 17 different tax brackets with rates ranging from 11% to 80%, but with a general provincial abatement to provide ‘tax room’ for provinces that lowered the effective federal rate down by 16% to 28% depending on the year. So, the effective top federal rate in 1962 was 67.2% and in 1971 was 57.6%. The highest bracket over this era started at an income level of $400,000. The $400,000 1962 top bracket in 2016 dollars is equivalent to $3.2 million. The tax base in this era was narrower than at present, with capital gains, unemployment insurance, and family allowance income being notable untaxed forms of income.

ii. 1972 to 1987

The 1972 tax reform saw a partial implementation of some of the features recommended by the Carter Commission. In particular, several forms of income were now included as taxable (such as the capital gains, unemployment insurance, and family allowance income noted above). There was also a substantial revision of the rate and bracket structure, with the top rate of 47% being applicable to incomes over $60,000 (or about $350,000 in 2016 dollars). The number of brackets was reduced to 13. A reform in 1983 reduced the number of brackets to 10, lowered the top

\(^{19}\) The source for this discussion is the original tax forms for most years, supplemented by the analysis in the annual publication “Finances of the Nation” and “The National Finances” (Canadian Tax Foundation).
bracket rate to 34%, and brought the top bracket threshold down substantially to $53,376 (about $125,000 in 2016 dollars). Provincial rates grew during this period, with a notable jump in 1977 when the federal government lowered federal rates slightly to provide more tax room to the provinces.

iii. 1988 to 2016

The tax reform of 1988 transformed most deductions into credits, including the basic personal amount, spousal amount, and child amount. These credits were valued at a rate equal to the lowest tax bracket, meaning a substantial cut in the value of these concessions for higher earners. The number of explicit brackets was reduced to three, with the top bracket starting at $55,000. However, from 1985 until 2000 there were surtaxes on higher earners which implicitly defined new brackets on top of the explicit brackets. This led to substantial progressivity—Frenette, Green, and Milligan (2007) find that the 1995 tax system was the most redistributive in the 1980-2000 time period. The federal surtaxes were removed in 2001, but a new top tax bracket was added in that year for those earnings $100,000 or more. Federal rates and brackets were then stable until 2016, when the newly elected government put in place a new tax bracket starting at $200,000 with a rate of 33% and lowered the 2\textsuperscript{nd} tax bracket from 22% to 20.5%.

Provincial rates over this time period grew in most provinces until about 1995, when they started to recede. In 2000-01, the nine provinces (the exception being Quebec) in tax collection agreements with the federal government switched to a system that allowed much more flexibility with their own tax rates and brackets.
Another important development in this time period was the substantial expansion of refundable tax credits. These were typically structured as a base benefit reduced by a certain percentage for every dollar earned over some threshold. A refundable tax credit for children had been introduced in 1978, and one for sales taxes in 1986. The consolidation of the Family Allowance and other child tax measures into the Canada Child Tax Benefit in 1993 was a landmark transformation of the tax system into delivering tax-based assistance to lower income families through a refundable tax credit. The introduction of the GST in 1991 led to the expansion of the refundable sales tax credit. Later in the 1990s, the National Child Benefit Supplement was added, then expanded. Finally, in 2016 three of the child benefits were consolidated and expanded into the Canada Child Benefit

6.2 Analysis of Marginal and Average Tax Rates, 1962-2016

To analyze the changes in the federal personal income tax system over the period from 1962 to 2016, I begin with the distribution of individual incomes from 2011. For this, I use the Survey of Labour and Income Dynamics. Given the focus on earned income in the optimal tax models discussed earlier, I use the same focus here. I do so by selecting individuals age 18 to 64 who have any earned income. From this sample, I record the 1st through 99th percentile of the distribution. I add to this the 2011 values for the 99.9th and 99.99th percentiles of the income distribution from the CANSIM high income database (matrix 204-0001). I then adjust this fixed 2011 distribution backward and forward using the Consumer Price Index for the years from 1962 to 2016. These percentiles of income are then put through the CTaCS tax simulator to obtain tax liabilities and refundable credit eligibilities, from which marginal and average tax rates may be derived. Spending programs like Family Allowance, the Universal Child Care Benefit, and Old
Age Security are not included, nor are payroll taxes like Employment/Unemployment Insurance or Canada/Quebec Pension Plan contributions. The conceptual experiment applied here is to observe what tax rates would result if the tax systems of each year from 1962 to 2016 were applied to people with the income distribution observed in 2011.

The first graph of marginal tax rates at selected percentiles of the income distribution is shown in Figure 6. For the 50th through 90th percentiles, the marginal tax rates evolve in a fairly narrow band. There is remarkable stability after 2001, with the inflation-indexed brackets not being adjusted much over these recent years. The most obvious element in the graph is the large drop at the 10th percentile and increase at the 25th percentile starting in the late 2000s. This occurs because of the introduction of the Working Income Tax Benefit in 2007, which is first phased in with earned income, and then phased out. This acts as a subsidy to earnings over lower earnings ranges, then an extra marginal tax on earnings over the range including the 25th percentile. The odd jump at the 10th percentile in 1971 results from exceeding the threshold for the small federal low-income tax abatement in place in the 1970s.

To investigate what is happening at the top of the income distribution, I graph in Figure 7 the marginal tax rates through time for those at the 95th, 99th, 99.9th and 99.99th percentiles of the income distribution. Here the picture is quite different, with a fan shape revealing that top marginal tax rates were not distinct among those in the top one percent since the early 1980s. That is, there is no marginal progressivity in the range of income that has shown the most income growth over the last thirty years. This changed in 2016 with the new 33% tax bracket for high

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20 For 2011, the 99th percentile of individual income is $207,900, the 99.9th is 595,100, and the 99.99th is $2,701,600. Translated to 1962 incomes, the 99.99th is still not in the top tax bracket which starts at $400,000 in that year.
earners that hits at the highest percentile. In some contrast, the marginal rate in 1962 for someone at the 99.99th percentile was nearly double the rate faced by a 95th percentile earner.

To summarize these trends from a different angle, I graph in Figure 8 the marginal tax rate of each percentile for the years 1966, 1996, and 2016. Looking first at the 1966 line, there is substantial progressivity through the income distribution, culminating in a rapid raise in the last few percentiles of income. By 1996, there was no longer any rise in the top few percentiles, but the marginal tax rate for high earners was clearly above lower earners—17.5% at the 25th percentile, but 26.8% at the 75th. For both 1996 and 2016, there is a bump around the 55th percentile reflecting the 5% phase-out rate of the GST refundable tax credit. The 2016 line shows the impact of the Working Income Tax Benefit being phased in and out, but then appears almost flat over most of the rest of the range, until jumping up in the last percentile owing to the new 33% bracket. Compared to 1996, marginal tax rates in 2016 above the median are sharply lower by as much as 10 percentage points before the lines cross in the top percentile. This pattern in the upper half of the distribution largely took hold in the tax cuts implemented in 2001, which got rid of the high income surtaxes and reset the tax brackets and rates.

These patterns in marginal tax rates are interesting, but marginal tax rates are only a means to the end of shaping the overall distribution of tax burdens. These overall distributions of tax burdens are best assessed using the average tax rate, calculated by dividing the income tax (less refundable tax credits) by the income level.
The overall tax burden for selected percentiles between the 10\textsuperscript{th} and 90\textsuperscript{th} is displayed in Figure 9. For the 50\textsuperscript{th} through 90\textsuperscript{th}, there are common trends as the average tax burden rises and falls over time. In particular, it is worth noting that average tax burdens since 2000 have fallen at each of the percentiles shown here. It is interesting how closely the movements between the 50\textsuperscript{th} and 90\textsuperscript{th} percentiles are aligned. At the 10\textsuperscript{th} and 25\textsuperscript{th} percentiles, there is more volatility. With the introduction of the sales tax credit in 1986 and then the Working Income Tax Benefit in 2007, the average tax rate at the 10\textsuperscript{th} percentile falls sharply into negative territory. In simulations not shown here, this trend is greatly magnified for a family with children, as the expansions of the Canada Child Tax Benefit and National Child Benefit supplement took hold through the 1990s. Finally, the impact of lowering the 2\textsuperscript{nd} tax bracket from 22\% to 20.5\% in 2016 can be seen in the slight dip in the average tax rates at the 75\textsuperscript{th} and 90\textsuperscript{th} percentiles. This tax break only affects those above $45,282 in 2016 which cuts above the median of the individual income distribution in 2016.

I repeat the analysis for those at the top of the income distribution in Figure 10, with results quite different than for the 10\textsuperscript{th} to 90\textsuperscript{th} percentiles, but anticipated by the pattern of marginal tax rates for high earners in Figure 7. The tax burden at the 95\textsuperscript{th} percentile has been fairly constant at 20 percent over the 1962 to 2016 time period. In contrast, the tax burden at the 99.99\textsuperscript{th} percentile has fallen from more than 50 percent to under 30 percent. Moreover, the gaps between the 99\textsuperscript{th} and the 99.9\textsuperscript{th} and also within the top 1/10\textsuperscript{th} of one percent, have shrunk considerably. Most of this decrease happened before 1985, during the Pearson and Trudeau years—although the 1988 tax reform in the Mulroney years also shifted burdens at the top downward. Of course, this analysis assumes that statutory burdens are paid and not avoided. However, it is still informative.
to point out the changes in statutory burdens embedded within the tax structure. Finally, the impact of the new 33% tax bracket on high earners instituted in 2016 can be seen clearly here with the uptick for the average tax rate at the 99.9th and 99.99th percentiles.

The analysis is summarized in Figure 11 by showing the results for all percentiles for three selected years. The tax burden through most of the income distribution in 1996 was highest. The tax burden at the very top is clearly highest in 1966. But, from the 55th to the 95th percentile, the average tax rate in 2016 was within one percentage point of 1966. Below the 30th percentile, the average tax rate is substantially lower in 2016, mostly driven by the Working Income Tax Benefit. So, the 1960s featured higher average tax burdens at the bottom and the very top than today, but comparable burdens in the middle of the income distribution. The 1990s were characterized by much higher tax burdens on the middle and mid-upper reaches of the income distribution than was the case in the 1960s or is the case today.

7 Policy options and simulations

The analysis above has suggested some large changes to the progressivity of the Canadian personal income tax system over the past 55 years. Comparing recent years to the 1960s, the income tax system is less progressive within the top one percent of the income distribution, but transfers substantially more to those in the bottom 25 percent. How sensitive are the average tax rates to the kinds of policy changes that might be considered in today’s political and economic environment? In this section I graph the impact of several possible tax reforms on the distribution of average tax rates in order to observe the magnitude and distribution of the impact.
These reforms are intended to be illustrative of different options that might be considered, and don’t represent my recommendations for the proper course of action.

For each potential reform, I first describe its features. I then present graphs comparing the average tax rate distribution to the baseline case. I do this both with an x-axis looking at income levels up to $500,000 and also one looking at percentiles. These two graphs together provide perspective on how the measures affect those in the middle vs. those at the top of the income distribution. Finally, I provide some indication of the overall revenue cost (or gain) of each measure based on numbers provided by the Parliamentary Budget Office. A summary table of the reforms appears in Table 3.

The analysis uses 2015 as a baseline and takes as the first reform the income tax rate and bracket changes implemented by the new Liberal government for 2016. This approach aims to illustrate the impact of these recent changes relative to other options to affect the progressivity of the income tax system. The other four reforms considered here remove the Liberal 2016 reform and use 2015 as the baseline.

### 7.1 Add new bracket at the top and lower the middle rate

The first measure I consider is the rate and bracket change implemented by the new Liberal government for the 2016 tax year. The 2\textsuperscript{nd} tax bracket rate is lowered from 22% to 20.5% and a new top bracket at $200,000 is added with a rate of 33%. The impact of this reform on average tax rates is illustrated in two graphs.

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21 I use the PBO’s “Ready Reckoner”, to get a sense of the cost of a small change in each of the tax parameters under consideration. (http://www.readyreckoner.ca/) Some of the reforms considered here are not small, so the cost is unlikely to be a simple linear extrapolation of the numbers given by the Ready Reckoner.
tax rates is displayed in Figure 12. Because the 2\textsuperscript{nd} bracket starts at $44,700 in 2015, no one under that dollar value is affected. That dollar value cuts at about the 60\textsuperscript{th} percentile of the individual earnings distribution. At $89,000, the average tax rate drops from 16.4 percent to 15.6 percent, a drop of 4.6\% in the tax burden. With the higher 33\% tax rate starting at $200,000, the average tax rate in the reform overtakes the baseline 2015 average tax rate at $217,000. By $400,000, the average tax rate has increased from 25.8 percent to 27.6 percent, an increase of 8.0\%.

The net cost of this reform as costed in the Liberal 2015 platform was revenue neutral. However, analyses by the Parliamentary Budget Office and the Department of Finance after the election projected the tax changes to carry a net fiscal cost. The Parliamentary Budget Office (2016) assessed a net cost of $300 million for 2016-17 before accounting for behavioural response, and $1.6 billion after allowing for some degree of behavioural response. The Department of Finance (2015) estimates the revenue loss will be $1.3 billion for tax changes relating to this switch of rates, including behavioural response. Milligan (2015) points out that the degree of behavioural response relating to the new 33\% bracket will ultimately depend on the strength of any measures introduced to decrease the ease of tax avoidance for high earners.

\textbf{7.2 Increase Basic Amount to $20,000}

The next measure I consider is an increase in the basic amount to $20,000 from its current value of $11,327. This reform would affect the marginal tax rates of those current facing taxation between the level of the current basic personal amount and $20,000. Because this affects
everyone from that level of earnings and higher, there is an impact on the overall tax burden for almost everyone with this reform, but the main impact is felt by middle earners.

Figure 13 graphs the average tax rates under this reform and with the base case for 2015, using a single person with no children and incomes ranging from $2,000 to $400,000. This reform drops the average tax rate noticeably for those under $100,000 of income, but the impact fades for higher earners. In the percentile graph, the impact of this reform can be seen more clearly. It has the largest impact around the 30th percentile of earners, then fading slowly as we move toward the highest earners in the top one percent.

The cost of this measure is likely to be substantial. The PBO estimates that the reduction in revenue is about $2.5 billion for each $1,000 the basic amount is changed. Moving from $11,327 to $20,000 is an increase of $8,673. While the impact of a larger change is not likely to be a linear extrapolation, it is clear that a large expansion of the basic personal amount costs a great deal of foregone revenue.

### 7.3 Stretch the thresholds of existing brackets

The third policy reform I examine takes the 2015 tax bracket rates—15%, 22%, 26%, and 29%—and stretches the income thresholds upward. The new bracket thresholds are $75,000 (instead of $44,701); $125,000 (instead of $89,401); $250,000 (instead of $138,586). The results appear in Figure 14. This has no impact below $44,701, and only a small impact until the existing upper tax threshold at $138,586 is reached. The gap reaches its maximum at $250,000, after which the marginal tax rate under the base case and simulated scenario is the same, meaning that the two
lines will eventually converge. At the $250,000 income level, the average tax rate would drop by 1.7 percentage points, or a 7 percent drop in the tax burden.

These changes would not be as expensive as the basic personal amount in terms of revenue. Moving the 2nd bracket threshold up to $75,000 would cost about $12.7 billion; moving the next threshold up to $125,000 would be about $3.1 billion; moving the top threshold to $250,000 would be about $1.7 billion. This totals about $17.5 billion. The PBO Ready Reckoner does include an allowance for a modest amount of behavioural response, but for high earners the actual behavioural response might exceed the PBO’s estimated response. This would lead to smaller cost estimates here since tax filers would be facing lower tax rates under this reform.

7.4 Add High-Income Tax Brackets

The fourth tax measure I consider is the addition of two new tax brackets on top of the existing structure. The brackets would be at a rate of 35% for taxable income above $250,000 and 40% for income above $400,000. When combined with prevailing provincial rates, this would take top tax rates close (if not over) the range where existing estimates suggest that a behavioural response would substantially eat away the potential revenue gain. Still, it is worthwhile seeing what impact these rates would have on average tax rates.

The results appear in Figure 15. For high earners, a substantial gap in the average tax rate opens up, compared to the base case. By an income of $500,000, the average tax rate is 4 percentage points higher than in the base case. This is a 15 percent increase in their tax burden. In the
percentile graph, there is no change in the bottom 99 percent, but the average tax rate within the top one percent increases noticeably.

An idea of the potential revenue from this reform can be ascertained from the PBO estimates. A one percentage point increase in the 2015 top tax bracket would bring in approximately $940 million. Since the new bracket thresholds are above the existing threshold, the gain might be less than this for each percentage point of tax increase. Using the CRA income statistics, Fortin et al. (2012) estimate that a 35% bracket above $250,000 would raise about $3 billion mechanically, but about half of this would disappear through behavioural response. Putting this together, I estimate a range of $2 billion to $5 billion in additional revenue from these brackets.

7.5 Cut Lowest Bracket Tax Rates

The final policy reform I simulate involves cutting the tax rate for the bottom bracket from 15% to 12%. Along with this, the credit rate for non-refundable tax credit is also assumed to change from 15% to 12%. The results appear in Figure 16. The impact of this measure only bites in a noticeable way after a taxfiler reaches above the basic amount and starts paying income tax at around $12,000. By $45,000, the gap in the average tax rates reaches 2.2 percentage points, 10.9% to 8.7 percent. The impact fades as the tax filer reaches higher income brackets. This option would be more costly than the previous one for foregone tax revenue. A three point drop in the 1st tax bracket would cost $10.8 billion according to the PBO estimates.
8. Conclusions

This paper has presented a comprehensive analysis of the structure of tax rates and brackets in the Canadian personal income tax. I find little in the Carter Commission’s framework for rates and brackets that should be maintained for today’s economy. It is noteworthy that Carter’s framework was part of the motivation behind the drop in top tax rates and income thresholds in the 1972 reform—a reform that removed top-end progressivity.

My review of the optimal income tax literature finds renewed theoretical support for a progressive income tax, and for tax measures that use large transfers combined with relatively high marginal tax rates to assist those at the bottom of the income distribution. The empirical evidence does suggest some limits to higher top-end tax rates because of the likelihood that those at the top may respond to higher tax rates by reporting less income. For the case of Canada, a reasonable estimate for the revenue-maximizing tax rate (beyond which higher rates result in a loss of revenue) is a range of 55 to 70 percent for the combined federal-provincial income tax rate.

I also simulated the marginal and average tax rates delivered by the Canadian personal income tax over the past fifty years, delivering two main findings. First, progressivity within the top one percent had been completely eliminated until the installation of a new high-earner bracket in 2016. This is striking since the growth of income concentration within the top one percent has occurred contemporaneous to the lower high-income tax rates. Second, the emergence of refundable tax credits over the past 25 years has transformed how the Canadian personal income tax treats individuals in the bottom part of the income distribution. There have been very large
decreases in the tax burden from the bottom through the middle of the income distribution for families with children. However, it is important to bear in mind that some of this extra redistribution has displaced redistribution done by provinces or through the spending side of the federal budget.

The final part of the paper simulated several distinct policy proposals that aim to increase the progressivity of average tax burdens in the Canadian personal income tax. All the reforms had noticeable impacts on average tax rates, but they varied substantially in fiscal cost and the part of the income distribution they affected. The largest impact on middle incomes was delivered by an increase to the basic exemption or extensions of the thresholds for tax brackets—but these options carry a large fiscal cost in the range of $20 billion.

The personal income tax is a vital part of the tax system that pulls the overall fiscal burden toward proportionality. Without sufficient progressivity delivered by the income tax, our overall fiscal system risks falling away from proportionality of tax burdens toward overall regressivity. If the income concentration trends seen over the last thirty years continue, a strong argument can be made that some of the progressive force of the income tax should be directed to top earners and away from middle earners. This paper has offered historical evidence and modern perspectives on how those changes could be enacted.
References


http://policyoptions.irpp.org/2015/12/10/what-elasticity-of-taxable-income-should-we-use-for-2016/


Appendix

Derivation of optimal tax formula:

Consumption is $c$, labour is $l$, type is $w$, which is also the wage rate. CDF $F(w)$; PDF $f(w)$

Gross income is therefore: $z = wl$

Labour elasticity: $\varepsilon = \frac{dl}{dw} \frac{w}{l}$

Tax function looks like this: $y = z - T(z)$, so $y$ is after-tax income. Since there is no saving, $c=y$. You consume your after-tax income.

Perturb the marginal tax rate by $dT'$ over range $dz$ at point $z_0$:

There are two effects: Mechanical and Behavioural.

The Mechanical effect: people earning $z_0$ or higher now pay higher taxes on income above $z_0$. Result is higher tax revenue.

The Behavioural effect: people earning between $z_0$ and $z_0 + dz$ now face a higher marginal tax rate. This distorts their marginal labour supply decision. They work less, leading to lower tax revenue.

Since the tax function $T$ was chosen optimally, the small perturbation cannot raise any revenue, meaning the magnitude of the mechanical effect must equal the magnitude of the behavioural effect.

To derive the mechanical effect, multiply the number of people affected by the amount of increase paid by each.

Proportion of people affected: $(1 - F(w_0))$

Tax increase per person: $dT'dz$

So, the total mechanical effect is $dT'dz(1 - F(w_0))$

To derive the behavioural effect, multiply the change in revenue by the proportion of people affected. Revenue drops because labour supply drops by $dl$. Tax revenue that is lost is $T'wdl$.

Draw on the definition of labour elasticity to get expression for $dl$: $dl = \frac{\varepsilon dw}{w}$

Elasticity depends on net wage, which is $w = w_0(1 - T')$ and the change in net wage $dw = dT'w_0$.

Substitute this into the loss in tax revenue:

$T'wdl = T'w \frac{\varepsilon dT'w_0}{w_0(1-T')}$.
Noticing that $z = wl$ and canceling the $w_0$ gives us:

Revenue loss per person: $T'wld = T'ze^{dT'}(1-T')$

In the range of the behavioural effect, the number affected is:

$f(w_0)dw_0$.

Rearrange $dw_0$:

$\frac{dz}{dw_0} = \frac{dz}{dw} = \frac{d(wl)}{dw} = l + w\frac{dl}{dw} = l + w\left(\frac{\varepsilon l}{w}\right) = l(1 + \varepsilon)$

Implying: $dw_0 = \frac{dz}{l(1 + \varepsilon)}$.

Now multiply together the change in revenue per person with the proportion of people in this range:

$T'z\varepsilon\frac{dT'}{(1 - T')}f(w_0)\frac{dz}{l(1 + \varepsilon)}$

Equate the mechanical and behavioural effects:

$dT'dz(1 - F(w_0)) = T'z\varepsilon\frac{dT'}{(1 - T')}f(w_0)\frac{dz}{l(1 + \varepsilon)}$

Which reduces to:

$\frac{T'}{(1 - T')} = \left(1 + \frac{1}{\varepsilon}\right)\frac{1 - F(w_0)}{w_0f(w_0)}$

**Derivation of revenue-maximizing tax rate formula:**

The derivation follows Saez, Slemrod, and Giertz (2012, p. 6-9)

Notation:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\tau$</td>
<td>Tax rate on top earners.</td>
</tr>
<tr>
<td>$z$</td>
<td>Reported income of top earner.</td>
</tr>
<tr>
<td>$\bar{z}$</td>
<td>Threshold to be in top bracket.</td>
</tr>
<tr>
<td>$z^m$</td>
<td>Average income of those in the top bracket.</td>
</tr>
<tr>
<td>$N$</td>
<td>Number of taxpayers in top bracket.</td>
</tr>
</tbody>
</table>

Elasticity:

$e \equiv \frac{1 - \tau}{z} \cdot \frac{\partial z}{\partial(1 - \tau)}$
\[ \beta = \frac{z^m}{\bar{z}}. \]

This coefficient \( \beta \) is called the inverted Pareto coefficient. It can be shown that the Pareto coefficient \( \alpha \) can be expressed as

\[ \alpha = \frac{\beta}{\beta - 1}. \]

It follows with some basic manipulation that

\[ \alpha = \left( \frac{z^m}{z^m - \bar{z}} \right). \]

Write down a behavioural effect (revenue loss by lower reported taxable income) and a mechanical effect (revenue gain from higher tax collected on reported income) for a given change in tax rates \( \partial \tau \).

**Mechanical effect:**

\[ dM \equiv N \cdot (z^m - \bar{z}) \cdot \partial \tau \]

**Behavioural effect:** First rearrange elasticity formula to solve for the change in reported income:

\[ dz^m = -e \cdot z^m \cdot \frac{d\tau}{(1 - \tau)} \]

\[ dB \equiv N dz^m \tau \]

\[ dB = -N \cdot e \cdot z^m \cdot \frac{\tau}{(1 - \tau)} \cdot d\tau \]

The change in revenue must be zero; the mechanical and behavioural effects should perfectly offset.

\[ dR = dM + dB = 0 \]

\[ dM \equiv N \cdot (z^m - \bar{z}) \cdot \partial \tau \]

\[ dB = -N \cdot e \cdot z^m \cdot \frac{\tau}{(1 - \tau)} \cdot d\tau \]

Revenue maximizing rate is therefore:

\[ \tau^* = \frac{(1 - \tau)}{1 + e \cdot \left( \frac{z^m}{z^m - \bar{z}} \right)} \]

Noticing that we can substitute in the Pareto coefficient \( \alpha \):

\[ \tau^* = \frac{1}{1 + e \cdot \alpha} \]
<table>
<thead>
<tr>
<th>Bracket Lower Threshold</th>
<th>1965</th>
<th>2016</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>195</td>
<td>1472</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>390</td>
<td>2944</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>781</td>
<td>5895</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>1562</td>
<td>11789</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>3125</td>
<td>23586</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>6250</td>
<td>47173</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>12500</td>
<td>94345</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>25000</td>
<td>188690</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>50000</td>
<td>377381</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>100000</td>
<td>754762</td>
<td>50%</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Taken from Canada (1966), p.11, Table 7-1, Volume 3, Part 1. The dollars in the source document are assumed to be from 1965. The ‘2016’ column updates these dollars to 2016 (January) using the CPI.
Table 2: Revenue-Maximizing Tax Rates

<table>
<thead>
<tr>
<th>e</th>
<th>1.5</th>
<th>1.6</th>
<th>1.7</th>
<th>1.8</th>
<th>1.9</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>87.0%</td>
<td>86.2%</td>
<td>85.5%</td>
<td>84.7%</td>
<td>84.0%</td>
<td>83.3%</td>
</tr>
<tr>
<td>0.20</td>
<td>76.9%</td>
<td>75.8%</td>
<td>74.6%</td>
<td>73.5%</td>
<td>72.5%</td>
<td>71.4%</td>
</tr>
<tr>
<td>0.25</td>
<td>72.7%</td>
<td>71.4%</td>
<td>70.2%</td>
<td>69.0%</td>
<td>67.8%</td>
<td>66.7%</td>
</tr>
<tr>
<td>0.30</td>
<td>69.0%</td>
<td>67.6%</td>
<td>66.2%</td>
<td>64.9%</td>
<td>63.7%</td>
<td>62.5%</td>
</tr>
<tr>
<td>0.40</td>
<td>62.5%</td>
<td>61.0%</td>
<td>59.5%</td>
<td>58.1%</td>
<td>56.8%</td>
<td>55.6%</td>
</tr>
<tr>
<td>0.50</td>
<td>57.1%</td>
<td>55.6%</td>
<td>54.1%</td>
<td>52.6%</td>
<td>51.3%</td>
<td>50.0%</td>
</tr>
<tr>
<td>0.60</td>
<td>52.6%</td>
<td>51.0%</td>
<td>49.5%</td>
<td>48.1%</td>
<td>46.7%</td>
<td>45.5%</td>
</tr>
<tr>
<td>0.70</td>
<td>48.8%</td>
<td>47.2%</td>
<td>45.7%</td>
<td>44.2%</td>
<td>42.9%</td>
<td>41.7%</td>
</tr>
<tr>
<td>0.75</td>
<td>47.1%</td>
<td>45.5%</td>
<td>44.0%</td>
<td>42.6%</td>
<td>41.2%</td>
<td>40.0%</td>
</tr>
</tbody>
</table>

Notes: calculation based on formula derived in appendix.
Table 3: Reforms and Approximate Costing

<table>
<thead>
<tr>
<th>Reform</th>
<th>Approximate Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lower 2nd bracket; install new 33% bracket above $200,000</td>
<td>$0.3 to $1.3 billion</td>
</tr>
<tr>
<td>2. Basic Personal Amount expansion to $20,000</td>
<td>$22 billion</td>
</tr>
<tr>
<td>3. 35% tax on $250,000-$399,999; 40% on $400,000+</td>
<td>($2 to $5 billion gain)</td>
</tr>
<tr>
<td>4. Extend bracket thresholds to $75,000; $125,000; $250,000</td>
<td>$17.5 billion</td>
</tr>
<tr>
<td>5. Lower first bracket to 12%</td>
<td>$10.8 billion</td>
</tr>
</tbody>
</table>

Notes: The costing for each reform is based on estimates from the Parliamentary Budget Office’s “Ready Reckoner” (http://www.readyreckoner.ca/). The PBO estimates are valid for a small change, and account for a small level of behavioural response (assuming an elasticity of 0.2). Many of the reforms here are large, and would bring about a behavioural response possibly larger than assumed by the PBO.
Figure 1: 2016 Marginal Tax Rates, single no children

Notes: Marginal tax rate for federal income tax and refundable tax credits for a BC resident in 2016. Single person with no children. Calculations by CTaCS.
Figure 2: 2016 Marginal Tax Rates, single with two children

Notes: Marginal tax rate for federal income tax and refundable tax credits for a BC resident in 2016. Single person with two children, ages 5 and 8. Calculations by CTaCS.
Figure 3: 2016 Average Tax Rates, single no children

Notes: Average tax rate for federal income tax and refundable tax credits for a BC resident in 2016. Single person with no children. Calculations by CTaCS.
Figure 4: 2016 Average Tax Rates, single with two children

Notes: Average tax rate for federal income tax and refundable tax credits for a BC resident in 2016. Single person with two children, ages 5 and 8. Calculations by CTaCS.
Figure 5: Annual Child Benefits in 2015-16, single two children

Notes: Single parent with children age 5 and 8, resident of BC. Assumed to be working full time full year (40 hours/week; 52 weeks) at $12/hour. Total annual earnings of $24,960. Calculations by CTaCS. All amounts annual.
Figure 6: Marginal Tax Rates by Selected Percentile, 1962-2016

Notes: Marginal tax rate for federal income tax and refundable tax credits for a BC resident at selected percentiles of the 2011 income distribution. Single person with no children. Calculations by CTaCS.
Figure 7: Marginal Tax Rates for High Incomes, 1962-2016

Notes: Marginal tax rate for federal income tax and refundable tax credits for a BC resident at selected percentiles of the 2011 income distribution. Single person with no children. Calculations by CTaCS.
Figure 8: Marginal Tax Rates by Percentile for Selected Years

Notes: Marginal tax rate for federal income tax and refundable tax credits for a BC resident at selected years using all percentiles of the 2011 income distribution. Single person with no children. Calculations by CTaCS.
Figure 9: Average Tax Rates for Selected Percentiles, 1962-2016

Notes: Average tax rate for federal income tax and refundable tax credits for a BC resident at selected percentiles of the 2011 income distribution. Single person with no children. Calculations by CTaCS.
Notes: Average tax rate for federal income tax and refundable tax credits for a BC resident at selected percentiles of the 2011 income distribution. Single person with no children. Calculations by CTaCS.
Figure 11: Average Tax Rates for Selected Years

Notes: Average tax rate for federal income tax and refundable tax credits for a BC resident at selected years using all percentiles of the 2011 income distribution. Single person with no children. Calculations by CTaCS.
Figure 12: Rates and Brackets 2016 Policy Simulation

Notes: Average tax rates for single BC resident in 2015, no kids. Federal personal income tax and refundable tax credits only. Calculations by CTaCS.
Figure 13: $20,000 Basic Personal Amount Policy Simulation

Notes: Average tax rates for single BC resident in 2015, no kids. Federal personal income tax and refundable tax credits only. Calculations by CTaCS.
Figure 14: Increase Tax Bracket Thresholds Policy Simulation

Notes: Average tax rates for single BC resident in 2015, no kids. Federal personal income tax and refundable tax credits only. The simulation increases the tax bracket thresholds to $75,000, $125,000, and $250,000. Calculations by CTaCS.
Notes: Average tax rates for single BC resident in 2015, no kids. Federal personal income tax and refundable tax credits only. The simulation imposes two new tax brackets: 35% at $250,000 and 40% at $400,000. Calculations by CTaCS.
Notes: Average tax rates for single BC resident in 2015, no kids. Federal personal income tax and refundable tax credits only. The simulation decreases the tax rates in the lowest bracket to 12% from 15%. Calculations by CTaCS.