Revisiting the Middle Class Tax Cut

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The Parliamentary Budget Officer (PBO) supports Parliament by providing economic and financial analysis for the purposes of raising the quality of parliamentary debate and promoting greater budget transparency and accountability.

This report provides *ex post* (after the fact) estimates of the fiscal impact of the middle class tax cut in tax years 2015 and 2016.

The analysis is based, in part, on Statistics Canada's Social Policy Simulation Database and Model. The assumptions and calculations underlying the simulation results were prepared by PBO staff and the responsibility for the use and interpretation of these data is entirely that of the analysts.

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Executive summary

This report provides *ex post* (after the fact) estimates of the fiscal impact of the middle class tax cut in tax years 2015 and 2016. The estimates are based on counterfactual scenarios that are compared to recent historical data from the Canada Revenue Agency. The fiscal impact estimates also account for the effects of income forestalling and unwinding.

Background

In December 2015, the Government of Canada announced the "middle class tax cut" which included two major changes to the federal personal income tax (PIT) regime. Effective 1 January 2016:

- The rate for the second tax bracket was reduced from 22.0 per cent to 20.5 per cent for taxable income between $45,282 and $90,563 ("middle income") and;
- A new 33.0 per cent top rate was introduced for taxable income over $200,000 ("high income").

In January 2016, PBO provided an *ex ante* (before the event) estimate of the fiscal impact of these announced changes. Although PBO's initial estimate incorporated behavioural responses, it did not explicitly account for the impact of what is known as *forestalling*.

Because the new tax rate on incomes greater than $200,000 was announced before the end of the 2015 tax year, some high-income individuals had time to shift income forward, or forestall, to take advantage of the lower 2015 tax rate. In subsequent years, this advanced income would be *unwound*.

Fiscal impact estimates of the middle class tax cut

For the tax year 2015, we estimate the total fiscal impact at $5.6 billion. That is, federal PIT revenues were $5.6 billion higher compared to a scenario without the announced increase in the top rate. This is due to high-income individuals bringing forward income that would have been taxed in future years at a higher PIT rate (Summary Figure 1).

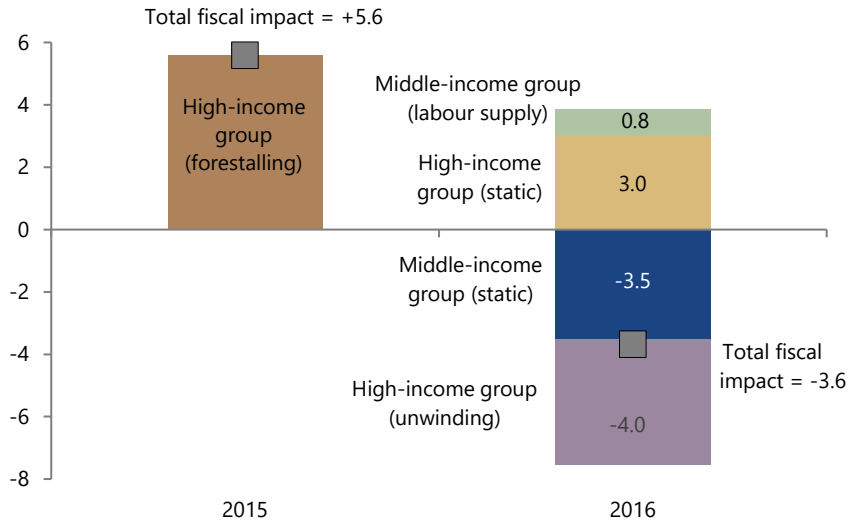
For the tax year 2016, we estimate the total fiscal impact at -$3.6 billion. In other words, federal PIT revenues were $3.6 billion lower than they would have been had the changes in tax rates not occurred. This estimate consists of a static (no behavioural) fiscal impact of -$0.4 billion and a behavioural fiscal impact of -$3.2 billion.

Under the assumption of no behavioural changes, the revenue loss to the Government from reducing the second PIT rate to 20.5 per cent ($3.5 billion) exceeds the revenue gain from introducing the new top rate of 33.0 per cent ($3.0 billion).

The behavioural fiscal impact in 2016 reflects the unwinding of some taxable income brought forward in 2015 by high-income individuals (-$4.0 billion) that is partially offset by higher revenues from middle-income individuals consistent with an increase in their labour supply ($0.8 billion).

Summary Figure 1 Middle class tax cut: total fiscal impact

$ billions



Sources: Statistics Canada, Canada Revenue Agency and Parliamentary Budget Officer.

Based on our counterfactual scenario and what appears to be a reasonable unwinding assumption, our baseline result suggests that individuals in the high-income group did not reduce their labour supply in response to the new 33.0 per cent top PIT rate.

PBO's initial estimate did not account for forestalling and unwinding. As such, it would not have included $5.6 billion in additional federal PIT revenue in 2015 due to high-income individuals bringing forward income from future tax years.

PBO's initial estimate of the total fiscal impact in 2016, which included behavioural responses, was a revenue loss of $1.6 billion. However, this estimate likely understated the loss in PIT revenue by omitting the impact of unwinding by high-income individuals.

Implicit estimates of the short-run elasticity of taxable income

The elasticity of taxable income (ETI) measures the responsiveness of individuals to changes in their marginal tax rate. Specifically, it measures the percentage change in taxable income corresponding to a 1 per cent increase in the net-of-tax rate (that is, 1 minus the marginal tax rate).

For individuals with taxable incomes of between $45,282 and $90,563, our results are consistent with a short-run elasticity of taxable income (ETI) of 0.47. This is higher than the ETI for this group (of 0.10) that was assumed in PBO's 2016 report. It suggests that middle-income individuals reacted more to the reduction in the second PIT rate in 2016 than we had assumed. The magnitude of our implicit ETI estimate for the middle-income group is largely supported by previous studies.

After adjusting for unwinding, our baseline result for the high-income group is consistent with a short-run ETI equal to 0, which suggests that these individuals did not reduce their labour supply in response to a higher marginal tax rate. This stands in contrast to the ETI (of 0.38) for the high-income group assumed in PBO's 2016 report, as well as estimates in previous studies. Many of these studies also did not control for the effects of forestalling/unwinding in their estimation.

We do consider some alternative assumptions related to unwinding and counterfactual taxable income growth. Nonetheless, our implicit ETI estimates for the high-income group in 2016 fall near the lower bound of the range of estimates in previous studies.

1. Introduction

In December 2015, the Government of Canada announced the "middle class tax cut" which included two major changes to the federal personal income tax (PIT) regime. Effective 1 January 2016:

- The rate for the second tax bracket was reduced from 22.0 per cent to 20.5 per cent for taxable income of between $45,282 and $90,563 ("middle income"); and
- A new 33.0 per cent top rate was introduced for taxable income over $200,000 ("high income").[1]

Prior to their implementation, various organizations provided estimates of the fiscal impacts of these changes (for example, see Finance Canada (2015), Laurin (2015) and Parliamentary Budget Officer (2016)). These estimates were *ex ante* in nature. That is, they represented the difference between PIT revenue projected under the new tax regime compared to revenue projected without the rate changes.

In addition, estimates of the fiscal impacts assumed behavioural responses that, on balance, increased the projected cost of the PIT changes above their "static" cost. That is, the cost based on the assumption that there is no change to income tax bases due to behavioural responses.

As noted in PBO's 2016 report, increases (or decreases) in marginal PIT rates may induce individuals to change their behaviour by choosing to work less (or more) and/or apply greater (or fewer) tax strategies to lower their reported taxable income. These behavioural responses would alter the size of the tax base and, therefore, projected revenue.

Although initial estimates of the middle class tax cut reflected behavioural responses, they did not explicitly account for the impact of *forestalling*. Because the tax on income greater than $200,000 was announced before the end of the 2015 tax year, some high-income individuals had time to shift some income forward, or forestall, to take advantage of the lower 2015 tax rate.[2] In subsequent years, this advanced income would be *unwound*.

Since the Government's 2015 announcement and implementation of the PIT rate changes, historical tax data have become available. As such, it is now possible to estimate the fiscal impact of these changes by comparing the observed data under the "new" PIT regime to an estimate of what revenue would have been in the absence of these tax rate changes.

The objective of this report is to construct an *ex post* estimate of the fiscal cost of the middle class tax cut in tax years 2015 and 2016. PBO's approach

accounts for the effects of tax forestalling/unwinding and provides estimates based on counterfactual scenarios that employ recent historical data from the Canada Revenue Agency (CRA).

Since the behavioural responses are embedded in the historical data, our approach can also be used to construct estimates of their magnitude, which is summarized by the elasticity of taxable income (ETI). That is, the percentage change in taxable income resulting from a 1 per cent increase in the net-of-tax rate (1 minus the marginal tax rate).

This report begins with the calculation of the static fiscal impacts based on Statistics Canada's Social Policy Simulation Database and Model (SPSD/M). Estimates of the behavioural impacts for the middle- and high-income groups are presented in subsequent sections. The total fiscal impact is calculated in the report's final section.

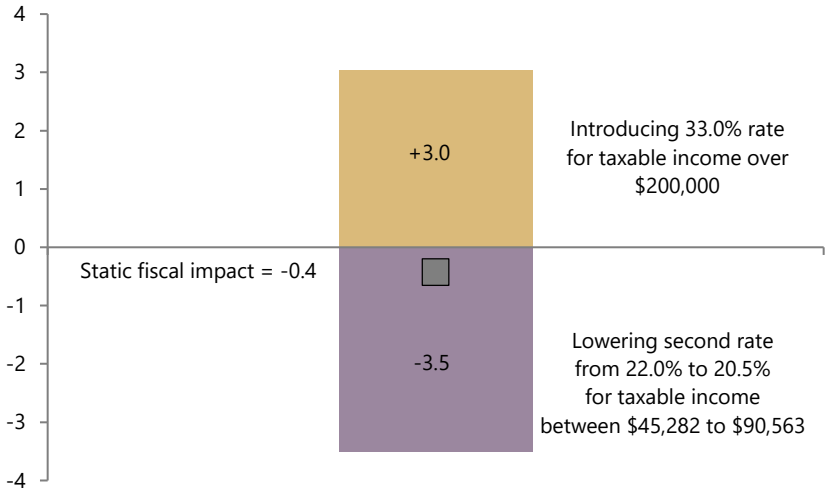
2. Static fiscal impact

We estimate the static, or primary, fiscal impact using Statistics Canada's SPSD/M (version 26.0).[3] This impact represents the fiscal cost based on the assumption that there are no behavioural changes and, therefore, no change in taxable incomes. Figure 2-1 provides a summary of these results.

For the 2016 tax year, we estimate that the static fiscal impact of lowering the second PIT rate from 22.0 per cent to 20.5 per cent amounted to a reduction in federal PIT revenue of $3.5 billion.[4] Roughly 45 per cent ($1.5 billion) of this amount would result in tax savings for individuals with taxable income of between $45,282 and $90,563 in 2016. The remaining $1.9 billion in tax savings would benefit individuals with taxable incomes exceeding $90,563.

Figure 2-1 Middle class tax cut: static fiscal impact, 2016

$ billions



Sources: Statistics Canada and Parliamentary Budget Officer.

For the new tax rate of 33.0 per cent applying to taxable income exceeding $200,000, we estimate the (static) increase in federal PIT revenue at $3.0 billion in 2016.[5] Under the previous regime, individuals with taxable incomes above $200,000 would have faced a top PIT rate of 29.0 per cent.

Thus, the static fiscal cost of lowering the second PIT rate to 20.5 per cent exceeds the additional revenue that would be generated by increasing the top PIT rate to 33.0 per cent (for individuals with incomes exceeding $200,000).

Based on the assumption of no behavioural changes, we estimate this shortfall to be $0.4 billion in 2016, which is almost identical to PBO's initial estimate.

3. Behavioural fiscal impact: middle-income group

As outlined in our 2016 report, there are two types of behavioural responses that individuals make to adjust their taxable income resulting from a change in their marginal PIT rate:

- Real economic behaviour: changes in the marginal tax rate may affect labour supply because of changes in the relative value of consumption and leisure. For example, individuals may increase or decrease their working hours in response to a change in their marginal tax rate.[6]
- Tax planning: individuals may change their tax strategies to minimize tax payments in response to increases in their marginal tax rate. For example, individuals may change their preferred form of remuneration and use other tax avoidance mechanisms more aggressively.[7]

A common way to analyze behavioural impacts associated with tax changes is to compare the actual data for an affected income group to a counterfactual scenario that would show the evolution of taxable income in the absence of the policy change.

However, it has been notoriously difficult to accurately separate behavioural responses from overall changes in economic conditions, other tax changes, and one-off factors such as forestalling.[8] That said, previous studies analyzing behavioural responses for high-income groups suggest comparing them to the closest income group unaffected by the policy change.[9] That is, the "control" group.

This report identifies control groups for middle- and high-income individuals whose *marginal* PIT rates were affected by the middle class tax cut announced in 2015 and implemented in 2016.

Control groups were selected based on their proximity to the affected groups as well as the historical relationship (prior to the tax rate changes) between growth in their taxable income and growth in the affected groups' taxable income. Based on this historical relationship, growth in a control group's taxable income was then used to construct growth in an affected group's taxable income under the counterfactual scenario.

In each case, the counterfactual scenario illustrates what the taxable income of individuals in the affected group would have been in the absence of the tax rate changes.

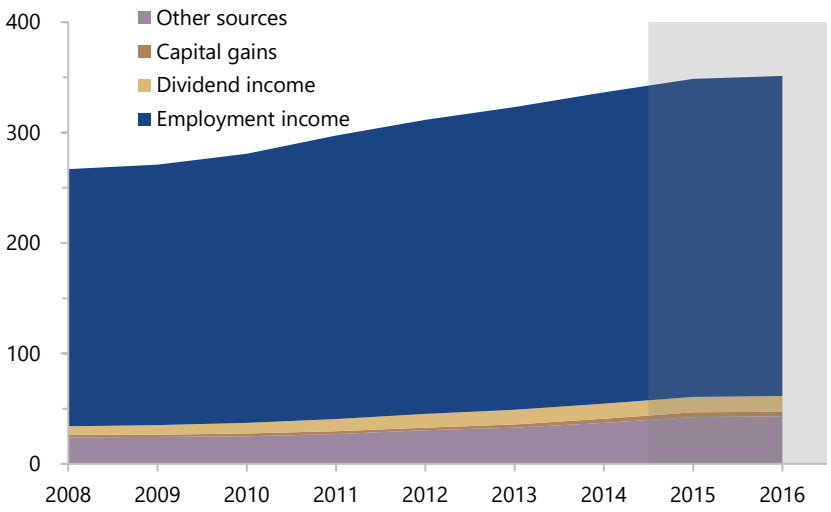
We also provide implicit estimates of the short-run elasticity of taxable income (ETI) which summarizes the behavioural responses that individuals make to adjust their taxable income resulting from a change in their marginal tax rate.

Due to data limitations, the middle-income group used in our analysis is based on individuals with taxable incomes ranging from $50,008 to $86,029.[10] While this falls somewhat short of the $45,282 to $90,563 range to which the change in the second PIT rate applies, we adjusted our estimates to try to account for the narrower range.[11]

In aggregate, and at first glance, it is difficult to discern any significant impact of the middle class tax cut on taxable incomes for the middle-income group. Total taxable income for these individuals increased by 3.6 per cent in 2015 and by 0.8 per cent in 2016 (Figure 3-1). Employment income contributed the most to annual growth followed by income from other sources (1.8 percentage points and 1.6 percentage points, respectively).[12]

Figure 3-1 Total taxable income: middle-income group

$ billions



Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: The middle-income group is defined as individuals with taxable incomes between $50,008 and $86,029.

Finding an appropriate control group for the middle-income group was challenging. Income groups below the $45,282 threshold of the second PIT bracket did not exhibit a close relationship to those with incomes in the second bracket over recent history (prior to 2016).

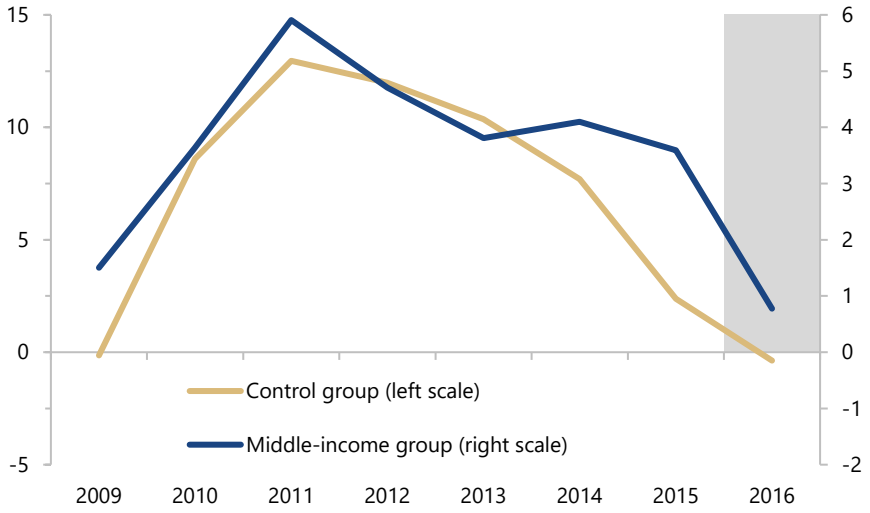
Consequently, we considered income groups closer to the upper bound ($90,563) of the second PIT bracket whose marginal tax rate would not have been impacted by the changes arising from the middle class tax cut.

After analyzing the historical relationships with other groups with comparable levels and composition of taxable income, we selected individuals with taxable incomes of between $112,623 to $136,000 as a control group for our middle-income group.

Figure 3-2 shows that, on balance, the control group and middle-income groups exhibited similar patterns with respect to year-over-year growth in their taxable incomes, prior to implementation of the middle class tax cut in 2016.

Figure 3-2 Growth in taxable income: middle-income group

%, year-over-year



Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: The series are plotted using dual axes to highlight their correlative relationship. The middle-income group is defined as individuals with taxable incomes of between $50,008 and $86,029. The control group is defined as individuals with taxable incomes of between $112,623 and $136,000.

To construct a counterfactual scenario, we use the historical relationship between the two groups to project the level of taxable income that would have been realized by the middle income group in the absence of the change to the second PIT rate in 2016.[13]

Based on our counterfactual scenario, taxable income for the middle-income group increased by $3.3 billion in 2016 as a result of the reduction in the second PIT rate (Figure 3-3). Adjusting for the broader range of incomes in the second PIT bracket (compared to our narrower range) increases this

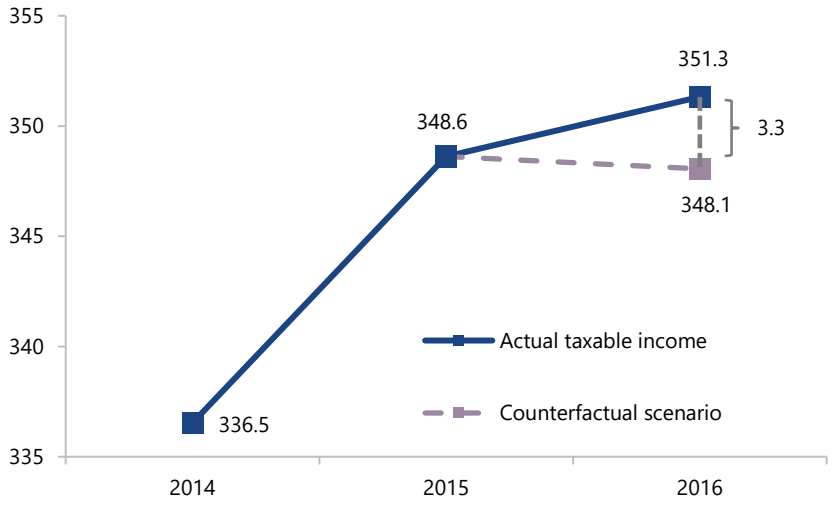
impact to $4.1 billion for individuals with taxable incomes of between $45,282 and $90,563. This result is consistent with a behavioural response by these individuals to increase their labour supply.

To estimate the fiscal impact for individuals in the second income bracket, we multiply the increase in taxable income (of $4.1 billion) by the weighted marginal federal PIT rate for this taxable income group, which we estimate at 19.9 per cent in 2016 (see Appendix A for details). This results in a fiscal impact of $0.8 billion.

Thus, although tax rates for individuals in the second income bracket were reduced, labour supply responses boosted their taxable income, helping to offset some of the cost to the Government. Based on our static fiscal cost of $1.5 billion for individuals in the second bracket, we calculate that approximately half of this cost was offset by their behavioural response.

Figure 3-3 Counterfactual analysis for the middle-income group

$ billions



Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: The middle-income group is defined as individuals with taxable incomes of between $50,008 and $86,029.

Given the behavioural impact on taxable income for individuals in the second PIT bracket, we can calculate a short-run elasticity of taxable income (ETI) for this group. The ETI measures the percentage change in taxable income corresponding to a 1 per cent increase in the net-of-tax rate. In this case, the net-of-tax rate is equal to 1 minus the effective (combined) federal-provincial marginal tax rate. We use SPSD/M to calculate the combined marginal tax rates under the current and previous PIT regimes for individuals in the second PIT bracket.

Our results are consistent with an ETI of 0.47 in 2016 for individuals with taxable incomes between $45,282 and $90,563. This is higher than the ETI for this group (of 0.10) that was assumed in PBO's 2016 report. This suggests that individuals in this group reacted more than we had assumed. The magnitude of our implicit ETI estimate for this group is largely supported by previous studies (see Appendix B).

We also consider an alternative counterfactual scenario for individuals with taxable incomes in the second PIT bracket in which their taxable income grows at the same rate as their control group. This approach follows Laurin (2018) who provides a similar counterfactual analysis of the middle class tax cut for high-income individuals. The results do not change significantly under the alternative counterfactual scenario and would suggest a larger behavioural response and fiscal impact.[14]

4. Behavioural fiscal impact: high-income group

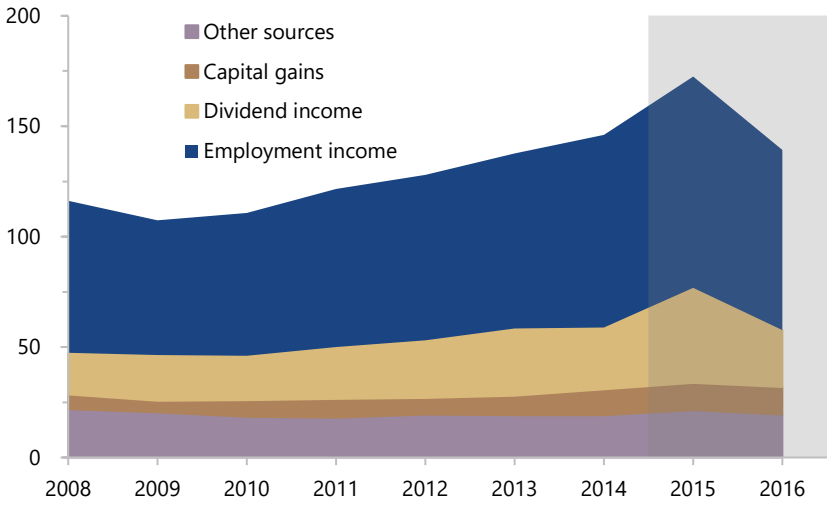
Because the new 33.0 per cent tax rate on incomes greater than $200,000 was announced before the end of the 2015 tax year, some high-income individuals had time to shift some income forward, or forestall, to take advantage of the lower 2015 tax rate of 29.0 per cent.[15]

Consequently, in 2016 and subsequent years, their taxable income would be lower (all else equal) as the forestalled income is "unwound".

Indeed, we observe that individuals with taxable incomes above $197,000 saw an 18.1 per cent (year-over-year) increase in total taxable income in 2015 that was followed by a 19.3 per cent decrease in 2016 (Figure 4-1).[16]

Figure 4-1 Total taxable income: high-income group

$ billions



Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: The high-income group is defined as individuals with taxable incomes over $197,000.

The spike in 2015 was primarily driven by large swings in dividend and employment income. Changes in dividend income contributed the most, adding 10.3 percentage points to growth in taxable income in 2015 and subtracting 9.9 percentage points in 2016. Fluctuations in employment income had a similar, albeit more moderate effect, adding 5.8 percentage

points to taxable income growth in 2015 and subtracting 8.2 percentage points in 2016.

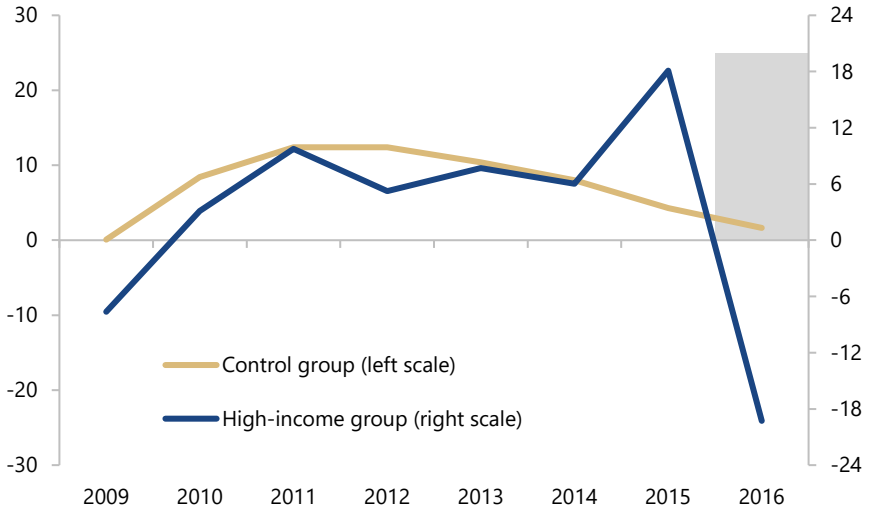
This type of pattern suggests that individuals in the high-income group responded to the announced tax rate increase by shifting some income forward to reduce their taxable income in future years. However, to determine the amount of income that was forestalled and unwound in 2015 and 2016, it is necessary to construct a counterfactual scenario in which the top PIT rate remained at 29.0 per cent.

For our high-income group (individuals with taxable incomes over $197,000), a natural candidate for its control group is the income group immediately preceding it, which in our case includes taxable incomes ranging from $142,001 to $197,000. This control group exhibits similar patterns with respect to the evolution of taxable income growth and its composition.

Prior to the announcement of the change in the top PIT rate in 2015 and its implementation in 2016, both groups exhibited a similar pattern in terms of year-over-year growth in taxable income (Figure 4-2). However, unlike the high-income group, the control group did not see a spike in their taxable income in 2015 and subsequent sharp decline in 2016.

Figure 4-2 Growth in taxable income: high-income group

%, year-over-year



Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: The series are plotted using dual axes to highlight their correlative relationship. The high-income group is defined as individuals with taxable incomes over $197,000. The control group is defined as individuals with taxable incomes of between $142,001 and $197,000.

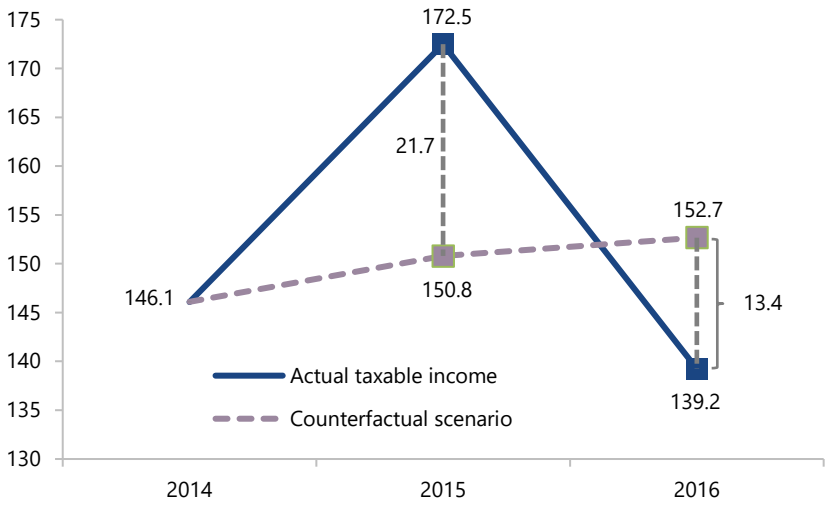
As before, we use the historical relationship between the two groups to project the level of taxable income that would have been realized by the high-income group in the absence of the announcement of the change to the top PIT rate in 2015 and its implementation in 2016.[17]

Based on our counterfactual scenario, we estimate that the announcement of the increase in the top PIT rate brought forward $21.7 billion of taxable income from future years (Figure 4-3).

To determine the amount of taxable income that was unwound in 2016, we followed the approach used by HMRC (2012) and Laurin (2018) and initially assumed that two-thirds of the income brought forward in 2015 was advanced from 2016.

Figure 4-3 Counterfactual analysis for the high-income group

$ billions



Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: The high-income group is defined as individuals with taxable incomes over $197,000.

For 2016, we estimate that taxable income was $13.4 billion lower compared to a scenario in which the top PIT rate was unchanged from 29.0 per cent. This decrease, however, is less than our initial assumption of the taxable income that was unwound in that year (that is, $14.5 billion).

It is unlikely that behavioural responses by individuals in the high-income group would have increased their labour supply in 2016, offsetting some of the reduction in their taxable income. Consequently, we assume that the entire $13.4-billion decrease is attributable to unwinding some of the taxable income that was brought forward in 2015. This would be consistent with an unwinding assumption of 61.9 per cent.

Based on our counterfactual scenario and what appears to be a reasonable unwinding assumption, our baseline result suggests that individuals in the high-income group did not reduce their labour supply in response to the new 33.0 per cent top PIT rate.

We estimate that forestalling by individuals in the high-income group increased federal PIT revenues by $5.6 billion in 2015. The unwinding of some of the forestalled income reduced revenues by $4.0 billion in 2016. These impacts were calculated by applying weighted marginal federal tax rates for individuals with taxable incomes over $200,000 (see Appendix A) to the amounts of taxable income corresponding to forestalling and unwinding effects.[18]

After adjusting for forestalling and unwinding, our baseline results for the high-income group are consistent with a short-run elasticity of taxable income equal to 0. This stands in contrast to the ETI (of 0.38) for this group that was assumed in PBO's 2016 report, which did not account for forestalling/unwinding, as well as estimates in previous studies (see Appendix B).

Aside from HMRC (2012) and Laurin (2018), and as noted in PBO's 2016 report, many earlier studies did not control for forestalling/unwinding effects in their assessment of past tax rate changes in Canada and other jurisdictions.

Similar to our analysis for the middle-income group, we consider an alternative counterfactual scenario in which the high-income group's taxable income grows at the same rate as its control group in 2015 and 2016 (following Laurin (2018)).

Under this alternative scenario, taxable income for the high-income group would increase by $20.2 billion in 2015 and decrease by $15.6 billion in 2016 ($13.4 billion from unwinding and $2.2 billion from labour supply responses). The corresponding fiscal impacts would be an increase of $5.2 billion in federal PIT revenue in 2015 and a decrease of $4.7 billion in revenues in 2016 ($4.0 billion from unwinding and $0.7 billion from labour supply responses). Based on an unwinding assumption of two-thirds, the implicit ETI would be 0.17 under this alternative scenario.

Based on an unwinding assumption of 50 per cent (the lower bound considered in Laurin (2018)), the implicit ETI would be 0.20 under our baseline counterfactual and 0.42 under our alternative counterfactual scenario.

That said, all of these implicit ETI estimates would fall near the lower bound of the range of estimates in previous studies.[19]

5. Total fiscal impact

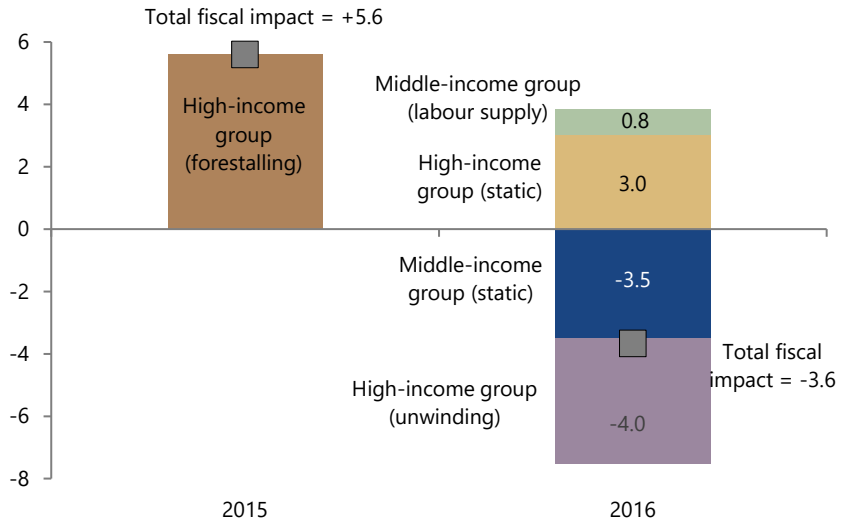
In this section we merge the static and behavioural fiscal impacts to provide an estimate of the total fiscal impact of the middle class tax cuts for the tax years 2015 and 2016.

For the tax year 2015, we estimate the total fiscal impact at $5.6 billion. That is, federal PIT revenues were $5.6 billion higher compared to a scenario without the announced increase in the top rate. This is due to high-income individuals bringing forward income that would have been taxed in future years at a higher PIT rate (Figure 5-1).

For the tax year 2016, we estimate the total fiscal impact at -$3.6 billion.[20] In other words, federal PIT revenues were $3.6 billion lower than they would have been had the changes in tax rates not occurred. This estimate consists of a static (no behavioural) fiscal impact of -$0.4 billion and a behavioural fiscal impact of -$3.2 billion.

Figure 5-1 Middle class tax cut: total fiscal impact

$ billions



Sources: Statistics Canada, Canada Revenue Agency and Parliamentary Budget Officer.

Under the assumption of no behavioural changes, the revenue loss to the Government from reducing the second PIT rate to 20.5 per cent ($3.5 billion) exceeds the revenue gain from introducing the new top rate of 33.0 per cent ($3.0 billion).

The behavioural fiscal impact in 2016 reflects the unwinding of some taxable income brought forward in 2015 by high-income individuals (-$4.0 billion) that is partially offset by higher revenues from middle-income individuals consistent with an increase in their labour supply ($0.8 billion).

PBO's initial estimate did not account for forestalling and unwinding. As such, it would not have included $5.6 billion in additional federal PIT revenue in 2015 due to high-income individuals bringing forward income from future tax years.

PBO's initial estimate of the total fiscal impact in 2016, which included behavioural responses, was a revenue loss of $1.6 billion. However, this estimate likely understated the loss in PIT revenue by omitting the impact of unwinding by high-income individuals.

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Appendix A: Federal marginal tax rates

To calculate behavioural fiscal impacts, for a given income group, we apply our estimates of the incremental change in their taxable incomes to their corresponding weighted federal marginal PIT rate.

Given that different sources of income are taxed at different rates, for each income group, we weight their marginal rates by income source based on the composition of their taxable income observed in 2015. That is, the weights represent the respective shares of taxable income for a given income group.

Middle income, taxable income of $45,282 to $90,563

Composition of taxable income	**Employment**	**Dividends***	**Capital gains**	**Other sources**
2015	82.6%	4.0%	1.2%	12.2%
Marginal tax rates	**Employment income**	**Dividends****	**Capital gains**	**Other sources*****
2015	22.0%	11.3%	11.0%	22.0%
2016	20.5%	9.6%	10.3%	20.5%
Weighted marginal tax rate				
2015	21.4%			
2016	19.9%			

High income, taxable income over $200,000

Composition of taxable income	**Employment**	**Dividends***	**Capital gains**	**Other sources**
2015	55.5%	25.0%	7.2%	12.4%
Marginal tax rates	**Employment**	**Dividends****	**Capital gains**	**Other sources*****
2015	29.0%	20.3%	14.5%	29.0%
2016	33.0%	25.6%	16.5%	33.0%
Weighted marginal tax rate				
2015	25.8%			
2016	30.0%			

Sources: Canada Revenue Agency and Parliamentary Budget Officer.

Note: * Dividend income includes eligible dividends and other than eligible dividends.
** The marginal tax rate for dividend income is calculated as the average of the post gross-up/credit tax rates on eligible dividends and other than eligible dividends.
*** We assume that all other sources of income are taxed at the same rate as employment income.

Appendix B: Elasticity of taxable income

The elasticity of taxable income (ETI) represents the percentage change in taxable income with respect to a one per cent increase in the net-of-tax rate (1 minus the marginal tax rate).

Estimating ETIs accurately is difficult. There are several methodological issues that may bias the results. Finance Canada (2010) has identified four such challenges:

- Changes over time in income inequality occurring at the same time as the PIT change, but resulting from non-tax factors,
- Changes in income due to transitory shifts,
- Income tax base shifting, and
- Changes in external factors (exogenous shocks affecting labour demand, investment income or institutional changes meant to increase tax compliance).

Milligan (2015) also notes that anti-tax avoidance measures in Canada have changed over time.

Moreover, ETI estimates are highly sensitive to the data and econometric method employed. While some studies have used individual-level data, others have looked at age or income groups (the high-income group being by far the most analyzed). Additional differences arise due to period or geography (federal vs. provincial level).

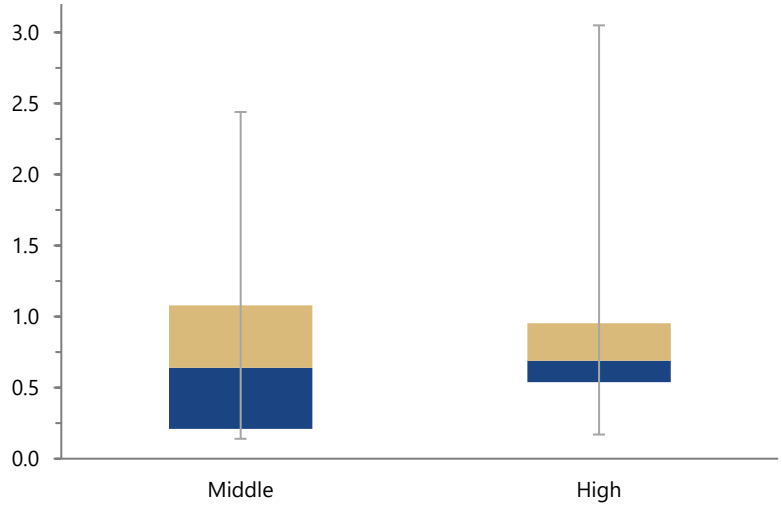
Finally, model specification plays an important role as different control variables significantly affect the estimated values of ETI. Figure B-1 summarizes the main findings of nine studies that analyzed the behaviour of Canadian taxpayers and that either estimated the ETI or assumed a certain value for it. Instead of focusing on preferred or mid-point estimates, the figure incorporates all statistically significant estimates of ETI to illustrate how much results can differ.

For both groups, the median values are relatively close: 0.6 for the middle-income group and 0.7 for the high-income group. This is slightly above the median value for advanced economies. The whiskers for the high-income group are much longer showing greater variability in estimates. The data are also rather skewed.

Further, given that the middle quartile boxes for high-income estimates are relatively narrow, there seems to be a greater consensus among studies about the values of the ETI for the high-income group. While the middle

quartile boxes on the left are somewhat evenly sized, estimated ETIs for the high-income group tend to be closer to 0.7-0.9 range.

Figure B-1 Previous estimates of ETIs by income group



Sources: Gagné et al (2000), Department of Finance Canada (2010), Laurin (2018, 2015), Sillamaa and Veall (2001), Saez and Veall (2005), PBO (2016, 2015), Milligan and Smart (2015).

Note: The coloured boxes represent the second and third quartile ranges. Department of Finance Canada (2010) provides a median value of 0.4 for advanced economies (based on either midpoints of preferred values of the studies reviewed).

Notes

1. Prior to the introduction of the 33.0 per cent top PIT rate on taxable income over $200,000, a top rate of 29.0 per cent applied to taxable income over $140,388.
2. See Box 3-1 in PBO (2016).
3. To ensure consistency with our estimates of the fiscal impacts associated with behavioural responses, we scaled our SPSD/M results to account for the difference between the taxable income base in SPSD/M in 2016 and the "counterfactual" taxable income base we constructed based on the previous PIT regime.
4. Our updated estimate of the static fiscal impact for the reduction in the second PIT bracket (-$3.5 billion) is in line with PBO's previous estimate of -$3.6 billion, on a tax year basis.
5. Our updated estimate of the static fiscal impact for the introduction of the 33.0 per cent top PIT bracket ($3.0 billion) is broadly in line with PBO's previous estimate of $3.2 billion, on a tax year basis.
6. See Finance Canada (2010).
7. See Finance Canada (2010).
8. HMRC (2012) identifies four main challenges faced in the literature: diverging income trends, sample selection, volatile income growth and forestalling and timing effects. See the same source for more details.
9. See Laurin (2018) and HMRC (2012). This is based on the difference-in-difference technique used in social sciences (especially in impact evaluation literature) studying the differential effects of an intervention on a treated group against a control group.
10. PBO requested aggregated PIT data by taxable income groups from CRA. The groupings, however, did not correspond to the exact PIT thresholds.
11. Specifically, we scaled our estimated behavioural income impacts by a factor of 1.257 for the middle-income group. This is equivalent to the ratio of the actual range of taxable incomes in the second PIT bracket ($90,563 minus $45,282) to the range of taxable incomes in the group we considered ($86,029 minus $50,008).
12. Income from other sources includes: business income, professional income, commission income, rental income, RRSP income, income from other pensions and superannuation, interest and other investment income.
13. Under the counterfactual scenario, growth in taxable income in 2016 for the middle-income group (of -0.16 per cent) was projected using the observed growth in the control group's taxable income in 2016 (of -0.37 per cent), multiplied by the average ratio (0.43) of growth in taxable income for the middle-income group to growth in the control group's taxable income, observed over 2010-2014.

14. Under the alternative approach, taxable income for the second PIT bracket would increase by $5.0 billion; the fiscal impact would be a $1.0 billion increase in federal PIT revenue; and the implicit ETI for this group would be 0.58.

15. Forestalling would likely be more prevalent among owners of Canadian-controlled private corporations (CCPCs) since they can choose the amount of dividends to disburse, which would then be subject to PIT. For example, see Laurin (2018). High-income individuals would also have some incentive to realise capital gains earlier in 2015.

    As Laurin (2018) cautions, the use of national-level data also captures the contemporaneous increase in Alberta's top PIT rate. That said, similar to Laurin (2018), we do not disentangle Alberta-specific factors from our analysis and of the high-income group.

16. Due to the limitations of the data we requested from CRA, we do not have the exact $200,000 taxable income threshold for which the new top PIT rate applies. The closest threshold in our dataset is $197,001 and over. Given the immediate proximity of our threshold to the actual PIT structure, we do not adjust our results for this income group as we did for the middle-income group.

17. Under the counterfactual scenario, growth in taxable income in 2015 and 2016 for the high-income group (of 3.24 per cent and 1.25 per cent, respectively) was projected using the observed growth in the control group's taxable income in 2015 and 2016 (of 4.30 per cent and 1.66 per cent, respectively), multiplied by the ratio (0.75) of growth in taxable income for the high-income group to growth in the control group's taxable income that was observed in 2014. Given the fluctuations in this ratio over 2010 to 2014, we judged that maintaining the relationship observed in the most recent period was appropriate for projecting over 2015 and 2016.

18. Based on an unwinding assumption of 50 per cent (the lower bound considered in Laurin (2018)), responses related to labour supply would amount to a reduction in taxable income of $2.6 billion. This would correspond to a federal fiscal impact of -$0.8 billion (and -$3.3 billion due to unwinding) in 2016.

19. The study by Laurin (2018) does explicitly account for forestalling and unwinding in its estimation of the ETI following the increase in the top federal PIT rate in 2016. However, the estimates are based on a control group that includes a portion of high-income income individuals impacted by the PIT rate change (those with total *reported* incomes between $200,000 and $249,000). Further, the counterfactual scenario for the high-income group does not account for the historical relationship (prior to the policy announcement and change) between the high-income group and its control group.

20. Under the alternative counterfactual scenario, the total fiscal impact would be $5.2 billion in 2015 and -$4.1 billion in 2016.