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The Revenue Effects of Rescinding Ontario's Tax Rate Hike on High-income Earners

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Executive Summary

Governments increasingly call upon high-income earners to pay their "fair share" of taxes, which is often a justification and a prelude to raising the income-tax rates faced by high-income earners. The ostensible motive for increasing these marginal tax rates is to generate greater revenues for the government. A case in point is provided by the Ontario government, which introduced a "temporary" tax rate hike that took effect starting July 1, 2012 and was fully phased in by 2013. The change in the tax rate effectively increased the top marginal personal tax rate from 17.41% to 20.53%. Combined with the federal government's top marginal personal income-tax rate of 33%, Ontario's high-income earners currently face a combined (federal plus provincial) personal income-tax rate of 53.53%.

Assuming that higher personal tax rates do not change the economic behaviour of those affected by the higher rates, the goal of generating more tax revenue is likely to be achieved. Equivalently, if the available tax base does not change and higher rates are applied to the base, tax revenues will increase. However, it is unrealistic to assume that higher-income taxpayers will not change their economic behaviour in the face of higher marginal tax rates. Besides stimulating efforts to find legal ways to shelter income from taxes, higher tax rates reduce incentives to work and increase incentives to consume more leisure time. As a consequence, the total income available for government to tax might well decline.

Higher marginal tax rates also discourage educated and skilled professionals from accepting higher paying jobs that involve more job-market risk, more responsibility and associated stress, or both, since the after-tax reward for leaving relatively secure and comfortable employment is reduced. A consequence is that the government's tax base will grow more slowly than it otherwise would with lower tax rates. Furthermore, if similar employment opportunities are available in other locations with lower tax rates, relatively educated and skilled professional workers may leave the jurisdiction with the higher tax rate to accept jobs elsewhere, further reducing the latter jurisdiction's tax base.

In short, efforts by governments to increase tax revenues by raising marginal tax rates on higher income earners are likely to be thwarted by behavioural responses that shrink the taxing jurisdiction's tax base. If the tax base shrinks sufficiently, the overall effect

of applying higher marginal tax rates might be a reduction in overall tax revenue collected. In this regard, given the various direct and indirect effects of higher marginal tax rates, including discouraging productive work and risk-taking as well as investments in improving educational and skill levels, it can be argued that making high-income earners pay their "fair share" of taxes by increasing their tax rates will leave the government with less rather than more tax revenue.

This study estimates the impact of rescinding the Ontario government's increase in the marginal tax rate on high-income earners. Specifically, it estimates the likely impact of rescinding the increase on Ontario's future tax base and the resulting tax revenue taken in by the government. In doing so, it takes into account the likely behavioural responses of higher-income taxpayers using historical data and simulation exercises. The study finds that there is likely to be a very modest direct decrease in future personal income-tax revenues collected by the government. However, the estimated direct decline in tax revenues is substantially smaller than the estimated loss that ignores the positive behavioural responses to a lower marginal tax rate, since those responses will increase the overall income tax base.

In addition, a lower marginal tax rate on high-income earners would make Ontario a more attractive location for businesses and highly educated workers. The likely resulting increase in corporate investment and employment is not incorporated into the study's estimate of future provincial tax revenues. Indeed, a conclusion that the Ontario government's future tax revenues would actually be increased by rescinding its recent tax increase is entirely plausible.

1. Introduction

In an attempt to generate more tax revenue, Ontario's provincial government introduced a new "deficit-fighting high-income tax bracket". The tax rate hike on high-income earners took effect starting July 1, 2012, but it was fully phased in by the beginning of 2013. Initially, this new high tax rate was applicable to residents of Ontario with taxable income above $500,000. Currently, the increase of two percentage points in the tax rate applies to Ontarians with taxable income in excess of $220,000. If one also considers the 56% surtax that the government imposes, the change in the tax rate was effectively equivalent to an increase of 3.1 percentage points. This raises the provincial top marginal personal income-tax rate from 17.41% to 20.53%. With the federal top marginal personal income-tax rate of 33%, Ontario's high-income earners currently face a combined personal income-tax (PIT) rate of 53.53%—the second highest in the country. Although the tax increase was initially adopted as a "temporary" measure to combat the province's budget deficit, the high tax rate is still in effect. While imposing a higher tax rate on the "rich" is often a popular choice in the face of fiscal challenges, a number of previous studies indicate that such a policy comes with a large efficiency cost to the economy. Consequently, many commentators and analysts voiced their concerns that Ontario is losing its tax competitiveness and call for rescinding the "temporary" hike in the income tax rate to stimulate economic activities in the province (Laurin, 2012; Lammam, MacIntyre, Ren, Eisen, and Palacios, 2016; Murphy, Palacios, and Fuss, 2019). What are the revenue effects of rescinding Ontario's increase in the personal income-tax rate for high-income earners? What are the long-term revenue implications of PIT rate cuts?

The experiences of Ontario and other jurisdictions suggest that when governments face fiscal challenges, they tend to raise the income-tax rate on high-income taxpayers. However, a number of previous empirical studies show that higher income-tax rates have adverse impacts on economic activities and cause a higher efficiency cost. A higher income-tax rate discourages individuals' incentives to save, invest, and work. Further, increases in the income-tax rate encourage tax avoidance. For instance, high-income taxpayers may engage in aggressive tax planning strategies to minimize their tax liabilities. Thus, the behavioural responses of taxpayers to tax rate hikes reduce taxable income, and the tax hikes often generate less revenue than governments expect. Similarly, the loss of revenue associated with tax rate cuts is generally lower than governments anticipate as a result of taxpayers' positive behavioural responses. Thus, empirical investigation of taxpayers' behavioural responses is crucial to informed public-policy discussions.

One way to measure the behavioural responses of taxpayers is by estimating the sensitivity of taxable income to changes in the tax rate. In the literature, this is known as "taxable income semi-elasticity" and it measures the percentage change in taxable income associated with a one-percentage-point change in the income tax rate.[1] Consequently, the tax base semi-elasticity estimate is a crucial parameter for analyzing the economic cost of taxes as well as the revenue effects of any change in tax policy.

Many of the earlier individual-level empirical studies focus on estimating the responsiveness of taxable income to changes in the net-of-tax rate (one minus the tax rate). While previous US-based studies such as Lindsey (1987) and Feldstein (1995) obtain estimates of taxable income elasticity in excess of one, Goolsbee (1999, 2000), Gruber and Saez (2002), and Giertz (2007) find very low estimates. Saez, Slemrod, and Giertz (2012) provide a survey of these earlier studies. Similar studies such as Sillamaa and Veall (2001), Milligan and Smart (2015, 2019) employ Canadian data to estimate taxable income elasticity. Sillamaa and Veall (2001) use Canadian individual-level data to estimate taxable income elasticity. They find an overall estimate of taxable income elasticity of 0.25 for the whole sample. However, when they classify the sample into various groups, they find taxable income elasticity in excess of one for high-income individuals, suggesting a significant behavioural response from this group of taxpayers. Milligan and Smart (2019) also employ Canadian individual-level data to investigate the sensitivity of top 1% income earners to changes in the provincial income-tax rate. They find that high-income earners show a very large behavioural response to changes in the provincial income-tax rate. Their results also indicate that high-income earners exhibit a higher behavioural responses to tax rate changes than low-income earners. Veall (2012) also investigates the evolution of top income shares and the tax rate responsiveness of high-income earners in Canada. He concludes that, as a result of the high tax rate sensitivity of high-income earners, governments are likely to raise very limited tax revenue—they may even lose revenue—by raising the top income-tax rate.

Another strand of the empirical literature focuses on investigating the direct response of taxable income to tax rate changes by estimating the tax base semi-elasticity (that is, the sensitivity of taxable income to tax rate changes). Canadian aggregate-level data-based

1. An alternative way of measuring taxpayers' behavioural responses is by estimating taxable income elasticity with respect to the net-of-tax rate (one minus the tax rate). Taxable income elasticity measures the response of taxable income to changes in the net-of-tax rate (rather than the tax rate). As there is a simple mathematical relationship between taxable income semi-elasticity and taxable income elasticity, the choice between the two is not that important. However, we believe that a direct estimation of taxable income semi-elasticity provides a better and more easily traceable relationship between the change in the PIT rate and its effects on taxable income and tax revenue.

studies such as Dahlby and Ferede (2012, 2018), Ferede (2019), and US-based studies such as Haughwout (2004) fall in this category. Dahlby and Ferede (2012) provide both short-term and long-term estimates of taxable income semi-elasticity estimates to measure the economic costs of the Canadian provincial personal income-tax system. The authors focus on the estimation of taxable income semi-elasticity that is common to all ten Canadian provinces. However, one would expect that taxpayers' behavioural responses vary across provinces because of province-specific characteristics that change over time. Recognizing this, Dahlby and Ferede (2018) study the long-term response of taxable income to changes in the provincial top PIT rate for each Canadian province separately. A recent study by Ferede (2019) also employs an empirical methodology very close to this paper to estimate the response of taxable income to Canadian federal income-tax rate changes. Ferede (2019) uses estimates of the federal tax base semi-elasticity with respect to the top PIT rate to investigate the revenue effects of federal PIT rate increases on the government's tax revenue.

While there exist estimates of the taxable income semi-elasticity for Canadian provinces as a whole (Dahlby and Ferede, 2012) and province-specific long-term estimates (Dahlby and Ferede, 2018), these estimates are not suitable for a realistic assessment of the short-term or year-to-year revenue effects of rescinding Ontario's increase in the PIT rate on high-income earners. This is because their results apply for the very long run when the economies are assumed to achieved steady-state equilibrium. Consequently, this study seeks to provide an empirical estimate of the short-term response of Ontario's taxable income to changes in the province's top PIT rate. To the best of our knowledge, this study is the first to provide a short-term taxable-income semi-elasticity estimate for Ontario. We then use the empirical estimates of the response of Ontario's taxable income to tax rate changes to investigate the effects upon income tax revenue of eliminating the "temporary" tax rate hike on high-income earners.

The econometric analysis of this paper finds a total taxable income responsiveness with respect to the top income-tax rate of about −0.62. This implies that a reduction of one percentage point in Ontario's top marginal PIT rate is associated with an increase in its total taxable income by about 0.62%. This tax base semi-elasticity estimate also corresponds to taxable income elasticity with respect to the net-of-tax-rate of about 0.51. Our result is well within the range of estimates obtained in previous studies. In particular, our taxable income semi-elasticity estimate is lower than those of Milligan and Smart (2019), but well within the range of those of Sillamaa and Veall (2001). This estimate of taxable income semi-elasticity is also very close to those of Dahlby and Ferede (2012),

which provide an estimate for the ten Canadian provincial governments. However, our estimate is higher than the short-run taxable income semi-elasticity estimate that Ferede (2019) obtains for the Canadian federal top PIT rate. This is generally expected since personal income-tax avoidance is relatively higher at the provincial level. While people can minimize their income tax liability by moving from a high-tax province to a low-tax province, this is not possible under the federal personal income-tax system.

This study also uses the empirical estimate of Ontario's tax base semi-elasticity to assess the tax revenue effects of rescinding the provincial income-tax rate hike on high-income earners. We simulate the total revenue effects of reducing the province's top marginal PIT rate from the current rate of 20.53% to 17.41% (including all applicable surtaxes). The simulation analysis suggests that a cut of 3.1 percentage points in the PIT rate would cause the province to collect about $26 million less in revenue in the first year. The revenue loss grows marginally over time as the tax base grows. It should be emphasized that this modest revenue loss is possibly the result of positive behavioural responses on the part of taxpayers, which expands Ontario's tax base. An important policy implication of the result of this paper is that the provincial government needs to take into account the strong behavioural responses of taxpayers when it contemplates any change in the personal income-tax rate on high-income earners. If the provincial government rescinds its tax rate increase, the province's tax competitiveness will increase considerably, and this encourages more economic activities. Such changes will ultimately help the province improve its overall fiscal position although revenue from the PIT shows a modest decrease. This casts doubt on the relevance of maintaining the "temporary" hike in the tax rate on high-income earners as a policy tool to reduce the province's budget deficit.

The remainder of this paper is organized as follows. In section 2, we present and discuss the empirical results. Based on the estimated results, in section 3, we conduct a simulation analysis of the effects on personal income-tax revenue of rescinding Ontario's increase in the tax rate on high-income taxpayers. Section 4 concludes.

2. Empirical Results and Discussions

2.1 Specification and data

We are interested in investigating the behavioural responses of Ontario's taxpayers to changes in the province's top personal income-tax (PIT) rate. That is, we are seeking to assess how Ontario's taxable income changes in response to cuts in its top PIT rate. Thus, in our specification, the dependent variable is the province's total taxable income and the key explanatory variable is Ontario's provincial marginal personal income-tax rate that is applicable to the top income-tax bracket. Our analysis is based on time-series data from 1976 to 2017. The choice of the sample period is dictated by the availability of data for our key variables of interest. The empirical specification is similar to those of previous studies such as Dahlby and Ferede (2012, 2018), Milligan and Smart (2019), and Ferede (2019). We use the following simple empirical specification:

$$\Delta\, ln\, B_t = \theta + \mu \Delta \tau_t^h + X_t + u_t \tag{1}$$

In **Equation 1**, Δ denotes change, $ln\, B_t$ is the log of total taxable personal income in year t for the provincial government. Thus, the dependent variable is the growth rate of total taxable income. Further, τ_t^h is the province's personal income-tax rate in year t that is relevant for the highest income-tax bracket. That is, we use the provincial statutory top marginal personal income-tax rate (including all applicable surtaxes). We deflate the taxable income with Ontario's GDP deflator (2012 = 100) to account for the effects of inflation and express it as per capita to account for population growth. Consequently, the dependent variable is the log of real per-capita total taxable income.[2] In **Equation 1**, X denotes a vector of control variables that can affect the PIT base and u_t is the error term. Our key coefficient of interest is μ, which denotes the *taxable income semi-elasticity* with respect to the top personal income-tax rate. That is, μ shows the change in Ontario's total taxable income due to a one-percentage-point change in its top personal income tax rate. A lower PIT rate encourages more economic activities and minimizes tax avoidance and evasion. That is, a reduction in the PIT rate causes positive behavioural responses from taxpayers and this expands taxable income. Consequently, we expect μ to be negative. We believe this specification provides a more straightforward way to evaluate the effects of changes in the top tax rate on the tax base and tax revenue than alternative specifications

2. Ideally, we would like to use taxable income data associated with the top personal income-tax bracket, but such a dataset is not available.

used in previous individual-level based studies. Note also that since **Equation 1** is specified in first difference form, it addresses the potential problem of nonstationarity that is common in time-series based empirical studies such as ours.[3] Further, the specification in the first difference form provides a short-term taxable-income semi-elasticity estimate—a crucial parameter that was missing from similar previous studies.

There are many factors that can affect a province's total taxable income. Arguably, one of these important factors is the state of the provincial economy. Taxable income normally can fluctuate with the economy. For instance, during economic downturns the taxable income may shrink as some taxpayers lose their jobs and capital gain declines. To account for such possible effects of the business cycle, we include the provincial unemployment rate as an explanatory variable. We expect higher provincial unemployment to affect the province's taxable income adversely.

In the Canadian personal income-tax system, both the federal and provincial governments use a similar definition of taxable income. Since the two levels of government occupy the same personal income-tax base, any change in the federal personal income-tax system can affect Ontario's taxable income. Thus, we control for this vertical fiscal externality by including the federal government's top marginal personal income-tax rate as an additional explanatory variable. A higher federal personal income-tax rate discourages economic activities and taxpayers' behavioural responses result in a reduction in the taxable income. Thus, we expect the coefficient of the federal personal income-tax rate to be negative.

In a federation such as Canada, labour is mobile across provinces and this has important implications for the provincial personal income-tax system. Generally, labour may move from a high-tax jurisdiction to a low-tax jurisdiction. In this case, a province's taxable income (and tax revenue) may be influenced by the tax policy of its neighbouring provinces. Consequently, we include the weighted-average (weighted by population) PIT rate of Ontario's neighbours (Quebec and Manitoba) to account for the possible horizontal tax competition. A higher PIT rate in the province's neighbours may encourage some taxpayers to move to Ontario and expand its taxable income. Thus, we expect the coefficient of neighbours' PIT rate to be positive.

In the absence of any change in the tax rate, governments often attempt to collect more tax revenue by adjusting the threshold income for the top income-tax bracket. For

3. A variable is considered "nonstationary" if its mean and variance are not stable across time.

instance, the Ontario provincial government lowered the threshold income for the top income-tax bracket from $509, 000 in 2013 to $220, 000 in 2014. One may expect such changes in the threshold income to influence the province's taxable income. We attempt to capture this by including the real threshold income for the highest income-tax bracket as an additional control variable.

Arguably, one of the most important reforms of personal income tax in the country's history occurred in 1988. In that year, the federal government expanded the personal income-tax base and significantly slashed the number of income-tax brackets and tax rates. At that time, provincial governments used to set their tax rates as a fraction of the federal income rates. Consequently, the 1988 tax reform expanded taxable income for both the federal and provincial governments. For instance, Ontario's taxable income increased by about 41% in 1988. Thus, we include a dummy variable to capture the effects of the 1988 tax reform.

Our empirical analysis uses an aggregate of Ontario's time-series data from 1976 to 2017. The marginal top personal income-tax rates and applicable surtaxes come from Canada Revenue Agency. The taxable income dataset is obtained from various issues of *Canadian Income Tax Rates for Individuals* from Canada Revenue Agency's (2020). Data on the GDP Deflator, population, and unemployment rate come from Statistics Canada's database, CANSIM (Statistics Canada, no date). The corporate tax rate is obtained from various issues of *Finances of the Nation* (formerly, *The National Finances*) published by the Canadian Tax Foundation. **Table 1** provides summary statistics for our key variables of interest.

Table 1: Summary statistics, 1976–2017

Variable	Mean	Standard deviation	Minimum	Maximum
Growth rate of PIT base	0.0209	0.0672	−0.0455	0.4100
Change in the top PIT rate	0.0015	0.0123	−0.0346	0.0459
Change in the unemployment rate	−0.0024	1.0783	−1.4000	3.3000
Change in Neighbours' PIT rate	−0.0002	0.0116	−0.0430	0.0416
Change in the federal PIT rate	−0.0034	0.0182	−0.0900	0.0400
Change in CIT rate	−0.0001	0.0064	−0.0250	0.0150
Change in Canadian terms of trade	0.0147	3.0724	−9.3217	4.9579

Source: Author's computation based on the datasets obtained from Statistics Canad and the Canada Revenue Agency, as described in the text.

Table 1 shows that our key variables of taxable income and top PIT rate exhibit variations during the sample period. The growth rate of taxable income shows significant variations over the sample period. The highest growth rate of Ontario's taxable income occurred in 1988 as a result of the federal tax reform introduced in that year. In 1988, taxable income grew by about 41%. Ontario's top marginal personal income-tax rate also shows variations over the period under consideration.

2.2 Empirical results and discussion

We present our main empirical estimates in **table 2.** In all the results, the dependent variable is the growth rate of PIT base as given by the first difference of the log of real per-capita total taxable income. As our analysis relies on long time-series data, one may be concerned with the potential problem of autocorrelation. Consequently, we use standard errors that are robust to heteroscedasticity and autocorrelation. The key variable of interest is the coefficient of the PIT rate, which is the taxable income semi-elasticity. Thus, the coefficient of the PIT rate measures the sensitivity of total taxable income to the PIT rate changes. In addition, to facilitate the comparison of our results with those of previous studies that use the net-of-tax rate rather than the PIT rate, we provide the equivalent taxable income elasticity with respect to the net-of-tax rate at the bottom of table 2.

In column (1), we provide a simple Ordinary Least Square (OLS) estimate of taxable income on the PIT rate. We also control for the relevant federal top PIT rate and the provincial unemployment rate. As indicated before, the former captures vertical fiscal externality and the latter is included to capture potential effects of the business cycle on taxable income. Our key variable of interest, the coefficient of the top PIT rate, is negative and statistically significant as expected. The result suggests that a one-percentage-point cut in Ontario's top PIT rate is associated with an increase of the provincial total taxable income by about 0.44%. Regarding the other control variables, the results indicate that the federal top PIT rate has statistically significant adverse effects on Ontario's total taxable income. This is expected as both the provincial and the federal governments occupy the same PIT base. The coefficient of the unemployment rate is also negative and statistically significant implying that economic downturns reduce the province's total taxable income.

In a federal country such as Canada, labour is mobile across provinces. Thus, one would expect the income-tax policy of Ontario's neighbours to influence the province's PIT base. To capture such potential effects of horizontal tax competition, in column 2, we include the weighted average (weighted by population) PIT rate of Ontario's

Table 2: The response of taxable income to PIT rate, 1976-2017

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	IV	IV	IV	IV
PIT rate	−0.439**	−0.458**	−0.680**	−0.674**	−0.708**	−0.623**
	(0.207)	(0.201)	(0.276)	(0.273)	(0.299)	(0.303)
Federal PIT rate	−0.558***	−0.540***	−0.505***	−0.506***	−0.545***	−0.502***
	(0.133)	(0.132)	(0.131)	(0.131)	(0.094)	(0.109)
Unemployment rate	−0.016***	−0.017***	−0.017***	−0.017***	−0.017***	−0.016***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)
PIT rate of neighbouring provinces		0.144	0.180*	0.208	0.206	0.006
		(0.183)	(0.106)	(0.135)	(0.133)	(0.102)
CIT rate				−0.691**	−0.686**	−0.946**
				(0.256)	(0.262)	(0.352)
Top tax bracket threshold					0.006	0.005
					(0.006)	(0.004)
Dummy 1988	0.347***	0.351***	0.350***	0.350***	0.349***	0.352***
	(0.008)	(0.008)	(0.004)	(0.003)	(0.003)	(0.004)
CanUSdum						−0.022***
						(0.006)
Constant	0.011***	0.011***	0.012***	0.012***	0.012***	0.009***
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)
Implied elasticity with respect to net-of-tax rate	0.358**	0.374**	0.555**	0.550**	0.578**	0.508**
	(0.169)	(0.164)	(0.225)	(0.223)	(0.244)	(0.247)
Over. id. test (p-value)			0.174	0.220	0.194	0.194
Observations	41	41	41	41	41	41
Adjusted R^2	0.910	0.908	0.906	0.909	0.907	0.917

Notes: In columns (3) to (6), the PIT rate is instrumented with one period lagged change in the deficit-to-GDP ratio, party dummy and as well change in the US top PIT rate. Heteroscedasticity and autocorrelation robust standard errors in parentheses. Significance levels are shown by * for 10%, ** for 5%, and *** for 1%. The implied taxable income elasticity with respect to the net-of-tax rate is simply obtained by multiplying the semi-elasticity estimate by (1− PIT rate) using the mean PIT rate of the sample period, which is 0.18372.

neighbouring provinces (Quebec and Manitoba). If labour is mobile from a high-tax province to a low-tax province, we expect the coefficient of neighbouring provinces' PIT rate to be positive. The results show that our key variable of interest continues to be negative and statistically significant. The other control variables are also significant with their respective expected signs. The coefficient of neighbours' PIT rate is as expected positive, but it is statistically insignificant.

Thus far we assume that the tax rate is exogenous. However, the province's tax base may affect its tax-rate choices. For instance, when a province's income-tax base falls and the tax revenue shrinks, the government may be forced to raise the PIT rate. This may make the tax rate endogenous. If this endogeneity of the tax rate is not properly addressed, it may bias our OLS coefficient estimate. Thus, in column 3, we assume that the top PIT rate is endogenous and use instrumental variable (IV) estimation method to address the potential problem of endogeneity and simultaneity bias. Following Dahlby and Ferede (2012) and Ferede (2019), we use one period lagged deficit-to-GDP ratio, party dummy, and the US top PIT rate as instruments. The party dummy equals one if the provincial governing party belongs to the conservative party and zero otherwise. Previous political economy studies such as that by Ferede, Dahlby, and Adjei (2015) find evidence that changes in the income-tax rate is often influenced by the ideological orientation of the governing party. Thus, we use the ideology of the governing party as a valid instrument in the analysis. Further, governments tend to raise the income-tax rate when they face fiscal challenges. Thus, the budget deficit of the government can also serve as a valid instrument. The regression results show that the coefficient of the key variable of interest continues to be negative and statistically significant. Note that the coefficient of the top PIT is higher (in absolute value) compared to our OLS estimates suggesting that not addressing the endogeneity problem biases downward the coefficient estimate. The other control variables are all statistically significant with their own expected respective signs.

In column 4, we include the provincial corporate income tax (CIT) rate as an additional control variable to capture the potential effects of income shifting between the provincial personal and corporate income-tax systems. A lower CIT rate may encourage income shifting to the corporate sector and this is expected to lower the PIT base. Thus, we expect the coefficient of the CIT rate to be positive. However, the coefficient of CIT has the unexpected negative sign and it is significant.

When governments face fiscal challenges, they attempt to collect more tax revenue from high-income earners. They do so either by raising the PIT rate on high-income earners or adjust the income threshold at which the top income-tax rate applies. Thus, in

column 5, we control for the threshold income of the top income tax bracket. The result shows that the coefficient of the threshold income variable is statistically insignificant. However, the results for all other control variables are very similar to column 4. More importantly, the coefficient of the top PIT rate continues to be negative and statistically significant. The estimated responsiveness of the taxable income to the top income-tax rate is slightly higher (in absolute value) in column 5.

Given the close relationship between the US and Canadian economies, one may argue that the presence of any gap between the tax rates of the two countries may encourage labour mobility by some high-income earners. To capture this potential impact, in column 6, we include a dummy variable (CanUSdum) that is equal to one if the Canadian combined federal and Ontario top PIT rate exceeds the US top PIT rate. We expect this variable to have negative impact on Ontario's taxable income. Column 6 includes all the relevant control variables that are likely to influence the PIT base. Various statistical tests show the validity of our instruments. Thus, we focus our empirical analysis and discussion on this result. The coefficient of the top PIT rate is negative and statistically significant. The estimated semi-elasticity of −0.623 suggests that a decrease of one percentage point in Ontario's top marginal personal income-tax rate is associated with an increase of the province's PIT base by about 0.62%. Note also that one can obtain the equivalent taxable income elasticity with respect to the net-of-tax rate using the period average PIT rate of 0.1837. We present the taxable income semi-elasticity estimate at the bottom of table 2 for comparison purposes with results of some of the previous studies. The results suggest that the equivalent taxable income elasticity with respect to the net-of-tax rate is about 0.508.[4]

Regarding the other control variables, the results show that the federal top PIT rate has negative and statistically significant effects on Ontario's PIT base. This is expected as the federal and provincial governments occupy the same tax base. Note also that this coefficient estimate shows that the adverse effects of the federal top PIT rate is lower than that of the provincial PIT rate as it is relatively more difficult to avoid the federal PIT rate. Further, the results show that, when the combined federal and Ontario PIT rate exceeds that of the US top PIT rate, as expected, it adversely affects taxable income.

How does our main taxable income semi-elasticity estimate for Ontario compare with those of previous studies? Differences in empirical methodology or the types of data

4. Over the period under investigation, the mean top PIT rate is 0.1837. Thus, we convert the tax base semi-elasticity estimate (−0.623) to its equivalent taxable income elasticity with respect to the net-of-tax rate as follows: $-(-0.623) \times (1 - 0.1837) = 0.508$.

employed make direct comparison difficult. Nonetheless, our estimate is broadly consistent with the results of earlier empirical studies. Dahlby and Ferede (2012) find short-term taxable income semi-elasticity estimate of −0.76 for all the Canadian provinces. Thus, our finding is close to this estimate of average Canadian provincial taxable income semi-elasticity. In a related study, Dahlby and Ferede (2018) provide an estimate of the province-specific long-term taxable income semi-elasticity of all Canadian provinces. In this study, they find a long-term taxable income semi-elasticity estimate of −4.15 for Ontario. Note also that our alternative taxable income elasticity of 0.508 is also within the range of values that Sillamma and Veall (2001) find using individual-based Canadian data but this estimate is slightly lower than those of Milligan and Smart (2019). It should be noted, however, that our estimate is not directly comparable to those of Milligan and Smart (2019) because, while Milligan and Smart (2019) focus on the tax rate sensitivity of the taxable income in the top tax bracket, in this study we estimate the tax sensitivity of total taxable income. This may account for our lower estimate of the tax rate sensitivity of the tax base.

2.3 Sensitivity analysis

In this section, we conduct sensitivity analysis to check the robustness of our key finding. Table 3 shows the robustness checks. Our main empirical analysis relies on Two-stage least-square estimation (2SLS) to address the potential endogeneity problem associated with the top PIT rate. As robustness checks, we use the General Method of Moments (GMM; column 1) and the Limited Information Maximum Likelihood (LIML; column 2) estimation methods. LIML is generally considered a better estimation method than 2SLS if one suspects the presence of weak instruments. GMM is another alternative efficient instrumental estimation method commonly used in the literature. Results of column 1 and 2 show that our key finding is robust to the use of alternative instrumental variable estimation methods. In particular, the coefficient of the PIT is still negative and statistically significant.

Our main empirical analysis accounts for domestic economic shocks such as the business cycle since we include the unemployment rate as an explanatory variable. However, one may be concerned that in an open economy such as Ontario's, external shocks may affect its taxable income. To address this concern, we check for the sensitivity of our results to the inclusion of Canadian terms of trade as an additional control variable in column 3.[5] The coefficient of PIT rate continues to be negative and statistically significant. However, the magnitude of the coefficient is slightly higher (in absolute value).

5. The terms- of- trade variable is defined as the ratio of export price index to import price index.

Table 3: Robustness checks, 1976–2017

	(1) GMM	(2) LIML	(3) Including terms of trade	(4) Capital gains inclusion rate	(5) Dummies for 2015 and 2016	(6) Using net-of-tax rate
PIT rate	−0.639**	−0.619**	−0.624**	−0.582**	−0.777***	
	(0.306)	(0.290)	(0.291)	(0.292)	(0.256)	
Terms of trade			−0.001**			
			(0.001)			
Net-of-tax rate						0.511**
						(0.200)
Inclusion rate				−0.044*		
				(0.023)		
Dummy 2015					0.010***	
					(0.001)	
Dummy 2016					−0.025***	
					(0.003)	
Constant	0.009***	0.009***	0.009***	0.009***	0.010***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	41	41	41	41	41	41
Adjusted R^2	0.917	0.917	0.918	0.915	0.915	0.910

Notes: Heteroscedasticity and autocorrelation robust standard errors in parentheses. Significance levels are shown by * for 10%, ** for 5%, and *** for 1%.

It is known that capital gains are included as income under the Canadian personal income-tax system. A higher capital gain inclusion rate increases taxable income. Currently, only 50% of eligible capital gains is taxable income but it should be noted that the capital inclusion rate has varied over the years. Thus, we control for the capital gains inclusion rate as an additional robustness check in column 4. Again, the result suggests that the taxable income semi-elasticity estimate is not very sensitive to the inclusion of the capital gains inclusion rate.

In 2015, the Canadian federal government announced that it would raise the top marginal personal income-tax rate from 29% to 33% beginning from 2016. This advance announcement of the rate hike encouraged taxpayers to bring their income (for

instance, dividend and capital gains) forward to 2015 to avoid the higher tax rate of 2016. Thus, this federal increase in the tax rate raised taxable income in 2015 and reduced it in 2016.[6] As an additional robustness check, we account for these two years by including time dummies in column 5. As expected, while the coefficient of the dummy for 2015 is positive, the coefficient of 2016 is negative and significant. But, more importantly, the PIT rate continues to have a statistically significant negative effects on taxable income.

In the previous section, we presented the implied taxable income elasticity with respect to the net-of-tax rate to allow the comparison of our results with those of previous individual-based studies. An alternative way is to directly estimate this variable by using the net-of-tax rate rather than the PIT rate as an explanatory variable. Thus, in column 6, we use net-of-tax rate as an explanatory variable instead of the PIT rate. Again, this taxable income elasticity is, as expected, positive and statistically significant. The magnitude of the coefficient estimate is also very close to our implied taxable income elasticity shown in column 5 of table 2. This suggests the robustness of our key empirical finding.

6. In fact, Ontario's real per-capita taxable income rose by about 2.7% in 2015 and fell by 2.6% in 2016.

3. Simulating the Revenue Effects of Ontario's Reduction in the PIT Rate

Currently, Ontario's top marginal income-tax rate is 13.16%. But with the applicable 56% surtax, the actual PIT rate for the top income tax bracket is 20.53%. As we indicated before, this makes Ontario the province with the second highest PIT rate in the country. In this section, we use our key empirical estimate of column 5 of table 2 to simulate the possible revenue effects of repealing Ontario's increase of the top PIT rate on high-income earners. That is, we investigate the impact of reducing the top PIT rate from the current 13.16% to 11.16%—the tax rate that was in effect before the introduction of the "temporary" hike. Given Ontario's relevant surtaxes, the cut of two percentage points in the top PIT rate is equivalent to 3.1-percentage-point reduction in the tax rate. The analytical framework for the revenue simulation is presented in Appendix 1.

The simulation analysis makes various assumptions for the revenue projection. First, we assume that the cut of 3.1 percentage points in top PIT rate takes effect in 2020. Thus, we conduct the projection beginning from the 2019 taxable income. Since taxable income data for 2019 is not available, we extrapolate the value from the 2017 data assuming that the taxable income grows at annual average growth rate of 4.01%. This growth rate corresponds to the average annual growth rate of Ontario's total taxable income over the period from 2003 to 2017. The simulation focuses only on Ontario's personal income-tax revenue. It is expected that the change in Ontario's PIT rate can have effects on the federal government's PIT revenue since both governments occupy the same tax base. However, the potential positive revenue effects for the federal government are excluded from the analysis. Further, various studies suggest that a lower PIT rate can encourage economic activities. If the cut in the PIT rate encourages more economic activities in Ontario, the province's other revenue sources might go up as well. Nevertheless, our simulation analysis abstracts from this possible increase in the province's other own sources. For these reasons, our simulation analysis may underestimate the positive revenue effects of the tax rate cut.

The potential effects upon income-tax revenue of rescinding Ontario's 2012 raising of the tax rate are shown in **table 4**. The amount of tax revenue that a government collects depends on the tax base and the applicable tax rate. So, when the tax rate is reduced, given the tax base, the government collects less revenue. This is the direct revenue effect of the tax-rate reduction. This direct effect assumes that taxable income remains constant

Table 4: Revenue effects ($ millions) of rescinding Ontario's increase of the PIT on high-income earners

	2020	2021	2022	2023	2024	2025
Prebehavioural revenue loss (static estimate)	−1,176	−1,244	−1,314	−1,388	−1,466	−1,547
Behavioural response	1,150	1,196	1,244	1,294	1,346	1,400
Post-behavioural revenue loss (dynamic estimate)	−26	−47	−70	−94	−120	−147

Source: author's calculations. The tax base semi-elasticity estimate reported in column 6 of table 2 and the cut of 3.1 percentage points in Ontario's PIT rate are used to compute the behavioural responses of the tax rate cut. See the text for a discussion of the computation method.

in the face of the cut in the tax rate; it is often referred to in the literature as a static estimate. The first row of table 4 shows the static revenue loss associated with the PIT rate cut assuming that the taxpayers do not change their behaviours. Note that the negative values denote that the provincial government's tax revenue falls with the cut in the tax rate. Thus, if Ontario's provincial government cuts its top PIT rate from 13.16% to 11.16% (or alternatively with the relevant surtaxes from 20.53% to 17.41%), then it would collect about $1,176 million less revenue in the first year of the tax cut. This is simply the mechanical effect and it is obtained by multiplying the reduction in the PIT rate by the relevant taxable income.[7] Note that this revenue loss increases over time as the tax base grows.

The seemingly large revenue loss shown in the first row is a common feature of static revenue estimations that ignore taxpayers' behavioural responses. Static revenue projections overestimate the revenue loss from cuts in the tax rate. As our foregoing empirical analysis shows, increases in the tax rate have an adverse effect on the tax base. Thus, when the top PIT rate is cut, the PIT base expands as a result of the positive behavioural response on the part of taxpayers. This expansion of the tax base increases the tax revenue that the government collects. The increase in tax revenue associated with the positive behavioural responses of taxpayers is shown in the second row of table 4. Note that, as a result of taxpayers' positive behavioural responses, the tax base expands, and this causes the government's revenue to rise by $1,150 million in the first year of the tax-policy change. The revenue gain associated with the positive behavioural response also increases over time.

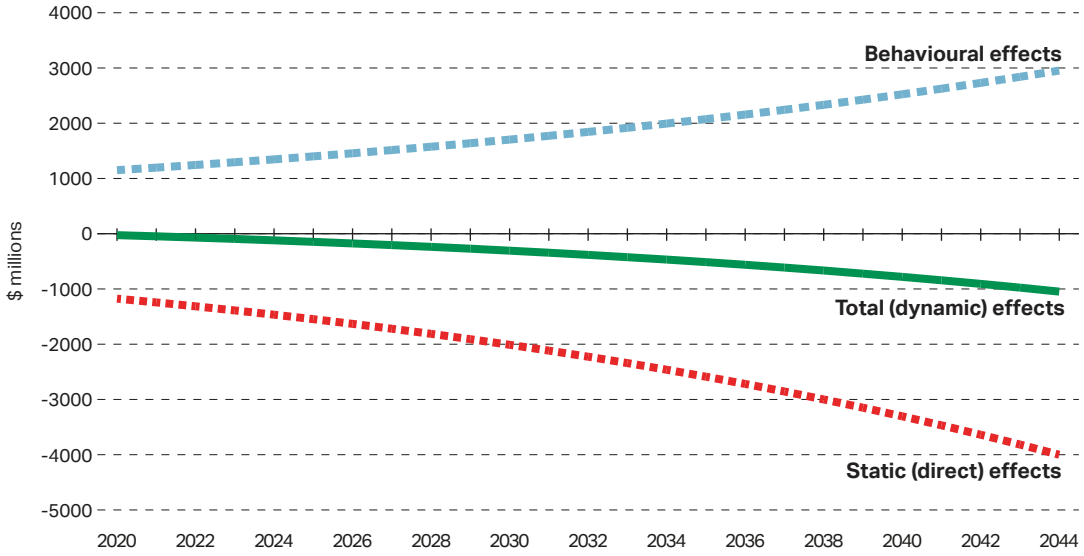
The upshot of the above discussion is that a realistic revenue projection should depend on a dynamic estimate that considers both the direct effects associated with the cut in

7. See HM Revenue and Customs (2012) and Ferede (2019) for a similar tax revenue simulation approach.

the PIT rate as well as the behavioural responses of taxpayers. Thus, the net total tax revenue effect of the PIT cut is simply the sum of the above two effects as shown in row 3 of table 4. Therefore, the simulation analysis suggests that the positive behavioural responses of taxpayers that expand the tax base help raise the tax revenue and the net loss of tax revenue associated with the cut in the tax rate is only $26 million in the first year. Moreover, the net tax revenue loss associated with the tax rate cut changes over time as a result of the expansion of the tax base. Consequently, in six years, the net revenue loss from the tax rate cut will be $147 million.

To shed some more light on the possible changes in Ontario's PIT revenue associated with a cut in the tax rate cut, we show the evolution of the revenue change over an extended period in **figure 1**. It suggests that, when one explicitly accounts for the positive behavioural responses of taxpayers, the net revenue loss associated with rescinding Ontario's top PIT rate hike will be much lower.

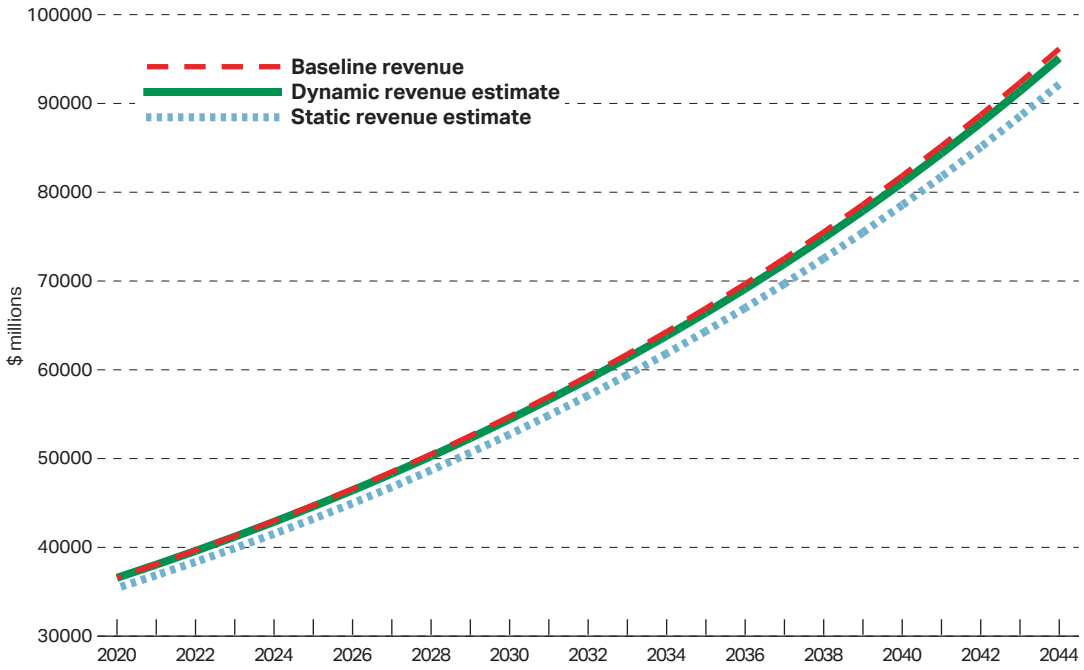
Figure 1: Simulated revenue effects ($ millions) of rescinding Ontario's increase of the PIT on high-income earners, 2020–2044



Source: Author's computation; see the text for the method of computation.

We further highlight the revenue implications of rescinding the increase of Ontario's PIT rate on high-income earners by projecting the province's total PIT revenue with and without the tax rate change. The projection is conducted over the period from 2020 to 2044 (**figure 2**). It is important to indicate the various assumptions we use to make the revenue projection. First, we assume that in the absence of a change in the

Figure 2: Ontario's projected total PIT revenue, 2020–2044



Source: Author's computation; see the text for the method of computation.

tax rate the province's total personal income-tax revenue would grow at annual rate of 4.1%. This growth rate matches the average annual growth rate of the PIT revenue of the province over the period from 1989 to 2012, which covers the time before the hike in the tax rate on high-income earners.

The simulation analysis provides three alternative total PIT revenue projections for Ontario. First, in the absence of any change in the PIT rate, we assume that the province's total PIT revenue would grow at the annual rate of 4.1% beginning from its 2019 level. This is our baseline revenue estimate and we illustrate this growth by the broken red line in figure 2.

In some previous studies and various public discussions, people often associate cuts in the tax rate with revenue losses. This is often referred to in the literature as a static revenue estimate. Static revenue estimation ignores behavioural responses of taxpayers. Thus, the static tax revenue projection shows that, when governments cut tax rates, tax revenue falls. This static revenue estimate, shown by the dotted blue line in figure 2, suggests that the cut in the tax rate will reduce the province's total PIT revenue as compared to the baseline estimate. Thus, static revenue projections tend to overestimate the revenue loss associated with the decrease in the tax rate.

Recognizing the limitations of static revenue projections, various commentators and analysts suggest that any realistic assessment of the revenue effects of tax rate changes need to explicitly account for taxpayers' behavioural responses. A revenue projection that incorporates taxpayers' behavioural responses is often described in the literature as a dynamic revenue estimate. The empirical results of the previous sections show that changes in the tax rate cause behavioural responses of taxpayers. A cut in the tax rate encourages more economic activity, and this causes taxable income to expand. But it is known that this increase in the tax base raises PIT revenue and that the revenue loss associated with cut in the tax rate will be lower than what the static revenue estimate predicts. In figure 2, we present the dynamic revenue estimate by the solid green line. A close examination of figure 2 suggests that the dynamic revenue estimate is very close to the baseline revenue estimate. This is a result of the strong positive behavioural response of taxpayers to the decrease in the tax rate, which boosts taxable income and helps the government recoup some of the tax revenue loss caused by the cut in the tax rate.

Note that Ontario's PIT rate cut and the associated positive behavioural responses of taxpayers increase the federal PIT revenue in the province. Further, if the tax rate cut encourages more economic activities and residents' income rises, then this may also increase the province's revenue from other tax revenue sources such as sales taxes. Our simulation analysis ignores these possible indirect positive revenue effects for the province. Thus, one may expect that even the dynamic revenue estimate may slightly overestimate the revenue loss associated with PIT rate cut.

An important policy implication of our simulation analysis is that rescinding the "temporary" increase of the income-tax rate on Ontario's high-income earners helps raise the tax competitiveness of the province. Such a cut in the tax rate will result in only a slight loss of income-tax revenue because taxpayers' strong positive behavioural responses raise taxable income. In other words, taxpayers' positive behavioural response helps the government recoup some of the loss of tax revenue. Thus, in the long run, with the decrease in the tax rate, the province can raise its tax competitiveness and encourage economic activities. This will obviously help the province improve its overall fiscal position although the PIT revenue shows a slight decrease. This casts doubt on the importance of maintaining the "temporary" hike in the tax on high-income earners as a way of reducing the province's budget deficit.

Conclusion

It is known that using a high personal income-tax rate causes significant economic costs to society by reducing individuals' incentive to save, invest, and work. However, governments generally find raising the income-tax rate on high-income earners a popular policy tool when they face budgetary challenges. Ontario's provincial government provides a good natural experiment for such policy choices. In 2012, Ontario resorted to increasing the personal income-tax rate on high-income taxpayers in an attempt to generate more tax revenue and reduce its budget deficit. Although the increase in the income-tax rate increase was introduced as a "temporary" measure, the policy change is still in effect and, as a result, Ontario is currently the province with the second highest income-tax rate on high-income earners. Consequently, various commentators and analysts have expressed their concern that such a high tax rate discourages economic activities and makes the province uncompetitive and there have been repeated calls for the government to rescind the "temporary" tax-rate increase.

We investigated the revenue effects of rescinding the "temporary" increase in the personal income-tax rate that Ontario's provincial government introduced in 2012/13. First, the paper provides an empirical estimate of the behavioural responses of Ontario's taxpayers to changes in the income-tax rate. We find that Ontario's total taxable income semi-elasticity with respect to the top PIT rate is about −0.62. This suggests that a one-percentage-point cut in the provincial top PIT rate is associated with a 0.62% growth in the province's total taxable income. Alternatively, this corresponds to a taxable income elasticity with respect to the net-of-tax rate of about 0.51. The empirical estimate is robust to various sensitivity checks and is close to those of previous similar studies.

We then use the taxable income semi-elasticity estimate to simulate the possible effects upon tax revenue of rescinding Ontario's hike of the tax rate on high-income taxpayers. Our dynamic revenue estimation, which incorporates taxpayers' behavioural responses, indicates that if Ontario reduces its current top personal income-tax rate of 20.53% to 17.41% (the rate before the 2012 hike), the province collects about $26 million less in revenue in the first year. However, this marginal revenue loss is possible because of the positive behavioural responses of taxpayers, which expands Ontario's tax base. An important policy implication for Ontario's provincial government is the need to consider the strong behavioural responses of taxpayers when it contemplates any change

in the personal income-tax rate on high-income earners. If Ontario's provincial government cuts its top PIT rate, the province's tax competitiveness will significantly increase and this encourages more economic activity. Such changes will ultimately help the province improve its overall fiscal position although the PIT revenue shows a slight decrease. This casts doubt on the importance of maintaining the "temporary" tax hike on high-income earners as a way of reducing the province's budget deficit.

Appendix: Analytical framework

In this appendix, we outline the analytical framework that is used to simulate the revenue effects of rescinding Ontario's increase in the tax rate that was introduced in 2012. We are particularly interested in investigating the revenue effects associated with a reduction in the province's top marginal personal income-tax rate (PIT) from 20.53% to 17.41% (including of all the relevant surtaxes). Consequently, in this Appendix we provide the analytical framework that will be used to assess the revenue effects of a reduction in the personal income-tax rate on high-income earners in the province of Ontario. In the Canadian personal income-tax system, both the federal government and provincial governments use multiple personal income-tax brackets and the top PIT rate is applicable only to the top income-tax bracket.

Suppose we classify all income-tax brackets into just two: the top income-tax bracket and all other tax brackets. We can then divide the total PIT base (B_t) into in the top income tax bracket (B_t^h) and taxable income from all other remaining tax brackets (B_t^l). One can then specify the province's total PIT base as:

$$B_t = B_t^h(\tau_t^h;X) + B_t^l(\tau_t^l;X) \tag{A.1}$$

where B_t^h denotes the taxable income from the highest or top income-tax bracket in year t and B_t^l denotes the taxable income from all other tax brackets. Similarly, τ_t^h is the top marginal income tax and τ_t^l denotes the tax rate for all tax brackets other than the top income-tax bracket. X denotes other factors that can influence tax bases. The total tax revenue that the provincial government collects are obtained by multiplying the tax bases by the relevant tax rates. Consequently, using Equation A.1 and the applicable tax rates, one can specify the provincial government's total personal income tax revenue (R_t) as:

$$R_t = \tau_t^h B_t^h(\tau_t^h;X) + \tau_t^l B_t^l(\tau_t^l;X) \tag{A.2}$$

Consider a tax reform by Ontario's provincial government that rescinds the tax-rate hike of 2012/13 by cutting the top marginal personal income-tax rate leaving all tax rates for other tax brackets unchanged. Such a tax-rate cut is generally expected to affect only those individuals whose taxable income falls in the top income-tax bracket. Thus, as a result of the behavioural responses of taxpayers, we expect B_t^h to change in response to

the reduction in the top tax rate. On the other hand, we expect B_t^l to remain unaffected. One can show the effect of the cut in the top tax rate on the provincial government's tax revenue as:

$$\Delta R_t = B_t^h \Delta\tau_t^h + (\tau_t^h B_t \mu \Delta\tau_t^h) \tag{A.3}$$

where Δ denotes change, ΔR_t is change in total income-tax revenue, $\Delta\tau_t^h$ is change in the top PIT rate, $\mu = \Delta\, ln(B_t)/\Delta\tau_t^h$ is the semi-elasticity of total taxable income with respect to the top PIT rate, and all other symbols are as defined before. Equation A.3 indicates that a reduction in the top marginal income-tax rate has two opposite effects on the provincial government's tax revenue. The first part is the direct or mechanical effect of the tax rate cut on the government's revenue. This is shown by the first part of Equation A.3. This direct effect of changes in the tax rate on tax revenue is obtained as the product of the change in the tax rate and the taxable income of the top income tax bracket (Δ).

The second part of Equation A.3, $\tau_t^h B_t \mu \Delta\tau_t^h$, shows the change in government tax revenue associated with the behavioural responses of taxpayers to changes in the tax rate. Note that the behavioural effect of tax rate cut on revenue is negative since taxable income semi-elasticity (μ) is negative and this raises tax revenue when the tax rate is cut. This is possible because reductions in the tax rate encourage economic activities and expand the tax base. Thus, the net revenue effect of any cut in the tax rate is the sum of the *direct* and *behavioural* effects. Revenue projections that incorporate both direct and behavioural effects are referred in the literature as dynamic scoring or dynamic revenue estimation.

Further, assume that the taxable income in the top tax bracket follows a pareto distribution as discussed in previous studies such as Diamond and Saez (2011). This means the ratio of the average taxable income (b^h) in the top tax bracket and the threshold income level for the top income-tax bracket (b^*) satisfies $b^h/b^* = a/a{-}1$, where a > 1 is the pareto parameter. Denote also the average marginal tax rate for all taxpayers by τ_{ave}, the initial total taxable income by B_0, the number of taxpayers in the top tax bracket by N_h, the initial threshold income level for the top income tax bracket by b_0^*. Since we are interested in assessing the change in revenue over time, we also assume that taxable income grows at the annual rate of g and threshold income for the top income-tax bracket is indexed to inflation, that is, it grows at the rate of inflation p. Then, Equation A.3 can be rewritten to obtain the change in revenue in time t as:

$$\Delta R_t = N_h b_0^* (1{+}g)^t \; [a/a{-}1 - (1{+}p)^t/(1{+}g)^t]\Delta\tau_t^h + \{\tau_{ave}\mu B_0 (1{+}g)^t\}\Delta\tau_t^h \tag{A.4}$$

The mechanical effect of tax rate changes is shown by the first expression on the right-hand side of Equation A.4. This expression is negative for tax-rate cuts. The second term in Equation A.4 captures the behavioural response of taxpayers. Since μ is negative, the effect of the taxpayers' behavioural responses on tax revenue is positive for tax-rate cuts.

Our simulation analysis is based on Equation A.4. We assume that the inflation rate (p) is 2%, the growth rate of taxable income is 4.01%. We use Veall's (2012) estimate of $a = 1.87$ for the pareto parameter. Further, the number of taxpayers in the top tax bracket (N_h) is 150,000 (for year 2017); the threshold income level for the top income-tax bracket (b_0^*) is $220,000; and the average tax rate (τ_{ave}) is 0.125. Equation A.4 shows that any realistic revenue projection of the effects of changes to the tax rate needs to include the behavioural responses of taxpayers. Thus, the tax base semi-elasticity estimate (μ) is a very valuable parameter to assess the revenue effects of changes in tax policies. We use Equation A.4 and the estimated taxable income semi-elasticity estimate to assess the revenue effects of rescinding the hike in Ontario's top PIT rate beginning from year 2020.

References

Canada Revenue Agency (2020). *Canadian Income Tax Rates for Individuals*. <https://www.canada.ca/en/revenue-agency/services/forms-publications/tax-packages-years.html>, as of May 12, 2020

Canadian Tax Foundation (various issues). *Finances of the Nation* (*The National Finances*). <https://financesofthenation.ca>, as of May 12, 2020.

Dahlby, B., and E. Ferede (2012). The Effects of Tax Rate Changes on Tax Bases and the Marginal Cost of Public Funds for Provincial Governments. *International Tax and Public Finance* 19: 844–883.

Dahlby, B., and E. Ferede (2018). The Marginal Cost of Public Funds and the Laffer Curve: Evidence from Canadian Provinces. *FinanzArchive/Public Finance Analysis* 74, 1: 173–199.

Department of Finance Canada (2010). *Tax Expenditures and Evaluations 2010*. <https://www.canada.ca/content/dam/fin/migration/taxexp-depfisc/2010/TEE2010_eng.pdf>, as of May 12, 2020.

Diamond, P., and E. Saez (2011).The Case for a Progressive Tax: From Basic Research to Policy Recommendations. *Journal of Economic Perspectives* 25, 4: 165–190.

Feldstein, M. (1995). Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act. *Journal of Political Economy* 103, 3: 551–572.

Ferede, E. (2019). The Revenue Effects of Tax Rate Increases on High-Income Earners. Fraser Institute. <https://www.fraserinstitute.org/sites/default/files/revenue-effects-of-tax-rate-increases-on-high-income-earners.pdf>, as of March 24, 2020.

Ferede, E., B. Dahlby, and E. Adjei (2015). Determinants of Statutory Tax Rate Changes by the Canadian Provinces. *Economics of Governance* 16: 27–51.

Fullerton, Don (1982). On the Possibility of an Inverse Relationship between Tax Rates and Government Revenues. *Journal of Public Economics* 19: 3–22.

Giertz, S. (2007). The Elasticity of Taxable Income over the 1980s and 1990s. *National Tax Journal* 60: 743–768.

Goolsbee, A. (1999). Evidence on the High-Income Laffer Curve from Six Decades of Tax Reform. *Brookings Papers on Economic Activity* 2: 1–47.

Goolsbee, A. (2000). What Happens when You Tax the Rich? Evidence from Executive Compensation. *Journal of Political Economy* 108. 2: 352–378.

Gruber, J., and E. Saez, E. (2002). The Elasticity of Taxable Income: Evidence and Implications. *Journal of Public Economics* 84: 1–32.

Haughwout, A., R. Inman, S. Craig, and T. Luce (2004). Local Revenue Hills: Evidence from Four U.S. Cities. *Review of Economics and Statistics* 86: 570–585.

HM Revenue and Customs (2012). The Exchequer Effect of the 50 per Cent Additional Rate of Income Tax. HMRC, Government of the United Kingdom. <https://webarchive.nationalarchives.gov.uk/20140206181159/http:/www.hmrc.gov.uk/budget2012/excheq-income-tax-2042.pdf>, as of March 24, 2020.

Lammam, C., H. MacIntyre, F. Ren, B. Eisen, and M. Palacios (2016). *Canada's Rising Personal Tax Rates and Falling Tax Competitiveness*. <https://www.fraserinstitute.org/sites/default/files/canadas-rising-personal-tax-rates-and-falling-tax-competitiveness.pdf>, as of March 24, 2020.

Laurin, Alexandre (2012). *Ontario's Tax on the Rich: Grasping at Straw Men*. <https://www.cdhowe.org/public-policy-research/ontario%E2%80%99s-tax-rich-grasping-straw-men>, as of March 24, 2020.

Lindsey, Lawrence (1987). Individual Taxpayer Response to Tax Cuts: 1982-1984, with Implications for the Revenue Maximizing Tax Rate. *Journal of Public Economics* 33: 173–206.

Milligan, K., and M. Smart (2019). An Estimable Model of Income Redistribution in a Federation: Musgrave Meets Oates. *American Economic Journal: Economic Policy* 11, 1: 406–434.

Murphy, R.P., M. Palacios, and J. Fuss (2019). *Canada's Rising Personal Tax Rates and Falling Tax Competitiveness*. <https://www.fraserinstitute.org/sites/default/files/canadas-rising-personal-tax-rates-and-falling-tax-competitiveness_0.pdf>, as of March 24, 2020.

Saez, E., J. Slemrod, and S. H. Giertz (2012). The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review. *Journal of Economic Literature* 50, 1: 3–50.

Sillamaa, M.-A., and M. R. Veall (2001). The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1988 Tax Flattening in Canada. *Journal of Public Economics* 80, 3: 341–356.

Slemrod, Joel (1998). Methodological Issues in Measuring and Interpreting Taxable Income Elasticities. *National Tax Journal* 51, 4: 773–788.

Statistics Canada (No date). *CANSIM @ CHASS*. Last updated December 10, 2019. <http://dc2.chass.utoronto.ca/chasscansim/>, as of January 2, 2020; access restricted.

Veall, Michael (2012). The Income Tax Shares in Canada: Recent Trends and Policy Implications. *Canadian Journal of Economics* 45, 4: 1247–1272.

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