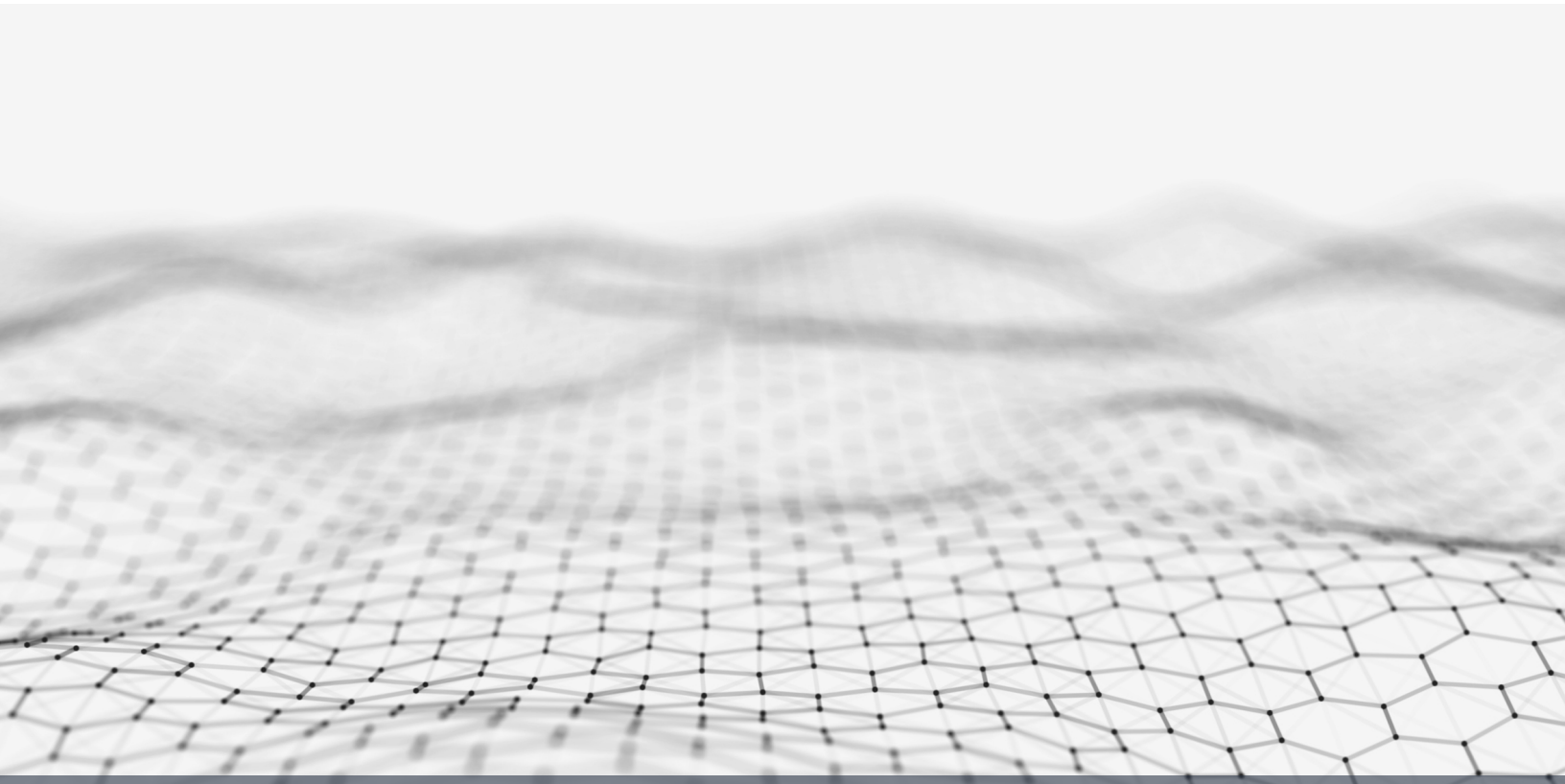
May 26, 2023

Responsiveness of taxable income to changes in the corporate income tax rate of small businesses



OFFICE OF THE PARLIAMENTARY BUDGET OFFICER
BUREAU DU DIRECTEUR PARLEMENTAIRE DU BUDGET

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 estimates of the responsiveness (commonly referred to as "elasticity" in the economic literature) of taxable income to a change in the corporate income tax rate. Having a reliable estimate of this responsiveness allows for better estimation of the impact on federal revenue of proposed changes to the corporate income tax system.

Lead analysts:

Govindadeva Bernier, Advisor-Analyst
Louis Perrault, Advisor-Analyst

Prepared under the direction of:

Jason Jacques, Director General

Nathalie Desmarais, Marie-Eve Hamel Laberge, Martine Perreault and Rémy Vanherweghem assisted with the preparation of the report for publication.

For further information, please contact the Office of the Parliamentary Budget Officer.

Yves Giroux
Parliamentary Budget Officer

Table of Contents

Highlights

The aim of this report is to estimate the magnitude of changes to Canadian-controlled private corporations' taxable income in response to changes in the CIT rate. We find that estimates of the corporate elasticity of taxable income for Canadian-controlled private corporations (CCPC) range from 0.26 in New Brunswick to 1.43 in Alberta.

Considering the behavioural response of CCPCs following a one percentage point increase in the federal small business tax rate reduces the federal revenue estimate by 7.6 per cent compared to the mechanical estimate where no behavioural changes are incorporated. In other words, not considering the behavioural response overestimates the federal revenue increase by 8.2 per cent.

Summary

Corporations, like individuals, are responsive to changes in their tax rate. An increase in the corporate tax rate might not increase tax revenue by the same magnitude. Indeed, corporations might reduce their taxable income in response to tax increases. This response is generally referred to in the economic literature as the corporate elasticity of taxable income (CETI) where the elasticity is a measure of how sensitive taxable income is to taxation.

The aim of this report is to estimate the magnitude of changes to Canadian-controlled private corporations' taxable income in response to changes in the CIT rate. This report relies on the bunching approach to estimate the CETI. It uses administrative firm-level data reported on T2 Corporate Income Tax returns from 2008 to 2019. This empirical method uses changes to incentives created by discrete changes in the tax system at a specific point, called the *kink* point. This report uses the change in the marginal tax rate faced by CCPCs eligible to the small business deduction at $500,000 as the kink point.

We find that estimates of the CETI for Canadian-controlled private corporations range from 0.26 in New Brunswick to 1.43 in Alberta. Summary Table 1 presents the results of our elasticity estimates by province as well as a 95% confidence interval.

This report also provides an illustrative example of applying the estimated elasticities to a revenue estimation of an increase in the small business tax rate using 2019 tax data. Considering the behavioural response of CCPCs following a one percentage point increase in the federal small business tax rate reduces the federal revenue estimate by 7.6 per cent compared to the estimate where no behavioural changes are incorporated. In other words, not considering the behavioural response overestimates the federal revenue increase by 8.2 per cent.

Summary Table 1

Elasticity of Taxable Income for CCPCs, by province

Province	Elasticity	95% Confidence Interval
Newfoundland and Labrador	1.13	[0.97 , 1.28]
Prince Edward Island	0.41	[0.27 , 0.55]
Nova Scotia	0.40	[0.32 , 0.47]
New Brunswick	0.26	[0.19 , 0.32]
Quebec	0.79	[0.77 , 0.82]
Ontario	0.87	[0.85 , 0.88]
Manitoba	0.52	[0.4 , 0.63]
Saskatchewan	1.11	[1.04 , 1.19]
Alberta	1.43	[1.39 , 1.46]
British Columbia	0.54	[0.52 , 0.57]
Multi-Jurisdictional Firms	1.07	[0.97 , 1.17]

Source:
Office of the Parliamentary Budget Officer.

Note:
Multi-Jurisdictional firms have operations in more than one province and therefore report taxable income and pay provincial CIT in more than one province (as reported on T2 schedule 5). For these firms, we assumed a combined small business rate of 16.2% and a combined general rate of 26.2%.

Introduction

Corporations, like individuals, are responsive to changes in their tax rate. An increase in the corporate tax rate might not increase tax revenue by the same magnitude. Indeed, corporations might reduce the taxable income they will report either through a reduction in real economic activity (for example by relocating some of its productive activities in another jurisdiction), or through more "cosmetic" changes that have an impact on how income is reported for tax purposes (for example using non-capital losses from previous years that can be carried forward). This response is generally referred to in the economic literature as the corporate elasticity of taxable income (CETI) where the elasticity is a measure of how sensitive taxable income is to taxation.

There are several estimates in the literature of the elasticity of taxable income with respect to changes in the corporate income tax (CIT) rate.[1] These estimates vary widely depending on the country studied, and the data and method used. To our knowledge, there exists only two papers published in peer-reviewed journals that have attempted to estimate the corporate elasticity of taxable income in the Canadian context.[2] However, these two papers focus on differences in provincial CIT rates and the ensuing interprovincial income shifting.

The aim of this report is to estimate the magnitude of changes to Canadian-controlled private corporations' taxable income in response to changes in the CIT rate. This elasticity is a critical piece of information in evaluating revenue implications of proposed changes to the CIT rate. This report relies on the bunching approach to estimate the CETI. The approach uses administrative firm-level data, obtained from the Canada Revenue Agency as reported on T2 Corporate Income Tax returns, and features of the Canadian tax system to elicit behavioural responses.

The obtained estimates, which rely on the combined federal-provincial statutory tax rate, can be readily used in evaluating changes to the Federal small business tax rate. We find that estimates of the CETI for Canadian-controlled private corporations range from 0.26 in New Brunswick to 1.43 in Alberta.

The rest of the report proceeds as follows. The next section briefly explains the methodology while section 2 presents the data used for the estimation. Section 3 summarizes the key results and section 4 presents an application of our elasticity estimates to the revenue estimation of a change in the Federal CIT rate for small businesses. Finally, section 5 concludes.

1. Methodology

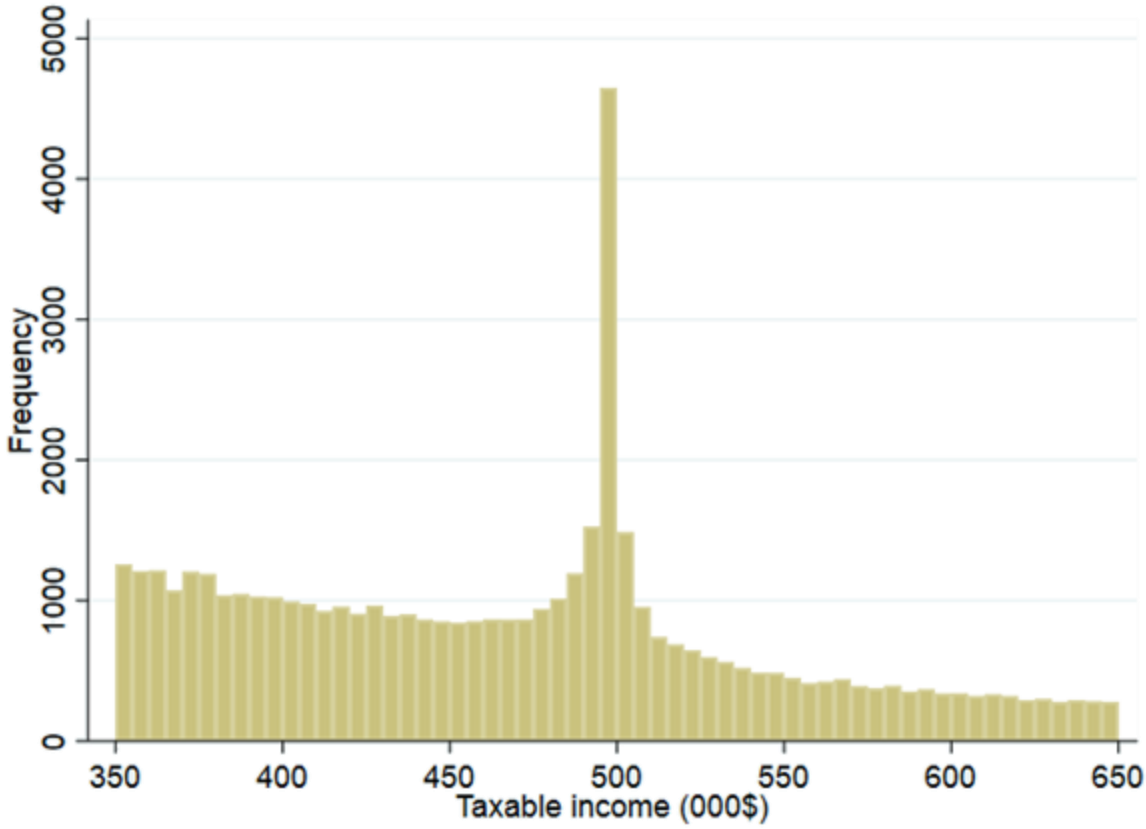
This report relies on the bunching approach. This empirical method developed by Saez (2010) and Chetty et al. (2011) uses changes to incentives created by discrete changes in the tax and transfer system at a specific point. Here, the change of interest is a discrete change to the marginal tax rate on taxable income faced by Canadian-controlled private corporations (CCPCs). The point where there is a change in the marginal tax rate is called the *kink* point. For example, CCPCs will usually face a change in the corporate tax rate at $500,000 of taxable income (the limit of the small business deduction (SBD)) where income above the threshold will be taxed at a higher rate than the income below the same threshold.

The presence of a kink point in the tax schedule will lead some firms to choose not to increase their income slightly above the threshold because it would not be worth the marginal cost of obtaining the extra income. Thus, theoretically, we would expect to observe more firms earning exactly the amount of income at the threshold than we would observe in the absence of this discrete change in the marginal tax rate and less firms just after the kink. In other words, corporations will "bunch" at the kink point.

This theoretical prediction can be observed in the Canadian corporate tax data. Figure 1 shows the empirical distribution of taxable income of CCPCs eligible to the SBD in Ontario from 2012 to 2015 around the $500,000 kink point. There is a large mass of corporations at and around this specific kink point. Without this point, we would expect a flatter profile to the figure, as can be seen further away from the kink where there are no discrete changes to the corporate tax rate. We call "bunching mass" the mass of firms that locate at the kink point in excess of the number of firms we would observe in the counterfactual scenario without the kink.

Figure 1

Distribution of taxable income around the kink: Small businesses in Ontario (2012-2015)



Textual description:
This figure shows the distribution of the number of small businesses reporting taxable income between $350,000 and $650,000 in Ontario from 2012 to 2015. It shows the number of corporations declines as the reported taxable income increases, except around the kink point at $500,000. There is a break in this pattern for corporations reporting taxable income between $475,000 and $510,000, with a large spike of corporations reporting taxable income between $495,000 and $500,000.

Source:
T2 Administrative data, Statistics Canada.

The key insight of the bunching approach is that the more corporations "bunch" by reducing income to the kink point the more they are sensitive to changes in the tax rate, i.e. the larger the elasticity of taxable income is the larger the bunching mass will be.

To motivate this approach where there is a link between the bunching mass and the elasticity parameter, we use a neoclassical model of the firm where it seeks to maximise its value to shareholders. Further details of the model can be found in Appendix C.

To estimate the corporate elasticity of taxable income from this bunching mass, we use the methodology from Bertanha, McCallum and Seegert (2022).[3] This method relies on the fact that bunching can be reframed as a censored regression model. More specifically it uses a mid-censored Tobit model to identify the elasticity using data truncated in an interval around the kink point.

Finally, the theoretical prediction that every bunching corporation will choose the exact taxable income of the kink point is very strong. As can be seen in Figure 1, there is extra mass around the $500,000 kink point and not just specifically at the kink. In practice, this can be caused by many things such as optimizing frictions like adjustment costs which would prevent corporations to perfectly choose the level of taxable income. It can also be measurement errors and other distortions. Conceptually, these firms are attempting to bunch and should therefore be counted in the bunching mass on which the estimate of the elasticity relies upon. To handle this issue, we use a filtering method that fits a polynomial to the empirical distribution of taxable income, excluding observations in a specified window around the kink, to create a counterfactual distribution in the excluded interval. Using this distribution, we obtain a "filtered" taxable income for each observation of the data from which we can proceed in estimating the corporate elasticity of taxable income.[4]

2. Data

We use CORTAX data which is a dataset of the universe of all T2 Corporate Tax Returns and their schedules filed by Canadian corporations from 2000 onwards. It contains an average of about 2 million tax filings per year. This database is generated by the Canada Revenue Agency and shared with Statistics Canada. PBO researchers accessed an anonymized version of the microdata through Statistics Canada's Canadian Centre for Data Development and Economic Research (CDER).

We constructed multiple samples where for each sample we kept together corporations facing the same combined federal-provincial statutory tax rate, before and after the kink throughout a given tax year. A table of CIT rates by year and province is presented in Appendix A and the full list of subsamples and their characteristics is detailed in Appendix B.

Corporations eligible for the small business deduction (SBD) face a lower tax rate on their first $500,000 of taxable income (called the business limit). Taxable income in excess of $500,000 will then be taxed at the general CIT rate. For example, sample 16 contains corporations in Ontario with a tax year beginning on or after January 1, 2012, and ending on or before December 31, 2015. These corporations faced a combined rate of 15.5% (federal rate of 11% and provincial rate of 4.5%) on their first $500,000 of taxable income and then a combined rate of 26.5% (federal rate of 15% and provincial rate of 11.5%) after the kink.

In some situations, the business limit of a CCPC can be lower than $500,000.[5] Corporations with a different business limit would not face the kink at the same value of taxable income and thus would have an incentive to bunch at that different value. To avoid having these corporations "contaminate" the distribution around the $500,000 kink, we have excluded them from all samples used.[6] We also excluded inactive corporations.[7]

Small Business Deduction (SBD)

Canadian-controlled private corporations (CCPC) that are considered "small", that is they have a total taxable capital of less than $10 million, are eligible for the small business deduction. The SBD allows for a corporation to pay a lower rate of tax both at the federal and provincial level on the first $500,000 of taxable income (known as the business limit). The business limit is gradually reduced if the CCPC earns between $50,000 and $150,000 of passive investment income or if it has a total taxable capital between $10 million and $50 million. Corporations that are not CCPCs (publicly traded corporations and other private corporations) face the general CIT rate on all their taxable income.

3. Estimation Results

Table 1 presents the results of our elasticity estimates by province as well as a 95% confidence interval.[8] As can be seen in Appendix B, some provinces were represented in more than one sample. For these provinces, the elasticity presented in the table is an inverse-variance weighted average of the different samples.[9]

Table 1

Elasticity of Taxable Income for CCPCs, by province

Province	Elasticity	95% Confidence Interval
Newfoundland and Labrador	1.13	[0.97 , 1.28]
Prince Edward Island	0.41	[0.27 , 0.55]
Nova Scotia	0.40	[0.32 , 0.47]
New Brunswick	0.26	[0.19 , 0.32]
Quebec	0.79	[0.77 , 0.82]
Ontario	0.87	[0.85 , 0.88]
Manitoba	0.52	[0.4 , 0.63]
Saskatchewan	1.11	[1.04 , 1.19]
Alberta	1.43	[1.39 , 1.46]
British Columbia	0.54	[0.52 , 0.57]
Multi-Jurisdictional Firms	1.07	[0.97 , 1.17]

Source:
Office of the Parliamentary Budget Officer.

Note:
Multi-Jurisdictional firms have operations in more than one province and therefore report taxable income and pay provincial CIT in more than one province (as reported on T2 schedule 5). For these firms, we assumed a combined small business rate of 16.2% and a combined general rate of 26.2%.

The estimates range from 0.26 in New Brunswick to 1.43 in Alberta. CCPCs in provinces with significant oil & gas revenue (Newfoundland and

Labrador, Saskatchewan, and Alberta) tend to have higher elasticity estimates, which could suggest industry specific differences. Unfortunately, the North American Industry Classification System (NAICS) codes available with the tax data are self-reported, and are missing for about 20% of the CCPCs, and therefore do not allow for a robust estimation by industry.

These estimates are slightly above what is found in the literature, e.g. Gruber and Rauh (2007), but in line with the estimates from Coles et al. (2022). The authors also found that small private corporations in the U.S. were more sensitive to a change in the tax rate than public corporations as they could rely more on earnings management techniques to reduce their taxable income. It is reasonable to believe that Canadian private corporations also have more flexibility in their financial reporting, which could very well explain the higher elasticities obtained in our analysis.

4. Illustrative Application

The PBO has designed a microsimulation model which is used to estimate changes in federal government revenue brought about by modifications to the corporate income tax system.[10] The model computes mechanically the revenue impacts of a tax change. For example, if a corporation has a taxable income of $100,000 and is facing the small business CIT rate of 9% at the federal level, under the baseline scenario (that is the current system) it will pay $9,000 in tax ($100,000 * 9%). If we wanted to measure the change in tax revenue from increasing the rate by one percentage point to 10%, our model would now calculate tax payable as $100,000 * 10% which would yield a federal tax payable of $10,000. Hence, the revenue impact from that increase in the tax rate would be $1,000 ($10,000 - $9,000).

The behavioural impact can be measured by the following formula

$$dTI = -e * TI * d\tau/(1-\tau)$$

where: dTI is the change in taxable income reported, e is the corporate elasticity of taxable income (CETI), TI is taxable income reported by the corporation prior to the increase in the tax rate, $d\tau$ is the change in the tax rate and τ is the combined federal and provincial tax rate prior to the increase.

If we assume a CETI of 0.5 and a provincial tax rate of 3% for small businesses, we can substitute these values with those from the previous example in the equation above and obtain a change in taxable income reported of -$568.18. Therefore, in response to the one percentage point increase in the federal CIT rate, the corporation would now only report $99,431.82 of taxable income. When multiplying this amount by the increased rate of 10%, we obtain a new federal tax revenue of $9,943.18. Thus, when accounting for the behavioural effect we see that the increase in federal revenue was only $943.18 rather than the $1,000 we estimated from the mechanical calculation, which is a reduction of $56.82 (-5.7%) from

our mechanical estimate. If we assume a CETI of 1.0, the reduction would be equal to $113.64 (-11.4%).

Using the elasticity estimates reported in section 3, Table 2 presents the impact on federal revenue of a 1 percentage point increase in the small business rate (which corresponds to a 1 percentage point reduction in the small business deduction rate). The revenue increases are calculated using our microsimulation model.[11]

Table 2

Federal revenue impact of a 1 percentage point increase in the small business CIT rate (mechanical vs behavioural)

Province	Revenue Increase - Mechanical ($M)	Revenue Increase Including Behavioural Response ($M)	Overestimation of Revenue in Mechanical Approach ($M)	Overestimation (%)
Newfoundland and Labrador	7.2	6.5	0.8	11.8
Prince Edward Island	3.9	3.7	0.1	3.7
Nova Scotia	24.7	23.7	0.9	4.0
New Brunswick	15.3	14.9	0.3	2.2
Quebec	217.1	202.4	14.7	7.3
Ontario	367.3	340.3	27.0	7.9
Manitoba	30.6	29.2	1.4	4.7
Saskatchewan	45.4	41.0	4.4	10.7
Alberta	184.4	160.3	24.1	15.1
British Columbia	184.9	176.4	8.4	4.8
Multi-Jurisdictional Firms	19.6	18.5	1.1	5.8
Total	**1,100.4**	**1,017.1**	**83.3**	**8.2**

Source:
Office of the Parliamentary Budget Officer.

Note:
The overestimation of revenue is equal to the difference between the mechanical revenue increase and the revenue increase including a behavioural response. The overestimation in percentage is calculated as the overestimation of revenue divided by the revenue increase including a behavioural response.

In the mechanical estimate, the increase translates into additional federal revenue of $1,100.4 million. However, when we account for the behavioural component, the increase in federal revenue is estimated to be of $1,017.1 million. Therefore, not considering the behavioural response of CCPCs following an increase in the tax rate overestimates the federal revenue increase by 8.2 per cent.[12]

5. Concluding Remarks

The estimates presented in this report are derived from the responses of small CCPCs and may not be representative of the responses to taxation of larger corporations. Future work could be done to estimate the elasticity of large businesses facing the general CIT rate. However, the bunching methodology requires a discrete change in the tax schedule faced by the firms. For these large corporations the only kink in the tax schedule is at a taxable income of zero. Indeed, negative income is not taxed (facing a rate of 0%) but above zero the corporation starts facing a CIT rate of 15% at the federal level plus the provincial CIT rate in effect. Estimating the CETI using the bunching methodology requires some modifications to the approach used in this report as in Agostini et al. (2022) or requires a different method as in Coles et al. (2022).

Furthermore, as mentioned in the introduction, the behavioural response of corporations may encompass many different behaviours. Although the theoretical model used to motivate the approach implies a real response through the choice of capital, it does not imply that what we measure is due entirely to real responses. Further work could be done to try and disentangle real earnings versus earnings management responses. In addition, the elasticities presented in this report capture responses along the intensive margin, i.e. changes in the level of taxable income, but do not capture changes along the extensive margin such has the decision to operate or perhaps to relocate to another jurisdiction.

Appendix A: Federal and Provincial Tax Rates

Table A-1

Small Business Statutory Tax Rates (2008 – 2020), (%)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Federal	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.5	10.5	10.0	9.0	9.0
Newfoundland and Labrador	5.0	5.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Prince Edward Island	3.2	2.1	1.0	1.0	1.0	4.5	4.5	4.5	4.5	4.5	4.0	3.5	3.0
Nova Scotia	5.0	5.0	5.0	4.5	4.0	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
New Brunswick	5.0	5.0	5.0	5.0	4.5	4.5	4.5	4.0	3.5	3.0	2.5	2.5	2.5
Quebec	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	6.0	5.0
Ontario	5.5	5.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	3.5	3.5	3.5
Manitoba	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saskatchewan	4.5	4.5	4.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Alberta	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0
British Columbia	3.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0

Source:
Finance Canada.

Note:
The rates presented above for each year are the rates in effect on December 31 of that year.

Table A-2

General Statutory Tax Rates (2008 – 2020), (%)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Federal	19.5	19.0	18.0	16.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Newfoundland and Labrador	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	15.0	15.0	15.0	15.0	15.0
Prince Edward Island	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Nova Scotia	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
New Brunswick	13.0	12.0	11.0	10.0	10.0	12.0	12.0	12.0	14.0	14.0	14.0	14.0	14.0
Quebec	11.4	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.8	11.7	11.6	11.5
Ontario	14.0	14.0	12.0	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Manitoba	13.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Saskatchewan	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.5	12.0	12.0	12.0
Alberta	10.0	10.0	10.0	10.0	10.0	10.0	10.0	12.0	12.0	12.0	12.0	11.0	8.0
British Columbia	11.0	11.0	10.5	10.0	10.0	11.0	11.0	11.0	11.0	11.0	12.0	12.0	12.0

Source:
Finance Canada.

Note:
The rates presented above for each year are the rates in effect on December 31 of that year.

Appendix B: Data Samples

Table B-1

Characteristics of the data samples used for estimation

Sample no.	Province	No. of observations	Combined CIT rate (Small)	Combined CIT rate (General)	Start date	End date
1	NL	8,430	13.5	30.0	1-Jan-16	31-Dec-17
2	NL	4,480	14.0	29.0	1-Jul-14	31-Dec-15
3	PE	3,130	15.5	31.0	1-Apr-13	31-Dec-15
4	PE	2,830	16.1	36.1	1-Jan-16	31-Dec-17
5	NS	6,560	13.0	31.0	1-Jan-18	31-Dec-18
6	NS	6,680	13.5	31.0	1-Jan-17	31-Dec-17
7	NB	4,840	11.5	29.0	1-Jan-19	31-Mar-20
8	NB	5,020	15.5	25.0	1-Jan-12	30-Jun-13
9	NB	6,040	15.5	27.0	1-Jul-13	31-Dec-14
10	QC	41,630	15.0	26.5	1-Jan-19	31-Dec-19
11	QC	441,870	19.0	26.9	1-Jan-12	31-Dec-15
12	QC	57,550	19.0	30.9	1-Jan-08	31-Dec-09
13	ON	140,540	12.5	26.5	1-Jan-19	31-Dec-20
14	ON	114,360	13.5	26.5	1-Jan-18	31-Dec-18
15	ON	358,740	15.0	26.5	1-Jan-16	31-Dec-17
16	ON	721,620	15.5	26.5	1-Jan-12	31-Dec-15
17	ON	63,720	15.5	28.0	1-Jan-11	31-Dec-11
18	MB	8,950	9.0	27.0	1-Jan-19	31-Mar-20
19	SK	54,630	13.0	27.0	1-Jan-12	30-Jun-15
20	AB	38,750	12.5	27.0	1-Jan-17	31-Dec-17
21	AB	37,130	13.5	27.0	1-Jan-16	31-Dec-16
22	AB	343,610	14.0	25.0	1-Jan-12	30-Jun-15
23	AB	32,450	14.0	26.5	1-Jan-11	31-Dec-11
24	AB	29,040	14.0	28.0	1-Jan-10	31-Dec-10
25	AB	26,770	14.0	29.0	1-Jan-09	31-Dec-09

Sample no.	Province	No. of observations	Combined CIT rate (Small)	Combined CIT rate (General)	Start date	End date
26	BC	47,500	11.0	27.0	1-Jan-19	31-Mar-20
27	BC	48,590	13.0	26.0	1-Jan-16	31-Mar-17
28	BC	183,240	13.5	26.0	1-Apr-13	31-Dec-15
29	Multiple	20,130	15.2	26.2	1-Jan-12	31-Dec-14

Source:
Office of the Parliamentary Budget Officer.

Notes:
The tax rates for multi jurisdiction CCPCs is an average of all provincial rates (weighted by taxable income reported in each province) in effect during the sample period.

When the CIT rate changes during the tax year of a corporation, the tax payable will be computed using each tax rate prorated by the number of days in effect during the corporation's tax year. Therefore, each sample contains only CCPCs with a tax year beginning on or after the start date of the sample and ending before or on the end date so that they face the same combined tax rate throughout their tax year.

Appendix C: Model

To derive a parametric relationship between bunching at a kink point in the tax schedule and the elasticity of taxable income with respect to the net-of-corporate tax rate, we use the following two-period neoclassical model of firms.[13]

Consider firms with heterogeneous productivity, captured by A_i, that exist for two periods. Each firm is owned by a single shareholder. In the first period, firm i begins with retained earnings K_1 and it must choose the amount of dividend payments ($D \geq 0$) to distribute and the amount of equity ($E \geq 0$) to issue. The choices implicitly determine the amount of capital the firm has in the second period, i.e. $K_2 = K_1 + E - D$.

Capital in the second period generates taxable income, in this case profits net-of-depreciation cost, according to the following function

$$Y(K_2) = \frac{1+e}{e} A_i^{\frac{1}{1+e}} K_2^{\frac{e}{1+e}},$$

where e is the elasticity of taxable income with respect to net-of-tax rate. Shareholders can also hold government bonds which yield a tax-exempt rate of return $r > 0$. Finally, at the end of period 2, all firms liquidate implying that all principal and profits are returned to the shareholders. Firms face a piecewise linear tax system where the marginal tax rate on taxable income is t_0 for $Y_i \leq \kappa$ and t_1 for $Y_i > \kappa$.

The firm's problem of maximizing the present value of the firm to the shareholder is

$$\max_{K_2} V = K_1 - \frac{r}{1+r} K_2 + \frac{\mathbb{I}(Y(K_2) \leq \kappa)(1-t_0)Y(K_2)}{1+r} + \frac{\mathbb{I}(Y(K_2) > \kappa)\{(1-t_0)\kappa + (1-t_1)[Y(K_2) - \kappa]\}}{1+r},$$

where $\mathbb{I}$ is the indicator function.[14] The solution to the choice of capital in the second period leads to the following piecewise linear function for taxable income:

$$Y_i = \begin{cases} \frac{1+e}{e} r^{-e}(1-t_0)^e A_i, & A_i \leq \underline{A} \\ \kappa, & \underline{A} < A_i < \overline{A} \\ \frac{1+e}{e} r^{-e}(1-t_1)^e A_i, & A_i \geq \overline{A}, \end{cases}$$

where thresholds $\underline{A}$ and $\overline{A}$ are

$$\underline{A} = \frac{\kappa}{\frac{1+e}{e} r^{-e}(1-t_0)^e} \quad \text{and } \overline{A} = \frac{\kappa}{\frac{1+e}{e} r^{-e}(1-t_1)^e}.$$

Firms with productivity A_i, such that $\underline{A} < A_i < \overline{A}$, have a non-interior solution and bunch at the kink. Notice that the solution has a similar form to the ones found in the bunching literature in different context e.g. Saez (2010) and conforms to the framework found in Berthanta, McCallum and Seegert (2022) where the natural logarithm of taxable income is used.

References

Agostini, C., Bertanha, M., Bernier, G., Bilicka, K., He, Y., Koumanakos, E., . . . Zudel, B. (2023). *The elasticity of corporate taxable income across countries*. Working Paper.

Bachas, P., & Soto, M. (2018). *Not(ch) your average tax system: Corporate taxation under weak enforcement*. World Bank Policy Research.

Bertanha, M., McCallum, A., & Seegert, N. (2022). Better bunching, nicer notching. *Working Paper*.

Bertanha, M., McCallum, A., Payne, A., & Seegert, N. (2022). Bunching estimation of elasticities using stata. *The Stata Journal, 22*, 597-624.

Bukinova, J., Lichard, T., Palguta, J., & Zudel, B. (2020). *Tax reforms and inter-temporal shifting of corporate income: Evidence from tax records in Slovakia*. CERGE-EI Working Paper Series (660).

Chetty, R., Friedman, J., Olsen, T., & Pistaferri, L. (2011). Adjustment Costs, Firm Responses, and Micro vs Macro Labor Supply Elasticities: Evidence from Danish Tax Records. *Quarterly Journal of Economics, 126*(2), 749-804.

Coles, J. L., Patel, E., Seegert, N., & Smith, M. (2022). How do firms respond to corporate taxes? *Journal of Accounting Research, 60*, 965–1006.

Dahlby, B., & Ferede, E. (2012). The effects of tax rate changes on tax bases and the marginal cost of public funds for Canadian provincial governments. *International Tax and Public Finance*, 844-883.

Devereux, M., Liu, L., & Loretz, S. (2014). The elasticity of corporate taxable income: New evidence from UK tax records. *American Economic Journal: Economic Policy, 6*(2), 19-53.

Domínguez Islas, C., & Rice, K. M. (2018). Addressing the estimation of standard errors in fixed effects meta-analysis. *Statistics in Medicine, 37*, 1788-1809.

Dwenger, N., & Steiner, V. (2012). Profit taxation and the elasticity of the corporate income tax base: Evidence from German corporate tax return data. *National Tax Journal, 65*(1), 117-150.

Gruber, J., & Rauh, J. (2007). How elastic is the corporate income tax base? In A. Auerbach, J. R. Hines Jr, & J. B. Slemrod, *Taxing Corporate Income in the 21st Century* (pp. 140-163). Cambridge University Press.

Gruber, J., & Saez, E. (2002). The elasticity of taxable income: evidence and implications. *Journal of Public Economics, 84*(1), 1-32.

Knittel, M., Nelson, S., DeBacker, J., Kitchen, J., Pearce, J., & Prisinzano, R. (2011). *Methodology to Identify Small Businesses and Their Owners*. Technical Paper 4, Department of the Treasury, Office of Tax Analysis.

Krapf, M., & Staubli, D. (2020). *The corporate elasticity of taxable income: Event study evidence from Switzerland*. SSRN 3740327.

Lediga, C., Riedel, N., & Strohmaier, K. (2019). The elasticity of corporate taxable income--evidence from South Africa. *Economics Letters, 175*, 43-46.

Mintz, J., & Smart, M. (2004). Income shifting, investment, and tax competition: theory and evidence from provincial taxation in Canada. *Journal of Public Economics*, 1149-1168.

Parliamentary Budget Officer. (2017). *Corporate Tax Model*. Ottawa.

Patel, E., Seegert, N., & Smith, M. (2014). Testing the distortions from the corporate tax. *107th Annual Conference on Taxation*.

Saez, E. (2010). Do taxpayers bunch at kink points? *American Economic Journal: Economic Policy, 2*(3), 180-212.

Wen, J.-F., Yilmaz, F., & Trejo, D. (2020). Tax Elasticity Estimates for Capital Stocks in Canada. *IMF Working Paper WP/20/77*.

Notes

[1] See among others: Bachas and Soto (2018), Bertanha, McCallum and Seegert (2022), Bukinova, et al. (2020), Coles, et al. (2022), Devereux, Liu and Loretz (2014), Dwenger and Steiner (2012), Gruber and Saez (2002), Gruber and Rauh (2007), Krapf and Staubli (2020) and Lediga, Riedel and Strohmaier (2019).

[2] See : Dahlby and Ferede (2012) and Mintz and Smart (2004). Other papers have looked into the effect of the CIT rate, for example a recent IMF paper has looked at it's effect on the capital stock Wen, Yilmaz and Trejo (2020).

[3] We use Stata command **bunching** (Bertantha, McCallum, Payne and Seegert, 2022).

[4] We use Stata command **bunchfilter**. For further explanations on the exact process and methodology see Bertantha, McCallum, Payne and Seegert (2022). Note that this command requires the user to input parameters which determine the extent of the filtering window. As can be expected, increasing the filtering window slightly increased the elasticity estimates in most samples. However, even when using a very large filtering window, the elasticity estimates were on average only one tenth (0.1) higher than the ones reported in section 3.

[5] These situations include:

1) CCPCs with a short tax year, where the business limit is prorated by the number of days in the tax year divided by 365.

2) Associated corporations. To avoid multiplication of the SBD, associated CCPCs must share the $500,000 limit and fill-out schedule 29 to allocate the limit among them.

3) CCPCs with taxable capital greater than $10 million. The business limit is reduced linearly between $10 million and $15 million, after which the corporation is no longer eligible to the SBD (Budget 2022 increased the $15 million upper-bound to $50 million).

4) CCPCs with passive investment income greater than $50,000 in a taxation year after 2018. Budget 2018 announced the business limit would be reduced linearly between $50,000 and $150,000 of passive investment income, after which the corporation is no longer eligible to the SBD.

[6] The calculation of taxable income used in the analysis does not incorporate future losses that have been carried back as the decision to bunch at the kink is made at a point in time where the corporation should not yet know if it will incur losses in the future.

[7] Inactive corporations were excluded using two methods. The first was to exclude all corporations that checked the box "Yes" to the question "Is the corporation inactive?" on line 280 of the T2 return. The second method is using the two tests (De Minimis and Business Activity) described in Knittel, et al. (2011).

[8] The estimates presented in the table are obtained through mid-censored Tobit regressions with truncated data, using 30% of the sample, evenly split around the kink point. In all samples, the elasticity estimates were nearly identical using 10% to 90% of the data.

[9] Also know as a precision weighted average, it is calculated using the formula: $\beta_F = \frac{\sum_{i=1}^{k} \frac{1}{\sigma_i^2} \beta_i}{\sum_{i=1}^{k} \frac{1}{\sigma_i^2}}$, where β_i are the elasticity estimates from each sample and σ_i are the corresponding standard errors.

[10] See Parliamentary Budget Officer (2017) for more details on the model itself.

[11] The simulations were done on 2018 tax data using 2023 tax rates and scaling taxable income to 2023 dollars using provincial specific nominal GDP growth rates from PBO's Fiscal Sustainability Report 2023 (forthcoming).

[12] If the federal government increases the CIT rate, it will also increase the dividend gross-up rate and the dividend tax credit rate on the personal income tax (PIT) side to maintain integration of corporate and personal income taxes. These changes reduce PIT revenue which slightly offsets the CIT revenue increase. The numbers presented in Table 2 do not include this PIT revenue offset.

[13] This model is robust to many additional features, and we abstract from numerous complications. See Patel et al. (2014) for a more general model of corporate behaviour.

[14] Note that this model assumes the choice of capital that would maximize the firm's value is well below the $10,000,000 threshold of taxable capital for full eligibility to the Small Business Deduction. Therefore, we ignore the complication of modeling this feature of the corporate tax system.

RP-2324-005-S_e
T_RP_3.0.0