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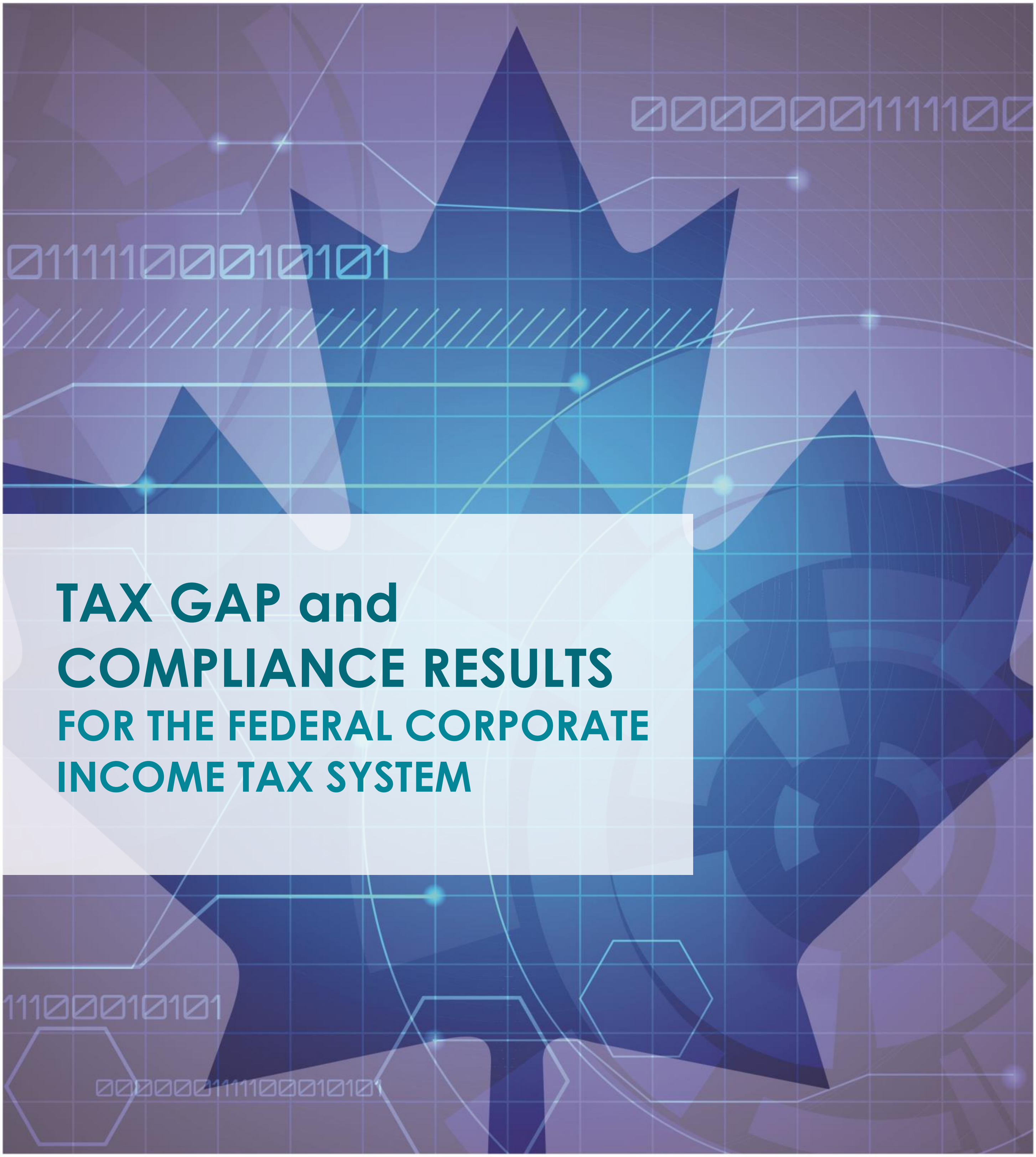

TAX GAP and COMPLIANCE RESULTS
FOR THE FEDERAL CORPORATE INCOME TAX SYSTEM

Canada

Contents

Executive Summary

In April 2016, the Government of Canada committed to estimating the federal tax gap to encourage an open and transparent discussion on tax non-compliance. Understanding how and why taxpayers are non-compliant is critical to help preserve the integrity of the tax system and to protect Canada's revenue base, which supports programs and benefits delivered to Canadians.

Acting on this commitment, a dedicated unit was established at the Canada Revenue Agency (CRA) to examine and publish a series of reports analyzing different components of the federal tax gap. Including this year's report, the CRA has published five reports:

- A conceptual study on tax gap estimation (June 2016);
- An estimate of the tax gap for Goods and Services Tax/Harmonized Sales Tax (June 2016);
- A report on domestic personal income tax compliance (June 2017);
- A study on the international tax gap for the personal income tax system (June 2018); and
- A report on the corporate income tax gap (June 2019).

This report examines the federal corporate income tax gap related to reporting non-compliance for tax year 2014, where corporations fail to provide complete and/or accurate information on their income, deductions and/or credits. It does not examine the impact of objections or appeals after audit. The corporate income tax gap is estimated using CRA's audit data and applying appropriate methodologies for incorporated small and medium-sized enterprises (SMEs) and large corporations. Tax year 2014 was examined to remain consistent with previous published tax gap estimates. There are separate estimates for SMEs and large corporations due to their unique characteristics and the existence of random audit data to facilitate the tax gap estimate for SMEs. In producing these estimates, the CRA consulted with other tax administrations, government departments and technical experts to solicit their feedback and to refine the methodologies used in this report.

Descriptive Statistics on Corporate Tax Filers

This report begins by highlighting the key features of the federal corporate income tax system and presents descriptive statistics on corporate tax filers.

- There were approximately 2.1 million corporate tax filers of which more than 99% were comprised of SMEs and less than one percent were large corporations for tax year 2014.

- Corporate tax filers reported approximately $298 billion in taxable income and $40.9 billion in total federal tax payable for tax year 2014. Large corporations alone reported about 52% of the total corporate taxable income and contributed to about 54% of the federal tax assessed in respect of corporations.

SME Tax Gap

The CRA periodically conducts random audits on SMEs to better understand compliance trends and enhance risk-assessment systems. Random audits also provide a representative sample upon which tax gaps can be estimated.

- The federal tax gap for incorporated SMEs was between $2.7 billion and $3.5 billion for tax year 2014 before considering any audit results.

- Based on a previous year's audit results[1], audits are estimated to reduce the tax gap for SMEs by between 31% and 40%, resulting in a tax gap of between $1.6 billion and $2.4 billion in 2014. This tax gap represents between 4% and 6% of overall federal corporate income tax revenue in 2014.

Large Corporation Tax Gap

The CRA relies exclusively on risk-based audits due to the relatively small number of corporations in the large corporation population and the high audit coverage already. Therefore, Canada's large corporate tax gap was estimated using two statistical approaches in order to reduce the level of selection bias when estimating the tax gap. These approaches, extreme value methodology and cluster analysis, were adapted for the Canadian context to produce a range of estimates for Canada's large corporate income tax gap.

- Using these methods, the federal tax gap for large corporations is estimated to be between $6.7 billion and $7.9 billion for tax year 2014 before considering any audit results.
- Based on a previous year's audit results, audits are expected to reduce the large corporate tax gap by between 64% and 75%, resulting in a tax gap between $1.7 billion and $2.9 billion for tax year 2014. This tax gap represents between 4% and 7% of overall federal corporate income tax revenue in 2014.

CRA's Compliance Efforts

The CRA's compliance efforts have been instrumental in identifying corporate tax non-compliance and will continue to reduce the tax gap. The report highlights the CRA's key compliance programs and international collaboration efforts, including:

- programs to educate Canadian businesses on their tax obligations and the CRA's improved abilities to detect non-compliance;
- enforcement actions such as risk-based audits, penalties and criminal investigations;
- bi-lateral and multi-lateral information-sharing initiatives with Organisation for Economic Co-operation and Development member states and other partner countries; and
- the CRA's offshore compliance programs.

Conclusion

Together, the federal corporate income tax gap in 2014 is estimated to be between $9.4 billion and $11.4 billion before considering any audit results. Assuming that the federal tax adjustments from audit for tax year 2014 are similar to a prior year, audits are expected to reduce the tax gap by 55% to 66%. After considering CRA audit activities, the tax gap for tax year 2014 is estimated to be between $3.3 billion and $5.3 billion. This overall federal corporate tax gap represents between 8% and 13% of corporate income tax revenue.

The corporate income tax gap estimates presented in this report are based on the CRA's internal administrative data. In particular, random audit results are used to estimate the SME tax gap and risk-

[1] Given that audits for tax year 2014 are not all finalized, the potential federal tax adjustment from audit is projected from tax year 2011 for both SMEs and large corporations.

based audit results are used to estimate the tax gap for large corporations. For a variety of reasons, auditors may not always identify all sources of non-compliance when conducting audits. Consequently, the actual tax gap may be somewhat higher than the estimates presented in this report. While certain countries have attempted to develop or incorporate “uplift factors” to account for undetected non-compliance, these remain imprecise and subjective. Additional research would be required to estimate an uplift factor that could be applied in the Canadian context.

The CRA is committed to openness and transparency as a world-class tax and benefit administrator, and is one of only about a dozen countries to publish an estimate of its corporate tax gap. With this report, the CRA has now published five tax gap reports that provide detailed information on its activities to combat non-compliance, as well as estimates of different components of Canada’s tax gap and the underlying methodologies. This information informs the public about the health of the tax system and strategically informs the CRA’s compliance activities.

The CRA will continue estimating the tax gap, while engaging with interested stakeholders, the Parliamentary Budget Officer and other external experts to further the Agency’s work in this area. Future reports will examine additional tax gaps (e.g., excise tax gap, payment gap), provide regular updates of tax gaps already estimated (e.g., personal income tax gap, Goods and Services Tax gap) and include additional information such as the impact of audits in reducing the tax gap. As well, the CRA is committed to improving its tax gap methodologies to leverage all of the data and methods available to create more accurate and pertinent estimates. Through an ongoing effort to understand different components of Canada’s tax gap, the CRA will continue to preserve the integrity of the tax system and protect Canada’s revenue base, which supports programs and benefits that improve the quality of life of all Canadians.

1. Introduction

The Government of Canada is committed to maintaining and improving the fairness and integrity of the Canadian tax system. As part of this commitment, the CRA estimates and publishes Canada's federal tax gaps to provide the public with information on tax compliance and non-compliance. The tax gap represents the difference between the taxes that would be paid if all obligations were fully met in all instances, and the tax actually paid and collected. In other words, the tax gap is a measure of tax revenue loss resulting from intentional and unintentional tax non-compliance which can occur at the time of filing, reporting or paying taxes. In addition, changes in tax policy and economic events can affect the tax gap. For example, changes to a tax form may help reduce errors and as a result reduce the tax gap while increased bankruptcies during a recession may prevent taxpayers from paying their tax debt and increase the tax gap. Therefore, tax gap levels are not fully under the control of tax administrations and, as a result, the tax gap can never be zero. Nevertheless, tax gap estimates, combined with other indicators of compliance and non-compliance, can provide tax administrations and governments with valuable insights into the general health of the tax system.

Given the complexity of tax gap estimation, the CRA has taken a step-by-step approach to develop appropriate and robust estimation methodologies that work within the Canadian context. The CRA's tax gap team has been closely collaborating with internal and external experts as well as our international partners to share best practices and to develop methodologies for the different components of the tax gap. Given these considerations, the CRA has focused on publishing estimates for specific components of the federal tax gap as well as detailed information on the methodological approaches used to estimate it. This is the CRA's fifth tax gap report since 2016, delivering on the Government's commitment to transparency.

In June 2016, the CRA took the first step to follow through on its commitment to estimate Canada's tax gap with the publication of a conceptual study on tax gap estimation. This report examined key considerations related to tax gap estimation and outlined different approaches taken by tax administrations in other countries. A second report, also released in June 2016, estimated the tax gap related to Goods and Services Tax/Harmonized Sales Tax (GST/HST). It found that the GST/HST gap was $4.9 billion in 2014, of which the federal component was $2.9 billion, representing 7.1% of GST revenues.

In June 2017, the CRA released its third tax gap report on domestic personal income tax compliance in Canada. The study provided two tax gap estimates for the 2014 tax year: 1) assessed personal income taxes that are not collected by the Agency at about $2.2 billion; and 2) the tax loss related to unreported income earned by individuals involved in certain underground economy activities at about $6.5 billion. Together these tax gaps amount to $8.7 billion or 6.4% of personal income tax revenues in 2014. The report also found that extensive third-party information reporting, in combination with other features of the tax system, contribute to a tax base that is largely tax assured or at low risk of non-compliance – for example, 86% of income assessed in 2014 was considered assured.

In June 2018, the Agency released the fourth report in its tax gap series examining international personal income tax compliance. In particular, Canada's offshore investment income tax gap was estimated using global financial statistics and international banking data based on methodologies developed by academics.[2] The estimated range of the federal personal income tax gap related to hidden offshore investment income was estimated to be between $0.8 billion to $3.0 billion for tax year 2014.

Building on these publications, this report examines the corporate income tax gap related to incorporated small and medium-sized enterprises (SMEs) and large corporations. The corporate population is divided into two groups to account for their unique characteristics. For example, a majority of incorporated SMEs are comprised of small Canadian-controlled private corporations that are generally subject to a lower tax rate while large corporations tend to operate on a much larger scale, often including complex international transactions. Given that reporting non-compliance is the largest factor contributing to the tax gap, this report focuses on corporations that do not accurately report income, deductions and/or credits.

For the SME population, random audit results conducted by the CRA are leveraged to estimate the federal tax gap for tax year 2014. Based on the results from these random audits, the federal tax gap in 2014 is estimated to be between $2.7 billion and $3.5 billion for SMEs before considering any audit results or between 7% and 9% of overall federal corporate income tax revenue. It is important to reiterate that these tax gap estimates do not reflect the CRA's audit activities that reduce reporting non-compliance. Assuming audit results for tax year 2014 are similar to a prior year[3], audits are expected to reduce the tax gap by $1.1 billion in federal tax or by 31% to 40% . This represents between 4% and 6% of overall federal corporate tax revenue in 2014.

For large corporations, two methodologies are applied to estimate lower- and upper-bound tax gap estimates using risk-based audit data. Based on these methodological approaches, the federal tax gap in 2014 is estimated to be between $6.7 billion and $7.9 billion for large corporations before considering any audit results or between 17% and 20% of the overall federal corporate income tax revenue. In the case of large businesses, the CRA's audit activities substantially reduce the tax gap. Assuming audit results for tax year 2014 are similar to a prior year, audits are expected to reduce the tax gap by $5.0 billion in federal tax or by 64% to 75%. This represents between 4% and 7% of overall federal corporate tax revenue in 2014.

Together, the federal corporate income tax gap in 2014 is estimated to be between $9.4 billion and $11.4 billion before considering any audit results or between 24% and 29% of corporate income tax revenues. Audits are expected to reduce the tax gap by $6.1 billion or by 55% to 66%. After considering CRA audit activities, the tax gap for tax year 2014 is estimated to be between $3.3 billion and $5.3 billion or between 8% and 13% of overall federal corporate income tax revenue (see Table 1).

While we have used existing estimation methodologies that were adopted by other tax administrations for some of the estimates in the range, others are based on novel methodologies. The CRA will continue to improve on its methods to estimate the tax gap in collaboration with our peers as well as internal and external experts.

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[2] See previous tax gap report for further details. https://www.canada.ca/content/dam/cra-arc/corp-info/aboutcra/tax-compliance/intrntltxcmplnc-en.pdf

[3] Given that audits for tax year 2014 are not all finalized, the potential federal tax adjustment from audit is projected from tax year 2011.

Table 1: Federal Corporate Income Tax Gap Estimates for Tax Year 2014*

	SMEs	Large Corporations	Total
Number of Filers	2,098,300	14,650	2,112,950
Tax Gap before Audit	$2.7-$3.5 billion	$6.7-$7.9 billion	$9.4-$11.4 billion
Impact of Audit**	$1.1 billion	$5.0 billion	$6.1 billion
Tax Gap after Audit	**$1.6-$2.4 billion**	**$1.7-$2.9 billion**	**$3.3-$5.3 billion**

Source: T2 Corporation Income Tax Return, 2014 tax year as of November 2018
*Figures may not add to total due to rounding.
**Given that audits for tax year 2014 are not all finalized, the potential federal tax adjustment from audit is projected from tax year 2011. These figures in the report do not include future audit adjustments and cannot be directly compared to other audit statistics published by the CRA, which are on a fiscal year basis and can include multiple tax years.

Combining the corporate income tax gap with other tax gap components previously published by the CRA, Canada's federal tax gap before considering the impact of audit for tax year 2014 is estimated to be between $21.8 billion and $26.0 billion or between 10.6% and 12.6% of corresponding revenues (see Table 2). This estimate provides a picture of the overall federal tax gap for Canada's major revenue-generating taxes before any CRA enforcement activities such as audits.[4]

The CRA will continue estimating the tax gap, while engaging with interested stakeholders, the Parliamentary Budget Officer and other external experts to further the Agency's work in this area. Future tax gap reports will examine topics such as the payment gap, excise tax gap, non-compliance in the claiming of deductions and credits by individuals, and the impact of audits at reducing the tax gap. As well, Canada's tax gap estimates will be regularly updated to ensure they remain relevant.

[4] Additional components of the tax gap will be estimated in future reports. However, the value of these estimates are expected to represent a relatively small percentage of the overall federal tax gap.

Table 2: **Canada's Federal Tax Gap Estimates Before Audit* for Tax Year 2014**

Tax Gap Component	Federal Tax Gap Estimate Before Audit	% of Corresponding Revenues**
Goods and Services Tax	$2.9 billion	7.1%
Domestic Personal Income Tax	$8.7 billion	7.0%-8.6%
International Personal Income Tax	$0.8-$3.0 billion	
Corporate Income Tax	$9.4-$11.4 billion *($3.3-$5.3 billion after audit results)*	24%-29% *(8%-13% after audit results)*
Total Tax Gap to Date	**$21.8-$26.0 billion**	**10.6%-12.6%**

* Unless specified otherwise.

** Percentages of corresponding revenues are based on federal tax revenues from the 2014-15 fiscal year as published in the Public Accounts of Canada 2015-2016.

This report is organized as follows. Section 2 highlights the key features of the federal corporate income tax system, presents descriptive statistics on corporate taxpayers, provides background information on the stages of non-compliance and outlines the scope of tax gap estimation. Section 3 presents the federal tax gap estimates for SMEs on the basis of random audit results, including the methodology and random audit findings. Section 4 presents the federal tax gap estimates for large corporations on the basis of risk-based audit results, including an overview of the two methodologies used to derive the lower- and upper-bound estimates. Section 5 highlights the CRA's key compliance efforts targeted at SMEs and large corporations. Section 6 provides concluding remarks and summarizes the main findings of the report.

2. Background

Like many other developed countries, Canada's corporate income tax system is based on self-assessment whereby corporations resident in Canada must report all sources of world-wide income and are responsible for claiming any deductions and tax credits to which they are entitled. This section briefly reviews the key features of the federal corporate income tax system, presents descriptive statistics on corporate taxpayers, provides background information on the stages of non-compliance and outlines the scope of tax gap estimation presented in this report.

2.1 Key Features of the Federal Corporate Income Tax System

Corporations resident in Canada (and some non-resident corporations[5]) are required to file a corporate income tax (T2) return every tax year whether or not there is any tax payable.[6] In general, corporate returns are due six months after the end of each fiscal year. For example, if a corporation's fiscal year end is March 31, the filing deadline would be September 30. Corporate income tax returns also include provincial/territorial tax returns except for corporations that are located in Quebec or Alberta, where corporations file separate provincial corporate tax returns.

Generally, corporate taxable income includes all sources of revenue minus current expenses, allowable capital costs, and other types of deductions:

- **Revenue sources** can include proceeds from the sale of goods and services as well as income received from certain financial assets.[7] Corporations are taxed on their world-wide income.
- **Current expenses** can include costs related to business inputs such as labour, materials and rent.
- **Capital costs** can include interest costs and capital cost allowances related to capital inputs such as machinery and buildings.
- **Other types of deductions** can include income losses and charitable donations.

An important feature of the corporate income tax system is its treatment of losses, which occur when costs are greater than revenues. Business and capital losses can be carried over to prior or subsequent taxation periods in recognition of the cyclical nature of business activity and investment.

The general federal corporate tax rate applied to taxable income has been 15% since 2012 while a lower tax rate applies to the income of small Canadian-controlled private corporations (CCPCs). For CCPCs, the first $500,000 of qualifying active business income is eligible for the small business deduction making the small business federal tax rate 9% since January 2019. After the $500,000 threshold, the remaining

[5] A non-resident corporation must file a corporate income tax return if it carried on business in Canada, had a taxable capital gain or disposed of a taxable Canadian property at any time in the tax year. Non-resident corporations are taxed only on the income from business they carry on in Canada and on certain other amounts (e.g., capital gains or losses, resource properties, partnership interests and trust properties).
[6] An exception to this rule are corporations that were registered as charities for the entire year that must to file a Registered Charity Information Return.
[7] Dividend income from Canadian corporations that has already been taxed at source is exempt.

income is subject to the general federal tax rate of 15%. Table 3 provides a summary of federal corporate income tax rates between 2007 and 2019. In addition, corporations are subject to provincial corporate income taxes which vary by province.[8]

Table 3: Summary of Federal Corporate Income Tax Rates, 2007-2019 (in %)

<table>
<tr><th></th><th>2007</th><th>2008</th><th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th><th>2018</th><th>2019</th></tr>
<tr><td>General Federal Tax Rate</td><td>22.12*</td><td>19.5</td><td>19</td><td>18</td><td>16.5</td><td colspan="8">15</td></tr>
<tr><td>Small Business Federal Tax Rate</td><td>13.12*</td><td colspan="8">11</td><td colspan="2">10.5</td><td>10</td><td>9</td></tr>
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* Including 1.12% federal surtax rate.

The corporate tax system makes various tax credits available at the federal level to achieve public policy objectives. For example, the Scientific Research and Experimental Development (SR&ED) Investment Tax Credits are provided to encourage Canadian corporations to carry out research and development. Certain tax credits, including the SR&ED Investment Tax Credits, can be carried forward to reduce future tax liability or carried back to reduce past tax liability for a limited time period. Similar credits may also be available in respect of provincial corporate income taxes.

For more information on the corporate income tax system and tax expenditures, visit the Government of Canada website on corporate taxation and the annual Report on Federal Tax Expenditures.[9]

2.2 Descriptive Statistics on Corporate Tax Filers

There has been a steady increase in the number of corporate tax filers between 2007 and 2014.[10] As illustrated in Figure 1, there were approximately 1.7 million corporate tax filers in tax year 2007 and approximately 2.1 million corporate tax filers by tax year 2014. On average, there has been a 2.8% annual growth in filers between 2007 and 2014.

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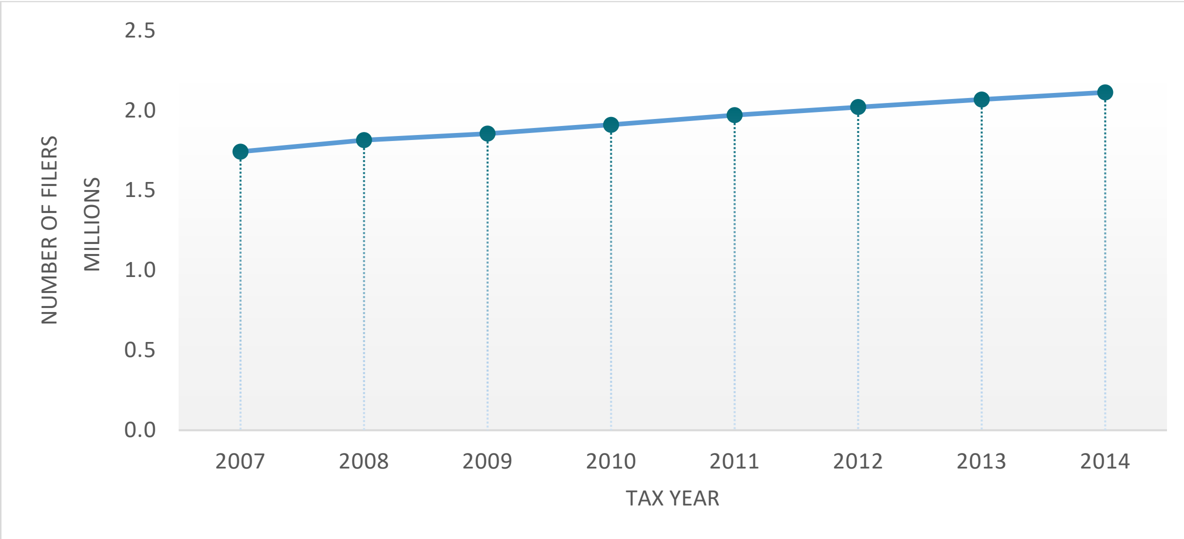
[8] For more information, visit: https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/corporations/corporation-tax-rates.html. 2019.

[9] Canada Revenue Agency, Corporation Income Tax. https://www.canada.ca/en/services/taxes/income-tax/corporation-income-tax.html; Department of Finance Canada. Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2019. https://www.fin.gc.ca/taxexp-depfisc/2019/taxexp19-eng.asp. 2019.

[10] Descriptive statistics provided in this section are based on initial assessment (the first assessment when a taxpayer files their tax return).

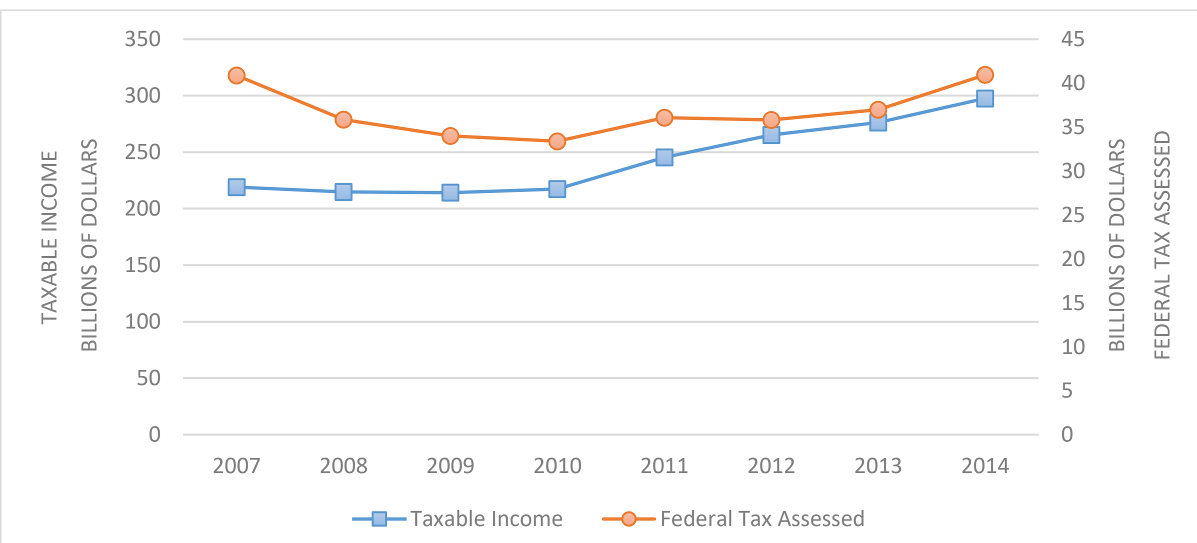
Figure 1: Number of Corporate Income Tax Filers, 2007-2014



Source: T2 Corporation Income Tax Return, 2007-2014 as of November 2018

As shown in Figure 2, corporate taxable income increased between tax years 2007 and 2014 while the federal tax assessed remained relatively stable. During this time frame, taxable income grew from $219 billion in 2007 to $298 billion in 2014, representing a compound average annual growth rate of 4.5%. The growth in income was more important from 2009 onwards as the economy recovered from the recession – the compound average annual growth rate has been 6.8% since 2009. The federal tax assessed declined during the recession between 2007 and 2009. It then grew from $34.0 billion to $40.9 billion during tax years 2009 and 2014, representing a compound average annual growth rate of 3.8%.

Figure 2: Taxable Income and Federal Tax Assessed of Corporate Tax Filers, 2007-2014*



Source: T2 Corporation Income Tax Return, 2007-2014 as of November 2018; amounts reported on initial assessment.
*Tax-exempt corporations, such as crown corporations, are excluded. Federal tax assessed is net of the dividend refund (line 784 of the T2) and the federal capital gains refund (line 788 of the T2).

2.2.1 Descriptive Statistics for Tax Year 2014

For tax year 2014, approximately 2.1 million Canadian-resident corporations filed corporate income tax returns. As shown in Table 4, 99.3% of filers were SMEs while large corporations accounted for the remainder. For the purposes of this report, SMEs are defined as corporations with less than or equal to $20 million in total gross revenues or up to $50 million for certain industry sectors. Large corporations are defined as corporations with total gross revenues above the SME threshold.[11] In 2014, corporations reported $298 billion in taxable income and the total federal tax payable was $40.9 billion. Although large corporations comprised less than one percent of the filing population, they reported about 52% of the total corporate taxable income and contributed to about 54% of the federal tax assessed at initial assessment.

Table 4: Distribution of Number of Corporate Tax Filers, Taxable Income and Federal Tax Assessed by Corporation Size, Tax Year 2014 (dollar amounts in billions)*

	SMEs	%	Large Corporations	%	All Corporations
Number of Filers	2,098,300	99.3	14,650	0.7	2,112,950
Taxable Income	$143	48.0	$155	52.0	$298
Federal Tax Assessed	$18.7	45.6	$22.3	54.4	$40.9

Source: T2 Corporation Income Tax Return, 2007-2014 as of November 2018; amounts reported on initial assessment.
*The definition of incorporated SMEs and large corporations are based on gross revenues at initial assessment and therefore may differ from the CRA's corporate income tax statistics. Figures may not add to total due to rounding.

Tables 5 to 7 present the five industry sectors with the highest concentration of corporate tax filers, taxable income and federal tax assessed for tax year 2014. The results are shown separately for SMEs and large corporations.

Almost half of SMEs (47.7%) and the majority of large corporations (63.4%) were concentrated in their respective top five industry sectors in tax year 2014 (Table 5). The highest proportion of SMEs was in the professional, scientific and technical services sector (14.2%) while the highest proportion of large corporations was in the manufacturing sector (19.7%).

[11] For more information, see Section 2.4.

Table 5: Top Five Industry Sectors with the Highest Proportion of Corporate Tax Filers by Corporation Size, Tax Year 2014

SMEs		Large Corporations	
Professional, scientific and technical services	14.2%	Manufacturing	19.7%
Construction	10.7%	Construction	14.0%
Real estate and rental and leasing	8.6%	Wholesale trade	10.5%
Management of companies and enterprises	7.2%	Retail trade	10.3%
Finance and insurance	7.0%	Finance and insurance	8.9%
Subtotal	**47.7%**	**Subtotal**	**63.4%**

Source: Business Number Registration, 2014 tax year as of December 2018 and T2 Corporation Income Tax Return, 2014 tax year as of November 2018.

The majority of reported taxable income from SMEs (55.3%) and large corporations (68.9%) was concentrated in their respective top five industry sectors in tax year 2014 (Table 6). The highest proportion of taxable income was in the finance and insurance sector for both SMEs (13.1%) and large corporations (26.7%).

Table 6: Top Five Industry Sectors with the Highest Proportion of Taxable Income by Corporation Size, Tax Year 2014

SMEs		Large Corporations	
Finance and insurance	13.1%	Finance and insurance	26.7%
Professional, scientific and technical services	12.5%	Manufacturing	17.7%
Health care and social assistance	11.7%	Wholesale trade	10.0%
Construction	10.0%	Management of companies and enterprises	9.2%
Real estate and rental and leasing	8.0%	Retail trade	5.3%
Subtotal	**55.3%**	**Subtotal**	**68.9%**

Source: Business Number Registration, 2014 tax year as of December 2018 and T2 Corporation Income Tax Return, 2014 tax year as of November 2018; amounts reported on initial assessment.

A large share of the total federal tax assessed for SMEs (56.4%) and large corporations (69.4%) was concentrated in their respective top five industry sectors in tax year 2014 (Table 7). Similar to taxable income, the highest proportion of federal tax assessed was in the finance and insurance sector for both SMEs (16.3%) and large corporations (28.0%).

Table 7: Top Five Industry Sectors with the Highest Proportion of Federal Tax Assessed by Corporation Size, Tax Year 2014

SMEs		Large Corporations	
Finance and insurance	16.3%	Finance and insurance	28.0%
Professional, scientific and technical services	11.2%	Manufacturing	16.1%
Health care and social assistance	10.2%	Wholesale trade	9.8%
Construction	9.4%	Management of companies and enterprises	9.8%
Management of companies and enterprises	9.3%	Retail trade	5.7%
Subtotal	**56.4%**	**Subtotal**	**69.4%**

Source: Business Number Registration, 2014 tax year as of December 2018 and T2 Corporation Income Tax Return, 2014 tax year as of November 2018; amounts reported on initial assessment.

The descriptive statistics presented above are based on the taxable income reported by corporations and the federal tax assessed by the CRA at initial assessment. However, like other taxpayers, corporations may be non-compliant with their tax obligations due to both intentional and unintentional actions ranging from honest mistakes to aggressive tax avoidance. These non-compliant actions can result in lower tax revenues for the government and contribute to the tax gap.

2.3 Tax Gap and the Types of Non-Compliance

Broadly defined, the tax gap is the difference between the taxes that would be paid if all obligations were fully met in all instances, and taxes that are actually paid and collected. In other words, the tax gap is a measure of tax revenue loss resulting from tax non-compliance. While the tax gap is sometimes seen as a measure of tax evasion or fraud, it is the result of both intentional and unintentional actions. For instance, non-compliance can be due to:

- deliberately under-reporting income or over-claiming deductions/credits;
- mistakes;
- ignorance of filing, reporting, or payment obligations; and
- inability to comply (such as when taxpayers declare bankruptcy and cannot pay their tax debt).

In general, non-compliance can occur at the time of filing, reporting or paying taxes. **Filing non-compliance** occurs when taxpayers fail to file their tax return when they are required to do so. Most Canadian-resident corporations file corporate income tax returns on time and, therefore, non-filing is considered to be a minor source of tax revenue loss for corporations compared to the other stages of non-compliance. Nevertheless, filing non-compliance by corporations that are not incorporated in Canada can be more difficult to detect. Filing non-compliance is not estimated in this report but may be examined in a future tax gap study.

Once corporations have filed their tax returns, there is potential **reporting non-compliance**. Corporations may fail to provide complete and/or accurate information in their tax return by under-reporting income and/or claiming deductions or credits to which they are not entitled. Reporting non-compliance generally accounts for a very high share of the overall corporate tax gap. In the United States (US), for example, corporate income tax reporting non-compliance represented about 93% of the overall estimated corporate tax gap from 2008-2010.[12] Given that reporting compliance is the largest factor contributing to the tax gap, this report focuses on corporations that do not accurately report income, deductions, and credits. Tax gap estimates related to reporting non-compliance by corporations are presented in Sections 3 and 4. Of note, this report only examines non-compliance identified through audits and does not report on the outcomes of objections or appeals which, if successful, could potentially reduce the tax gap. This approach of not considering the effect of appeals is consistent with how most other countries report on their tax gap estimates.

After corporations have been assessed by the CRA with additional taxes owing, **payment non-compliance** may occur when they do not fully pay the balance that is due by the payment deadline. The tax gap related to payment non-compliance is not examined in this report. A future tax gap study will examine this tax gap component in detail.

2.3.1 Base Erosion and Profit Shifting

In the context of the corporate income tax system, base erosion and profit shifting (BEPS) can also reduce tax revenues for the government. BEPS refers to instances where the interaction of different tax rules leads to double non-taxation or less than single taxation of business income. It also relates to arrangements that achieve no or low taxation of business income by shifting profits away from the jurisdictions where the activities creating those profits take place. No or low taxation is not per se a cause of concern, but it becomes so when it is associated with practices that artificially segregate taxable income from the activities that generate it.

Profits shifted abroad by corporations lower the amount of corporate taxes governments can collect. The Organisation for Economic Co-operation and Development (OECD), of which Canada is a member, reports that more than 100 empirical studies have been published, all of which suggest that such practices are an issue as they erode the tax base of higher-tax jurisdictions.

The appropriate treatment of BEPS for the purposes of tax gap estimation is complex. Due to the highly complex nature of BEPS transactions, it is often difficult to distinguish between legitimate and abusive activities based on information available to tax administrations. Many techniques are fully compliant with the laws of the countries involved and thus do not represent non-compliance as defined above. The initial OECD report Addressing Base Erosion and Profit Shifting (2013) concluded that no single law or provision is the root cause of BEPS, making it difficult to estimate accurately. The lack of data, particularly for profits booked in low-tax jurisdictions, complicates estimation procedures. Current BEPS estimation methods are experimental and are being developed primarily by the OECD and the academic community.

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[12] Internal Revenue Service. "Federal tax compliance research: tax gap estimates for tax years 2008-2010." https://www.irs.gov/pub/newsroom/tax%20gap%20estimates%20for%202008%20through%202010.pdf. Publication 1415. Washington, D.C., USA. 2016.

Given the lack of a generally accepted and reliable estimation methodology, this report does not provide an estimate of the overall federal tax revenue impact associated with BEPS. However, the tax gap estimates presented in this report do account for instances of BEPS that were clearly identified as tax non-compliance through audits. For example, a transfer-pricing issue identified by audit would be part of the tax gap estimates.

2.4 Scope of Tax Gap Estimation

Since corporations can range from small businesses to multinational corporations, this report provides tax gap estimates on two different groups of corporations based on their size. As previously mentioned, SMEs are defined as corporations with less than or equal to $20 million in total gross revenues or up to $50 million for certain industry sectors.[13] Large corporations are defined as corporations with total gross revenues above the SME threshold. The corporate population was divided into two groups to account for unique characteristics. For example, a majority of SMEs are comprised of small CCPCs that are subject to a lower tax rate, while large corporations tend to operate on a much larger scale, often including complex international transactions.

Similar to previously published tax gap reports, the analysis in this report is focused on changes in federal tax for a particular tax year. Therefore, the audit results presented in this report cannot be directly compared to those determining the impact of audit activities on public accounts, which account for amounts identified by audits completed in a given fiscal year regardless of the tax year subject to audit and include provincial/territorial taxes, interest charges and/or penalties.

This report presents statistics that capture both domestic and international non-compliance. Given that many audits involving corporate taxpayers examine a combination of domestic and international activities to identify non-compliance, it was not possible to develop separate estimates of domestic and international non-compliance. In addition, this report focuses on resident corporations that are incorporated and filing in Canada for tax purposes and, therefore, the tax gap estimates do not reflect the extent of tax non-compliance among non-resident corporations.

The corporate income tax gap is estimated using CRA's internal administrative data. In particular, random audit results are used to estimate the SME tax gap and risk-based audit results are used to estimate the tax gap for large corporations. For a variety of reasons, auditors may not always identify all sources of non-compliance in the course of conducting audits. For example, the scope of audits is sometimes limited to a subset of high-risk issues. Consequently, the actual tax gap may be somewhat higher than the estimates presented in this report. While certain countries have attempted to develop or incorporate "uplift factors" to account for undetected non-compliance, these remain imprecise and subjective. Additional research would be required to estimate an uplift factor that could be applied in the Canadian context.

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[13] This SME definition is based on how CRA audit programs are organized. Corporations with less than or equal to $50 million of gross income are from the following industry sectors: Manufacturing; Transportation and Allied Services; Wholesale Trade; and Retail and Services. This definition does not infer that other definitions of SMEs (for example, based on the level of revenues, assets and/or the number of employees) are not appropriate.

3. Tax Gap Results for Small and Medium-Sized Enterprises

To maintain and improve the fairness and integrity of the Canadian tax system, the CRA conducts targeted audits of taxpayers that are at high risk of non-compliance. These risk-based audits support the CRA's compliance strategy, which aims to minimize the compliance burden for a large number of taxpayers reporting correctly while dedicating valuable resources to high-risk areas. While risk-based audits help to identify the extent and nature of non-compliance for a particular subset of the population, non-compliance identified through these audits is difficult to generalize to the entire taxpayer population, because the sample is based on risk and not representative of all taxpayers. Consequently, tax gap estimation based on risk-based audit results requires specialized approaches in order to overcome the inherent selection bias in such data.

In contrast, audit findings based on a randomly selected sample of taxpayers (regardless of risk) will generally be representative of the entire taxpayer population. Using such a sample, it is possible to estimate the level of tax non-compliance within the population as a whole within a given margin of error. The CRA periodically conducts random audits of SMEs to better understand compliance trends and enhance risk-assessment systems. Random audit results can also be useful in producing robust tax gap estimates since tax non-compliance identified from a statistically representative sample of taxpayers can be extrapolated to the overall population. According to a 2015 OECD survey, 35 tax administrations reported having random audit programs in place and 12 reported that they use random audit results to produce tax gap estimates.[14] For example, Denmark, Finland and Sweden have estimated their corporate income tax gaps using random audit data while the Netherlands and the United Kingdom used random audit results to estimate their SME tax gaps.[15]

The CRA's most recent random audits of incorporated SMEs took place during fiscal years 2013-14 and 2014-15 and examined SMEs that filed a tax return for 2011. Using a stratified random sampling methodology, the CRA completed over 4,500 full-scope audits of SMEs operating in 21 industry sectors. The non-compliance issues that have been identified through these audits have helped the CRA to validate and refine its risk assessment systems. Based on the results from these random audits, the federal tax gap was estimated for tax year 2011. These results were then projected for tax year 2014 to remain consistent with the CRA's previous tax gap estimates. On this basis, the federal tax gap in 2014 before considering any audit results is estimated to be between $2.7 billion and $3.5 billion for SMEs or between 7% and 9% of overall federal corporate income tax revenue for that year. Due to the fact that risk-based audits for tax year 2014 are not all finalized, it is assumed that the federal tax adjustment from audit would be similar to a prior year[16] and on this basis, audits are expected to reduce the tax gap by $1.1 billion or by 31% to 40%. **After considering CRA audit activities, the tax gap for tax year 2014 is**

[14] Organisation for Economic Cooperation and Development. "Tax Administration 2017: Comparative Information on OECD and Other Advanced and Emerging Economies." OECD Publishing Press. 2017.

[15] Fiscalis Tax Gap Project Group. "The Concept of Tax Gaps Report II: Corporate Income Tax Gap Estimation Methodologies." European Commission Directorate-General Taxation and Customs Union, Brussels. 2018.

[16] The prior year was 2011 and included both risk-based and random audit results. For comparison, other years were also examined (without the presence of random audits) and the results were similar.

estimated to be between $1.6 billion and $2.4 billion or between 4% and 6% of overall federal corporate income tax revenue.

This section estimates the SME federal tax gap for tax year 2014 on the basis of random audit results. As indicated in Section 2, the outcomes of objections or appeals to audit findings are not examined.

3.1 Stratified Random Sampling Methodology

In order to develop reliable non-compliance estimates related to incorporated SMEs by industry, the CRA employed a stratified random sampling methodology. The sample was primarily drawn from the population of incorporated business filers with gross revenues of $20 million or less for tax year 2011. For some industry sectors, a higher gross revenue threshold of up to $50 million was employed.[17] Details on how the population was defined are presented in Annex 1. Based on these criteria, the SME population was comprised of approximately 1.4 million incorporated businesses in 2011 (target population) with more than 97% being CCPCs. These SMEs were grouped into 21 strata based on their industry sector and a random sample was taken from each stratum.[18] Stratification by industry sector helped ensure that each sector received proper representation within the sample.

Since the sample of SMEs is representative of the SME target population, the results can be extrapolated to determine the additional tax liability that would have been owed if all 1.4 million SMEs were audited for tax year 2011. Given that there is always some probability that the sample results may differ from what is happening in the overall SME target population (sampling error), a margin of error is also reported.

3.2 Results

Results from the over 4,500 audits indicate that about half of SMEs that were randomly audited made at least one reporting error on their corporate income tax returns for tax year 2011. Among audited taxpayers, about 37.6% of SMEs were assessed additional federal tax liability. On average, these SMEs were assessed for $1,721 (± $210) more in federal tax for tax year 2011. Extrapolating the results from this random sample of SMEs to the population as a whole, non-compliance for 2011 is estimated to be about $2.5 billion (± $0.3 billion) for 2011.[19]

The random audits also uncovered additional non-compliant taxpayers that were linked to the audited SMEs, such as individual shareholders and related corporations. Specifically, from 1,480 random audits of SMEs (or 33% of completed random audits), an additional 2,420 secondary audits were conducted, of which most were related to individual filers. These secondary audits of individual taxpayers resulted in an audit adjustment rate of 68%, mostly stemming from unreported or underreported shareholder

[17] For certain industry sectors, the sample was drawn from corporations with less than or equal to $50 million of gross income. These sectors were: Manufacturing; Transportation and Allied Services; Wholesale Trade; and Retail and Services.
[18] Industry sector groupings were based on the original North American Industry Classification System (NAICS) on the 2011 corporate income tax returns.
[19] The margin of error for the tax gap estimate is reported at the 95% confidence level. This means that if repeated samples were taken, there is a 95% chance that sample results plus/minus (±) the margin of error would represent what is truly happening in the overall target population.

benefits.[20] This reinforces one of the main findings from the previous international tax gap report: the importance of a holistic approach to audit that encompasses taxpayers and their related networks. Since the non-compliant taxpayers linked to SMEs were not the focus of the random audit study, the tax gap related to these non-compliant taxpayers was not estimated. More research is required to estimate the tax gap related to non-compliant shareholders of SMEs.

The stratified random audits undertaken by the CRA have identified important non-compliance issues that have helped validate and refine the Agency's risk assessment systems. In addition, these results provide a strong basis for a robust SME tax gap estimate for tax year 2014.

Given that the most recent stratified random audit results for SMEs are for tax year 2011, it was necessary to develop a method to extrapolate the findings to tax year 2014 to be consistent with other tax gap estimates previously published by the CRA. In order to account for changes in the SME tax base between 2011 and 2014, the growth rate of the total federal tax payable at initial assessment was applied to the 2011 SME tax gap. Between 2011 and 2014, the compound annual growth rate for incorporated SMEs was approximately 7.9%. It is important to note that due to data limitations, it was not possible to adjust for any fluctuation in non-compliance behaviours between 2011 and 2014. Accordingly, it was assumed that non-compliance rates remained stable during this time period. Other jurisdictions, such as the US and United Kingdom, have taken a similar approach to produce tax gap estimates for years where audit data are not available.[21]

After applying an annual growth rate of 7.9% for three years, the SME tax gap before considering any audit results was estimated to be between $2.7 billion and $3.5 billion in 2014 or between 7% and 9% of the overall federal corporate income tax revenue.[22] Due to the fact that many risk-based audits for tax year 2014 are not finalized, it is assumed that audit results would be similar to a prior year's and, on this basis, audits are expected to reduce the tax gap by $1.1 billion or by 31% to 40%. **Therefore, after considering CRA audit activities, the tax gap for tax year 2014 is estimated to be between $1.6 billion and $2.4 billion or between 4% and 6% of overall federal corporate income tax revenue.**

[20] If a shareholder of a corporation receives a benefit from the corporation, it is necessary to include the value of the benefit as income for tax purposes. Examples of shareholder benefits include corporate automobiles and loans provided to a shareholder.

[21] See Annex 2.

[22] This tax gap estimate could be an underestimate since the SME random audit population did not include the entire SME population. See Annex 1.

4. Tax Gap Results for Large Corporations

Unlike SMEs, the CRA relies exclusively on risk-based audits for the large corporation population due to the relatively small number of large corporations. The CRA continually monitors the large corporate population and risk assesses 100% of the identified population on a regular basis. Large corporations that are determined to be at a relatively high risk of non-compliance are subject to rigorous compliance audits. During this process, the CRA closely examines relevant books and records of corporations to make sure they fulfilled their tax obligations. Risk-based audits allow the CRA to focus its efforts on higher-risk taxpayers and reduce the compliance burden on businesses that are considered low risk. While risk-based audits make efficient use of audit resources, non-compliance identified through these audits cannot be directly extrapolated to the population due to selection bias. In order to address this bias, this section explains how statistical methodologies were applied to minimize selection bias and estimate the federal tax gap for large corporations.[23]

There is no consensus on the best method for estimating the tax gap for the large corporate population. However, certain methodologies have been applied by tax administrations in other countries using risk-based audit results. Adopting approaches used in the US and Italy, the CRA used two statistical techniques using risk-based audits results to measure the extent to which additional taxes would have been assessed if all large corporations were audited. The first method is the **extreme value methodology** that was adapted by the US Internal Revenue Service to develop its large corporate income tax gap estimates.[24] This section explains the use of the extreme value methodology to estimate the tax gap for large corporations in Canada, which closely follows the approach taken by Bloomquist, Hamilton, and Pope (2014) to estimate tax non-compliance.[25] The second method, which relies on **cluster analysis,** is similar to the post stratification method employed by the Italian Revenue Agency, but adopts an unsupervised machine learning approach.[26] Both the extreme value and clustering methods provide a statistical approach for removing selection bias to estimate the large corporate tax gap. However, these methods can either underestimate (extreme value) or overestimate (clustering) the tax gap. Therefore, both methods were used to create a range of tax gap estimates for the large corporation population. Given that risk-based audits of large corporations can take time to complete, the CRA used risk-based audit results for tax year 2011 to estimate the tax gap for both the extreme value methodology and cluster analysis.[27] To remain consistent with other tax gap estimates published by the CRA, the tax gap results were then projected to tax year 2014.

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[23] To further reduce bias, audits that were solely focused on the SR&ED credits were removed.

[24] Internal Revenue Service. "Federal tax compliance research: tax gap estimates for tax years 2008-2010." https://www.irs.gov/pub/newsroom/tax%20gap%20estimates%20for%202008%20through%202010.pdf. Publication 1415. Washington, D.C., USA. 2016.

[25] Bloomquist, K.M., S. Hamilton, and J. Pope. "Estimating corporation income tax under-reporting using extreme values from operational audit data." Fiscal Studies, 35, 4 pp. 401-419 2014.

[26] Fiscalis Tax Gap Project Group. "The Concept of Tax Gaps Report II: Corporate Income Tax Gap Estimation Methodologies." European Commission Directorate-General Taxation and Customs Union, Brussels. 2018.

[27] Risk-based audit results are product of an intensive process, starting from initial filing and risk assessment to the completion of rigorous risk-based audits, which can take a few years to complete. To ensure a large enough sample size, the most recent and complete year available at the time of writing was used to estimate the tax gap (tax year 2011).

Based on these statistical techniques, the federal tax gap in 2014 is estimated to be between $6.7 billion and $7.9 billion for large corporations before considering any audit results or between 17% and 20% of the overall federal corporate income tax revenue. Assuming audit results for tax year 2014 are similar to a prior year, CRA audits are expected to reduce the tax gap by $5.0 billion or by 64% to 75%. **After considering CRA audit activities, the tax gap for large corporations for tax year 2014 is estimated to be between $1.7 billion and $2.9 billion or between 4% and 7% of overall federal corporate income tax revenue.**

This section briefly describes the two statistical methods used to estimate the tax gap for large corporations with Section 4.1 providing an overview of the extreme value methodology and Section 4.2 providing an overview of cluster analysis. As indicated in Section 2, the outcomes of objections or appeals to audit findings are not examined.

4.1 Extreme Value Methodology

The CRA applied a statistical approach, commonly referred to as the extreme value methodology, to estimate the large corporate tax gap using risk-based audit results. This approach was selected because it has been employed in the US to estimate its corporate income tax gap and it has been employed in other contexts – academic and applied research – where there is a high degree of heterogeneity in a single population.[28]

The extreme value methodology relies on the assumption that audit adjustments among large corporations follow a distribution where the majority of tax non-compliance in the large corporate population is concentrated in a relatively small number of corporations. See Annex 3 for more details. An analysis is then performed to extrapolate tax non-compliance to the unaudited portion of the large corporation population.[29] An important feature of the extreme value methodology is that it takes selection bias into account. Since risk-based audits are undertaken based on the likelihood of identifying the largest amount of non-compliance, corporations that are audited will tend to be substantially more non-compliant than those not selected for audit. The extreme value methodology accounts for this tendency by assuming that all of the corporations with relatively extreme levels of non-compliance have been subjected to an examination under the risk-based audit selection process. As a consequence, it is assumed that non-compliance among unaudited corporations are lower than the amounts assessed for those audited corporations.

Using the extreme value methodology, the tax gap for tax year 2011 was estimated to be $6.2 billion (before audit results are considered). To be consistent with other tax gap estimates previously published by the CRA, it was necessary to translate these findings into tax year 2014.[30] The compound annual growth rate of federal tax payable for large corporations was approximately 2.7% between 2011 and 2014. After applying this rate to the 2011 tax gap, the federal tax gap for tax year 2014 before

[28] Bloomquist, K.M., S. Hamilton, and J. Pope, (2014).

[29] Risk-based audit results were transformed using a logarithmic scale to create an approximate linear relationship. A regression analysis was then employed to estimate the parameters of this relationship and project the extent of non-compliance within the unaudited large corporate taxpayer population.

[30] Other jurisdictions, such as the United Kingdom and the US, have taken a similar approach to produce tax gap estimates for years where audit data is not available. For more information on the extreme value methodology, refer to Annex 3.

considering any audit results is estimated to be $6.7 billion for large corporations or 17% of overall federal corporate income tax revenue. **After considering audit results, the tax gap for large corporations for tax year 2014 is estimated to be $1.7 billion or 4% of overall federal corporate income tax revenue.**

The extreme value methodology has certain limitations. For instance, since risk-based audit selection cannot be perfect, it is possible that some of the unexamined corporations may have relatively extreme levels of non-compliance. If so, the methodology will tend to under-estimate the extent of non-compliance within the unaudited population. As such, the tax gap estimate derived from this methodology is used as a lower-bound estimate for the large corporate population.

4.2 Cluster Analysis

Cluster analysis refers to an unsupervised machine learning technique in the field of artificial intelligence that is used for identifying subgroups or “clusters” in a population, where elements within a cluster are more similar to each other than to those in other clusters. In the context of tax gap analysis, a clustering technique was used to assign large corporations into relatively distinct clusters on the basis of their characteristics in order to estimate the potential level of non-compliance within each cluster. Characteristics included, among others, corporation type, industry sector, financial ratios, the presence of foreign affiliates and the level of international transactions. Within each cluster, unaudited members were assumed to have the same ratio of non-compliance level to reported gross revenue as audited members. The estimated tax gap for the large corporation population was obtained by aggregating the potential levels of non-compliance across all clusters.

This method is similar to the post-stratification method used by the Italian Revenue Agency to estimate its corporate tax gap. Post-stratification is a statistical approach whereby taxpayers are manually divided into subgroups based on characteristics that are deemed relevant to the audit selection process. Risk-based audit results from audited taxpayers are then used to impute the level of non-compliance among unaudited taxpayers within the same group. However, unlike the post-stratification approach where similar corporations are grouped together manually, cluster analysis uses artificial intelligence to find patterns in large tax datasets and select clusters that optimize the similarity of the corporations within each cluster.

The CRA’s cluster analysis identified between 10 and 20 key characteristics and grouped large corporations into a total of 63 clusters. For each of these clusters, a tax gap was calculated by assuming that the level of non-compliance for corporations that were not audited is the same as the audited population within their cluster. See Annex 4 for details. The tax gap from all the clusters were then added together to estimate an overall federal tax gap for large corporations for tax year 2011. The resulting estimate was approximately $7.3 billion (before considering audit results). Consistent with the approach taken in the extreme value methodology, the compound annual growth rate of the total federal tax payable for large corporations between 2011 and 2014 was used to project the 2014 tax gap. After applying an annual growth rate of 2.7% for three years, the federal tax gap for tax year 2014 before considering any audit results is estimated to be $7.9 billion for large corporations or 20% of overall federal corporate income tax revenue. **After considering audit results, the tax gap for large corporations for tax year 2014 is estimated to be $2.9 billion or 7% of overall federal corporate income tax revenue.**

Cluster analysis attempts to address selection bias by grouping audited and unaudited corporations together into distinct clusters based on the similarity of their relevant characteristics. The main assumption is that corporations with similar characteristics will tend to exhibit similar levels of non-compliance. More specifically, it is assumed that an examination of an unaudited large corporation within a cluster would result in a tax adjustment that is similar to that made for audited corporations within the same cluster. A limitation of this methodology is that audited and unaudited taxpayers within a cluster may still have some relevant differences that have not been accounted for by the clustering algorithm. The unaccounted differences can lead to over-estimating the tax adjustments that unaudited taxpayers in the cluster could have received if they had been subjected to an examination. This is because large corporations that are selected for risk-based audits should have higher levels of non-compliance than those that are not selected for audit. Therefore, this report uses the tax gap estimate derived from the cluster analysis as an upper-bound tax gap estimate for large corporations.

This section presented the federal tax gap estimates for large corporations in tax year 2014. Using risk-based audit results, two methods were applied to project a lower-bound and an upper-bound tax gap estimate for large corporations. Based on these methods, the federal tax gap in 2014 is estimated to be between $6.7 billion and $7.9 billion for large corporations before considering any audit results or between 17% and 20% of the overall federal corporate income tax revenue. Assuming audit results for tax year 2014 are similar to a previous year[31], audits are expected to reduce the tax gap by $5.0 billion or by 64% to 75%. **After considering audit results, the tax gap for large corporations for tax year 2014 is estimated to be between $1.7 billion and $2.9 billion or between 4% and 7% of overall federal corporate income tax revenue.**

[31] The prior year was 2011 and included only risk-based audit results. For comparison, other years were also examined and similar results were attained.

5. CRA's Compliance Efforts

While the majority of corporations are compliant with their tax obligations, some corporate taxpayers may under report their income or claim deductions and credits to which they are not entitled. This raises important fairness issues and potentially reduces the competitiveness of businesses that comply with the law. Therefore, the CRA strives to reduce tax non-compliance through outreach and enforcement to protect the integrity of Canada's corporate income tax system.

The last several federal budgets have invested in improving corporate compliance through both domestic and international measures. Given that these investments would affect tax years later than 2014 – the focus of this report – it is expected that budget investments will contribute to lowering the tax gap in future years. This section describes the CRA's key compliance efforts targeted at SMEs and large corporations.

5.1 Compliance Efforts for Small and Medium-Sized Enterprises

The SME population is large and diverse, with thousands entering and leaving its ranks each year. In tax year 2014, there were over two million incorporated SMEs representing 99% of corporate taxpayers in Canada. Recognizing that SMEs face different tax compliance challenges than larger corporations, the CRA focuses on using the right intervention based on risk in order to respond effectively and efficiently to the unique compliance challenges posed by the SME population. By using a wide range of interventions that are tailored to the risk of non-compliance, the CRA is better able to take appropriate enforcement actions to both prevent and reduce the tax gap. Specifically, the CRA takes a three-pronged approach: early education, detection, and enforcement. These approaches as well as the CRA's compliance efforts related to the underground economy (UE) and the Voluntary Disclosures Program are briefly described below.

5.1.1 Early Education

For SMEs at low risk of non-compliance, the CRA focuses on initiatives such as educational outreach and reminder letters, to encourage voluntary compliance and reduce common reporting errors. This includes a CRA video series for businesses on how to avoid common mistakes[32], the Industry Campaign Approach and the Liaison Officer service. These initiatives focus on preventing the tax gap and getting it right from the start.

The Industry Campaign Approach encourages voluntary tax compliance within certain industry sectors. Specifically, the CRA works with industry associations to provide businesses with sector-specific tax information that will help them to comply with their tax obligations. The Industry Campaign Approach is intended to encourage SMEs to self-correct and take steps to prevent common mistakes in their specific industry sectors. So far, the Industry Campaign Approach has sent customized letters to taxpayers in five different industry sectors to inform and educate these taxpayers on their tax responsibilities.[33] In 2017-18, around 21,000 letters were issued to help taxpayers comply with their tax obligations.

[32] The CRA's video series can be found here: https://www.canada.ca/en/revenue-agency/news/cra-multimedia-library/businesses-video-gallery.html

[33] The five industry sectors are: support services of the mining and oil and gas extraction industries, cattle ranching and dairy farming, child daycare services, graphic design services, and hardware stores.

The Liaison Officer service helps small businesses understand their tax obligations through in-person visits or seminars. A Liaison Officer answers tax-related questions, addresses potential concerns, explains common tax errors, provides information on various tools and services offered by the CRA, and explains general bookkeeping concepts and best practices. During 2017-18, the Liaison Officer service conducted over 8,600 taxpayer visits and delivered 33 seminars to more than 260 taxpayers. Building on the success of this initiative, the Liaison Officer service will expand its services to incorporated small businesses in 2019.

5.1.2 Detection

The CRA continues to enhance its detection capabilities in order to ensure that its audit and enforcement activities are focused on corporations with the highest risk of non-compliance. For example, the CRA is enhancing its risk assessment of the SME population by accelerating the development of risk algorithms and business intelligence tools to better identify complex tax schemes and arrangements. Furthermore, the CRA is exploring new and innovative ways to identify high-risk corporations for audit, including data mining and machine learning techniques which are being used to develop predictive models. Predictive models for SMEs will supplement existing CRA tools that are currently being used to detect non-compliance.

5.1.3 Enforcement Actions

For corporations that are at higher risk of non-compliance, progressively more aggressive interventions are undertaken, including audits, penalties and even criminal investigations. For instance, the CRA conducts targeted audits on the SME population that are at high risk of non-compliance. This risk-based compliance strategy minimizes the compliance burden for the majority of taxpayers who report correctly while dedicating valuable resources to high-risk SMEs. While comprehensive risk-based audits can take a few months up to a few years to complete, they help recover additional tax revenues, deter others from engaging in similar behaviour and reduce the size of the tax gap.

The CRA also conducts criminal investigations for tax evasion, tax fraud, and other serious violations of tax laws, and, where warranted, refers files to the Public Prosecution Services of Canada for criminal prosecution.

5.1.4 Underground Economy

The underground economy (UE) is commonly understood as economic activity or income that is purposely hidden from public authorities, which can include working under the table or skimming (when revenues are under-reported or costs over-reported to understate net income). The CRA attaches a high priority to addressing UE activity for SMEs because some businesses work in sectors of the economy characterized by cash transactions (e.g., construction and hospitality) and can be at a higher risk of non-compliance.

To address non-compliance from UE activities, the CRA has a dedicated UE strategy[34] and consults with the Minister's Underground Economy Advisory Committee.[35]

The CRA also has Underground Economy Specialist Teams located across the country with advanced training in identifying unreported and under-reported income. These teams focus on high-risk industry sectors such as construction, real estate, and retail to identify UE tax non-compliance. The CRA also uses sophisticated tools to analyze point-of-sale data to detect certain software that hide sales of goods and services in particular sectors of the economy.

5.1.5 Voluntary Disclosures Program

The Voluntary Disclosures Program (VDP) offers taxpayers, including incorporated businesses, a chance to correct inaccurate or incomplete information on a previously filed tax return or to disclose omitted information that should have been provided to the CRA. Taxpayers who make a valid disclosure have to pay taxes owing, plus interest in part or in full. However, participating taxpayers are eligible for relief from prosecution and, in some cases, from penalties that they would otherwise be required to pay. In 2017, the CRA tightened the eligibility criteria and the potential relief available under the VDP. For instance, the Limited Program under VDP provides limited relief where there is an element of intentional conduct on the part of the taxpayer or a closely related party. The revised VDP came into effect in March 2018.[36]

5.2 Compliance Efforts for Large Corporations

Canada has about 15,000 large corporations, representing less than one percent of all incorporated businesses. While the number of large corporations is small compared to SMEs, they contribute about half of the total corporate income tax revenues at the federal level. Furthermore, large corporations and their economic activities are generally more complex and global, presenting additional challenges to identify non-compliance. Therefore, the CRA has a number of compliance strategies in place to identify and address the tax non-compliance of large corporations. This section highlights some of these compliance strategies including risk-based audits conducted by integrated teams of auditors, collaboration with international partners and international compliance programs.

5.2.1 Risk-based Audits Conducted by Integrated Teams of Auditors

As part of its approach to large business compliance, the CRA focuses its compliance efforts on large corporations that are at a higher risk of non-compliance. The CRA's integrated teams include domestic tax, international tax, and abusive tax avoidance auditors who have extensive knowledge in regard to complex tax issues. In addition, the CRA continues to strengthen its internal capacity by adding technical experts including lawyers, valuation specialists, economists, data scientists and industry sector

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[34] Canada Revenue Agency. Underground Economy Strategy 2018-2021. https://www.canada.ca/en/revenue-agency/programs/about-canada-revenue-agency-cra/corporate-reports-information/underground-economy-strategy-2018-2021.html. 2018.

[35] The Minister's Underground Economy Advisory Committee is comprised of representatives from the business community, tax professionals and academia. Committee members offer advice to the Minister of Revenue on current trends in the UE, help the CRA identify emerging risks, deepen the CRA's understanding of taxpayer compliance behaviour, and contribute to the development of innovative compliance tools.

[36] Canada Revenue Agency. Backgrounder - Voluntary Disclosures Program. https://www.canada.ca/en/revenue-agency/news/2017/12/backgrounder_-_voluntarydisclosuresprogram.html 2018.

specialists to assist in auditing high-risk multinational corporations and unravelling complex international and abusive tax avoidance transactions. All intelligence gathered by these teams is fed back into the CRA's risk-assessing systems to better address non-compliance. This allows the CRA to focus its efforts within the large business population on the highest risk, least cooperative taxpayers, and to reduce the compliance burden for businesses that are considered low risk.

In addition, the CRA continually monitors its risk assessment processes to ensure that 100% of the identified large business population is risk-assessed on an annual basis. For example, Integrated Large Business Audit Teams are assigned to the highest-risk large business taxpayers for a constant examination. For large corporations that are transparent and are considered low-risk, they can reasonably expect earlier tax certainty and reduced compliance burden. However, for those that are considered to be the highest-risk taxpayers and for those who engage in abusive tax avoidance and non-cooperative practices, they will be subject to rigorous compliance audits. This approach allows the CRA to allocate resources more effectively to taxpayers where tax leakage is more likely.

To ensure a tax system that is responsive and fair to all Canadians, tackling international tax evasion and abusive tax avoidance also includes recognizing the importance of improving communications with Canadians. As part of its Approach to Large Business Compliance, the CRA meets with company executives to communicate unresolved compliance issues and, if applicable, any issues experienced by an audit team over the course of an audit.

5.2.2 Collaboration with International Partners

Collaboration with international partners is crucial to detecting and addressing tax non-compliance of multinational corporations. The CRA has a leadership role both bilaterally and multilaterally with other countries in the growing global network to address international tax non-compliance. For example, Canada is part of the OECD's Forum on Tax Administration which promotes international tax positions, reduces tax barriers, increases transparency around global tax issues, and coordinates strategies that will ensure that multinationals are paying their fair share of tax.

In addition, the CRA is part of the Joint International Taskforce on Shared Intelligence and Collaboration (JITSIC), which facilitates cooperation between 40 tax administrations to tackle international non-compliance. JITSIC increases public awareness of risks associated with offshore non-compliance and investigates abusive tax schemes such as cross-border financing arrangements, foreign tax credit generation and exploitation of offshore trust structures. JITSIC also facilitates exchanges of information relating to the Panama and Paradise Papers. The CRA's review of the Panama Papers has identified over 3,330 offshore entities with 2,670 possible beneficial owners that have some link to Canada. Over 80% of these possible beneficial owners have been reviewed. Further, the CRA is currently auditing over 1,100 taxpayers with offshore links, 10% of which relate to the Panama Papers.

5.2.3 Offshore and International Tax Compliance Programs

In addition to its international programs and initiatives aimed at large businesses, the CRA also has several programs and initiatives focused on offshore non-compliance specifically. These are described below.

Offshore Tax Informant Program

The Offshore Tax Informant Program was launched in 2014 and allows the CRA to award payments to individuals who provide credible and specific information about major international tax non-compliance. A payment representing a percentage of the federal tax collected can be made to informants, under certain conditions.

The Offshore Tax Informant Program has allowed the CRA to uncover information that would not otherwise have been available to the CRA and has resulted in new audits and investigations. From January 2014 to March 2018, the Offshore Tax Informant Program received over 1,200 informant calls, over 500 written submission, entered into 30 contracts with informants and identified $29 million in additional federal taxes and penalties to date. Of the $29 million in additional taxes identified so far, 91% is from personal income tax returns. By their very nature, international audits of large corporations are often complex and can take longer to complete.

Electronic Funds Transfers

As of January 2015, Canadian financial institutions such as banks and credit unions began reporting to the CRA on incoming and outgoing international electronic funds transfer information for transfers of $10,000 or more. This mandatory reporting requirement helps the CRA to better identify Canadian resident taxpayers who may be attempting to conceal income and assets offshore to avoid Canadian taxes.

As of March 31, 2018, the CRA analyzed over 187,000 electronic funds transfers worth over $177 billion. The CRA completed a review of electronic funds transfers in eight jurisdictions of concern and will continue to increase its coverage going forward. The CRA is also developing technology to automatically integrate the electronic funds transfer data with other available CRA data to better identify high-risk transactions.

Common Reporting Standard

The Common Reporting Standard was developed by the OECD as a new international standard for the automatic exchange of financial account information between tax administrations. Specifically, the Common Reporting Standard requires financial institutions (e.g., banks, credit unions) in a given jurisdiction to report information on financial accounts held by non-residents such as the taxpayer's name, address, account number, and account balance. Over 100 jurisdictions have committed to implement this new standard. The CRA began receiving offshore financial account information held by Canadian tax residents in September 2018.

Country-by-Country Reporting

In June 2017, Canada signed the OECD's Multilateral Convention to Implement Tax Treaty Related Measures to Prevent BEPS. This agreement allows treaty partners to share financial information on multinational corporations through the implementation of the Country-by-Country reporting.

The Country-by-Country reporting requires multinational corporations to provide information on their global operations in each tax jurisdiction where they do business. This requirement is part of a global initiative by the OECD and G20 to enhance transparency. Canada has passed the necessary domestic legislation to enforce reporting compliance, developed electronic forms to promote electronic filing, published guidelines for stakeholders and taxpayers, and developed the necessary infrastructure to exchange the information securely. Canada is now exchanging these reports with its international partners. Canada is one of 69 nations exchanging information, which helps the CRA to better risk assess multinationals for tax compliance.

Offshore Compliance Advisory Committee

In April 2016, the Minister of National Revenue established the Offshore Compliance Advisory Committee, an independent expert advisory committee on offshore tax evasion and aggressive tax planning. The mandate of the committee is to advise the Minister and the CRA on strategies to combat offshore tax non-compliance and consider the administrative measures needed to help protect the overall fairness and transparency of the Canadian tax system.

The CRA has made important program and policy changes using the advice and recommendations of the Offshore Compliance Advisory Committee such as the tightening of the Voluntary Disclosures Program criteria, and strengthening the governance around the use of audit agreements. The Offshore Compliance Advisory Committee's advice and recommendations will continue to broaden the CRA's understanding of risks, trends and practices in relation to offshore tax matters and assist the CRA to reduce international non-compliance.

This section described some of the CRA's initiatives to address international non-compliance. In addition, Budget 2019 is expected to further strengthen the CRA's ability to reduce tax non-compliance. For example, to help the CRA stay ahead of non-compliance schemes driven by the use of new, advanced technologies, Budget 2019 proposed to invest in the CRA's information technology systems so that the infrastructure used to address tax non-compliance continues to evolve. These efforts and continual modification of compliance tools based on business intelligence is expected to help reduce the corporate income tax gap going forward.

6. Conclusion

This report examined the corporate income tax gap related to incorporated SMEs and large corporations. It represents the fifth tax gap paper in the series and supports the government's commitment to report in an open and transparent manner.

Section 2 of the report outlined the key features of the federal corporate income tax system, presented descriptive statistics on corporate taxpayers, provided background information on the stages of non-compliance, and outlined the scope of tax gap estimation.

- There were approximately 2.1 million corporate tax filers for tax year 2014 of which more than 99% were comprised of SMEs and less than one percent were large corporations.
- Corporations reported approximately $298 billion in taxable income and $40.9 billion in total tax payable at initial assessment for tax year 2014. Large corporations alone reported about 52% of the total corporate taxable income and contributed to about 54% of the federal tax assessed in respect of corporations.

Section 3 outlined the results from a CRA random audit of SMEs and estimated Canada's tax gap for incorporated SMEs using these results.

- For the 2014 tax year, the federal tax gap for SMEs was between $2.7 billion and $3.5 billion before considering any audit results or between 7% and 9% of overall federal corporate income tax revenue.
- Assuming audit results for tax year 2014 are similar to a previous year, audits are expected to reduce the tax gap by $1.1 billion or by 31% to 40%.
- **After considering CRA audit results, the tax gap for SMEs for tax year 2014 is estimated to be between $1.6 billion and $2.4 billion or between 4% and 6% of overall federal corporate income tax revenue.**

Section 4 estimated Canada's large corporate tax gap using risk-based audit results and two statistical techniques, extreme value methodology and cluster analysis, to measure the extent to which additional taxes would have been assessed if all corporations were subject to audits.

- Using these methods, the federal tax gap for large corporations before considering any audit results is estimated to be between $6.7 billion and $7.9 billion for tax year 2014 or between 17% and 20% of overall federal corporate income tax revenue.
- Assuming audit results for tax year 2014 are similar to a previous year, audits are expected to reduce the tax gap by $5.0 billion or by 64% to 75%.
- **After considering CRA audit results, the tax gap for large corporations for tax year 2014 is estimated to be between $1.7 billion and $2.9 billion or between 4% and 7% of overall federal corporate income tax revenue.**

Section 5 highlighted the CRA's key compliance efforts in respect of SMEs and large corporations. These compliance efforts have been instrumental in identifying corporate tax non-compliance and will continue to reduce the corporate component of the tax gap.

In summary, this report provides an in-depth analysis of Canada's corporate tax gap and delivers on the Government's commitment to transparency. The overall federal corporate income tax gap for tax year 2014 is estimated to be between $9.4 billion and $11.4 billion before considering any audit results. Assuming audit results from tax year 2014 are similar to a prior year, audits are expected to reduce the tax gap by $6.1 billion or by 55% to 66%. After considering audit results, the tax gap for tax year 2014 is estimated to be between $3.3 billion and $5.3 billion or between 8% and 13% of overall federal corporate income tax revenue (see Table 8).

Table 8: Federal Corporate Income Tax Gap Estimates for Tax Year 2014*

	SMEs	Large Corporations	Total
Number of Filers	2,098,300	14,650	2,112,950
Tax Gap before Audit	$2.7-$3.5 billion	$6.7-$7.9 billion	$9.4-$11.4 billion
Impact of Audit**	$1.1 billion	$5.0 billion	$6.1 billion
Tax Gap after Audit	**$1.6-$2.4 billion**	**$1.7-$2.9 billion**	**$3.3-$5.3 billion**

Source: T2 Corporation Income Tax Return, 2014 tax year as of November 2018
*Figures may not add to total due to rounding.
** Given that audits for tax year 2014 are not all finalized, the potential federal tax adjustment from audit is projected from tax year 2011. These figures in the report do not include future audit adjustments and cannot be directly compared to other audit statistics published by the CRA.

The corporate income tax gap estimates presented in this report are based on CRA's internal administrative data. In particular, random audit results are used to estimate the SME tax gap and risk-based audit results are used to estimate the tax gap for large corporations. For a variety of reasons, auditors may not always identify all sources of non-compliance when conducting audits. Consequently, the actual tax gap may be somewhat higher than the estimates presented in this report. While certain countries have attempted to develop or incorporate "uplift factors" to account for undetected non-compliance, these remain imprecise and subjective. Additional research would be required to estimate an uplift factor that could be applied in the Canadian context.

Combining the corporate income tax gap with other tax gap components previously published by the CRA, Canada's federal tax gap in 2014 is estimated to be between $21.8 billion and $26.0 billion before considering any audit results or between 10.6% and 12.6% of corresponding revenues. This estimate provides a picture of the overall federal tax gap for Canada's major revenue-generating taxes and will help inform compliance and enforcement efforts to further reduce Canada's tax gap. The CRA intends to build on this research by continuing to study various aspects of the tax gap. The CRA will also continue to collaborate with tax administrations from other countries and other tax gap experts to provide robust tax gap estimates in a transparent manner.

Moving forward, subsequent tax gap reports will examine topics such as the payment gap, excise tax gap, non-compliance in the claiming of deductions and credits by individuals, and the impact of audits at reducing the overall tax gap. As well, Canada's tax gap estimates will be regularly updated to ensure they remain relevant. Through an ongoing effort to understand different components of Canada's tax gap, the CRA will continue to preserve the integrity of the tax system and protect Canada's revenue base that supports programs and benefits that improve the quality of life of all Canadians.

Annex 1: Small and Medium-Sized Enterprise Population for Random Audits

The CRA's Domestic Compliance Programs Branch conducted the most recent random audits of incorporated SMEs during fiscal years 2013-14 and 2014-15. The SME target population for random audits included all SME corporations that were active and filed a corporate income tax return for the 2011 tax year, after the following exclusionary criteria were applied:

- Filers with gross revenue greater than $20 million, except for those in certain designated industries where the limit was raised to $50 million. These industries were Manufacturing; Transportation and Allied Services; Wholesale Trade; and Retail & Services;
- SME corporations that are a subsidiary or otherwise controlled by a large corporation;
- bankrupt filers;
- filers recently audited or under audit; and
- public sector entities such as municipalities, universities, schools, hospitals, charities, and non-profit organizations.

Over 1.4 million corporate filers were included in the SME target population for tax year 2011, and a sample of more than 4,500 completed random audits was used for estimating SME non-compliance for tax year 2011, including the federal tax gap.

Annex 2: Estimating the 2014 Small and Medium-Sized Enterprise Tax Gap

In order to gross up the 2011 SME tax gap to 2014, it was necessary to account for changes in the SME tax base as a result of economic growth and changes in certain tax laws. Accordingly, the growth rate of the total federal tax payable at initial assessment for SMEs was used to account for these factors.[37] For example, this growth rate would account for the economic growth of SMEs as a result of higher income levels and a growing number of SMEs. In addition, it would account for legislative changes such as changes to deductions, credits and tax rates. Between 2011 and 2014, the compound annual growth rate of federal tax payable for SMEs was approximately 7.9%.

Due to data limitations, it was not possible to adjust for any fluctuation in non-compliance behaviours between 2011 and 2014. Accordingly, it was assumed that non-compliance rates remained stable during this time period. Other jurisdictions, such as the United Kingdom and the US, have taken a similar approach to produce tax gap estimates for years where audit data is not available.[38]

In order to gross up the 2011 SME tax gap to tax year 2014, the compound annual growth rate of 7.9% was applied to the 2011 federal tax gap for SMEs for three years:

$$\mathbf{2014\ SME\ Tax\ Gap} = \text{2011 SME Tax Gap} \times (1 + 0.0792)^{(2014-2011)}$$

To remain consistent, the compound annual growth rate approach was used to project the 2014 tax gap estimates for large corporations for both the extreme value methodology and cluster analysis. For more information, see Annex 3 and Annex 4.

[37] The growth rate of the total federal tax payable at initial assessment was used to stay consistent with the approach used for projecting the 2014 tax gap for large corporations.

[38] Her Majesty's Revenue and Customs. "Measuring tax gaps 2018 edition: Tax gap estimates for 2016-17." https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/715742/HMRC-measuring-tax-gaps-2018.pdf. 2018.

Annex 3: Extreme Value Methodology

The extreme value methodology in the context of estimating tax non-compliance has been employed by the US Internal Revenue Service to develop its large corporate tax gap estimates and it was refined by Bloomquist, Hamilton, and Pope (2014). Since risk-based audits of large corporations can take a few years to complete, audit results from tax year 2011 were used to estimate the tax gap.[39] Applying a similar method used by the US, the tax gap estimate was projected to tax year 2014.

The extreme value methodology relies on risk-based audit results to derive a tax gap estimate based on an assumed power law distribution. Under a power law distribution, the amount of federal tax adjustments from audit is inversely related to a corporation's non-compliance ranking in the population. This implies that the magnitude of non-compliance will tend to drop off exponentially as one moves down the ranks of corporations from the most to the least non-compliant.[40] To estimate the tax gap using the extreme value methodology, four steps are taken.

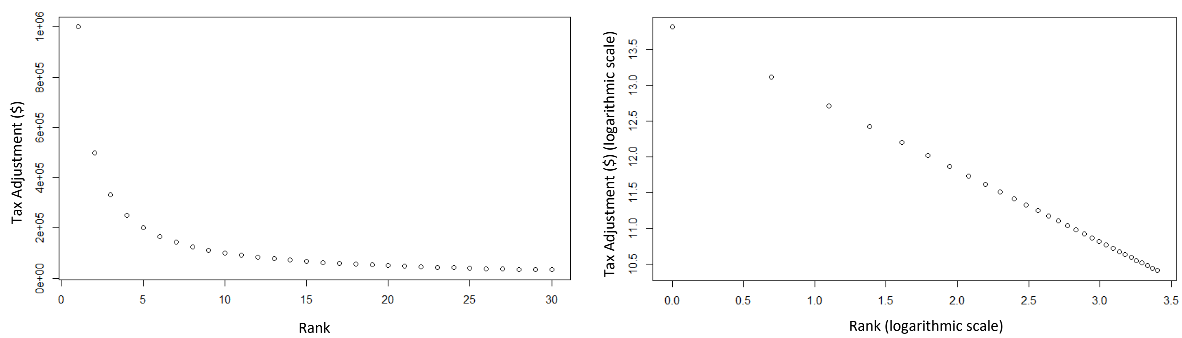
Step 1: Identify audit cases with positive federal tax adjustments and sort them in ascending order by federal tax adjustment amount. In this step, the ranking of non-compliance is determined based on the amount of federal tax adjustments from audit. For example, the corporation with the largest federal tax adjustment would be ranked one, the corporation with the second largest federal tax adjustment would be ranked two, and so on. Only the audited corporations with relatively extreme levels of non-compliance are included; corporations with small tax adjustments below a specified threshold are excluded.

Step 2: Transform the data on the taxpayer ranking and the underlying federal tax adjustment to a logarithmic scale. Under the power law distributional assumption, the relationship between the logarithm of the taxpayer ranking and the logarithm of the federal tax adjustment should approximate a linear relationship. Figure A1 provides an illustrative example of a power law relationship between measures of size and rank when these two variables are plotted based on their values and when they are plotted based on the logarithms of these values.

[39] Given that comprehensive risk-based audits can take a couple of years to complete, it was necessary to use historical audit data from earlier tax years to project the potential tax gap for tax year 2014. Tax years prior to 2011 were not considered to avoid the confounding effects of the 2008-2009 recession.

[40] Specifically, non-compliance will decline exponentially with the logarithm of the non-compliance ranking.

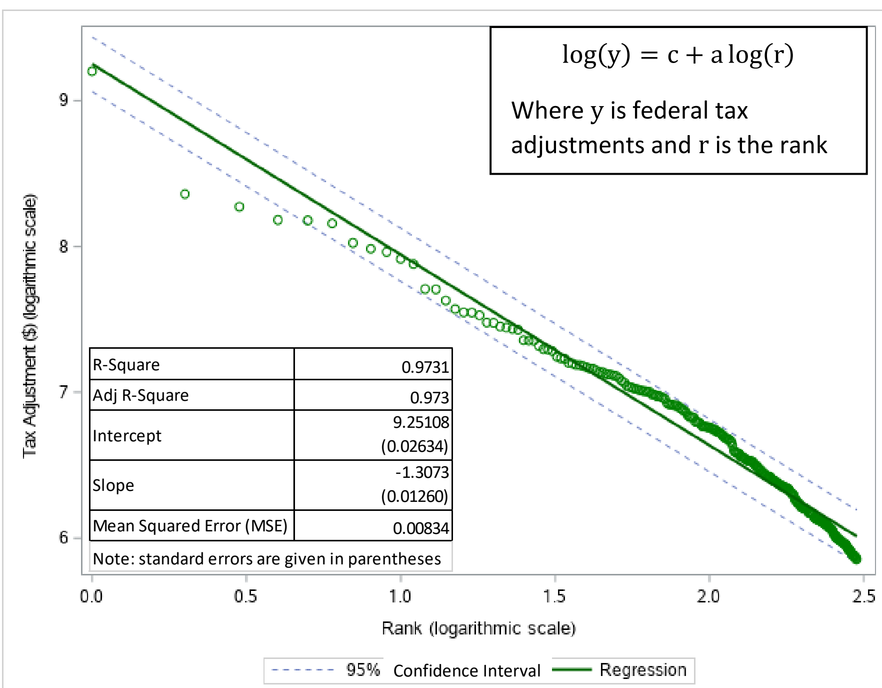
Figure A1: An Illustrative Example of the Power Law Distribution and Its Logarithmic Transformation



Source: Simulated data

Step 3: Apply ordinary least squares (OLS) regression to estimate the federal tax adjustments of unaudited large corporations. Figure A2 is an illustration of the OLS regression used to estimate the large corporate income tax gap.

Figure A2: OLS Regression to Estimate the Large Corporate Tax Gap, 2011



Source: T2 Corporation Income Tax Return, 2011 tax year as of November 2018; audit adjustments found by CRA audits

Step 4: To stay consistent with the CRA's other tax gap estimates, the compound annual growth rate of the total federal tax payable at initial assessment for large corporations (2.7%) was applied to the 2011 taxation year to project the 2014 tax gap estimate. Using this growth rate, the tax gap is estimated for tax year 2014. A similar approach is also used by the US to project their tax gap estimates.[41] Due to data limitations, it was not possible to adjust for any fluctuation in non-compliance behaviours between 2011 and 2014. Accordingly, it was assumed that non-compliance rates remained stable during this time period.

$$\textbf{2014 Large Corporation Tax Gap} = \text{2011 Large Corporation Tax Gap} \times (1 + 0.0273)^{(2014-2011)}$$

As mentioned in the Section 4, the extreme value method assumes that large corporations with the highest levels of non-compliance are audited. Since risk-based audit selection is not perfect, the extreme value method is used to derive a lower-bound tax gap estimate for the large corporate population.

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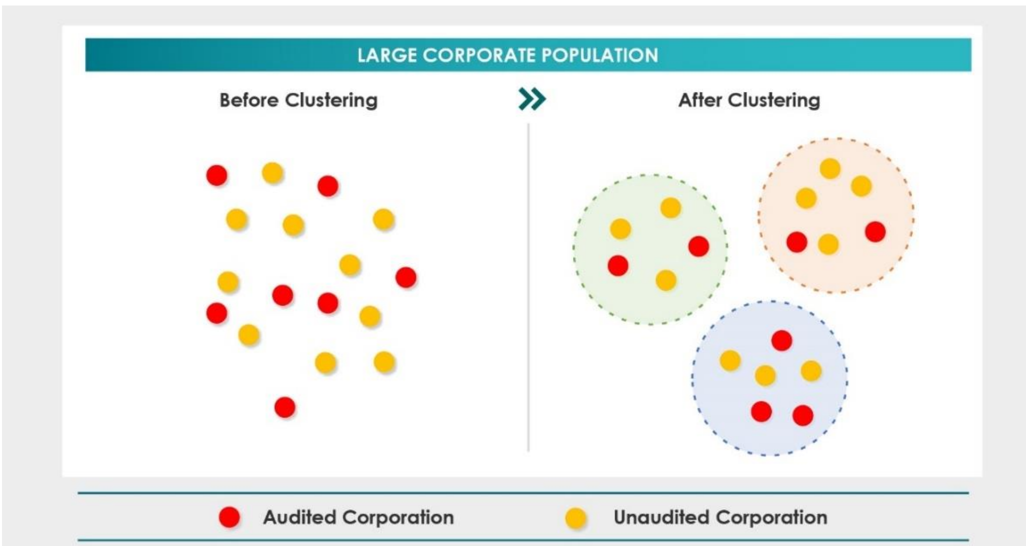
[41] Internal Revenue Service. "Federal tax compliance research: tax gap estimates for tax years 2008-2010." https://www.irs.gov/pub/newsroom/tax%20gap%20estimates%20for%202008%20through%202010.pdf. Publication 1415. Washington, D.C., USA. 2016.

Annex 4: Cluster Analysis

In addition to the extreme value methodology, a clustering technique was used to determine whether large corporations could be organized into relatively distinct clusters on the basis of certain key characteristics and to estimate the potential level of non-compliance within each cluster. See Box A1 for an illustrative example of clustering. Once the large corporate population was divided into clusters, federal tax adjustments from audited corporations were extrapolated to the entire cluster to estimate the projected federal tax adjustment if all large corporations within the same cluster had been audited. The overall federal tax gap is then estimated by aggregating the projected amounts of non-compliance across all clusters.

Box A1: An Illustrative Example of Cluster Analysis



The left-hand side illustrates the entire large corporate population, some that have been subject to a risk-based audit (red dots) and other that have not been audited (yellow dots). A clustering algorithm is used to group the corporations into clusters (green, orange, blue circles) based on key characteristics including, among others, corporation type, industry sector, financial ratios, the presence of foreign affiliates and the level of international transactions. Once they are grouped together, federal tax adjustments from already audited corporations (red dots) are extrapolated to the entire cluster to estimate the potential federal tax adjustment, including unaudited corporations (yellow dots).

To conduct cluster analysis on the large corporate population, the Two-Step Cluster Analysis was used.[42] This method uses an iterative clustering algorithm that is designed to group a large number of cases. The

[42] To conduct this analysis, Two-Step Cluster Analysis was conducted using SPSS. For more information, refer to this link:

main advantages of using the Two-Step Cluster Analysis are: it can handle both categorical and continuous variables, automatically determine the optimal number of clusters by comparing different clustering solutions, and analyze large data files.

Using a clustering algorithm, rather than identifying clusters manually, reduces selection bias and helps to reveal groupings within the large corporate population that may not otherwise be apparent. In addition, it helps to optimize cluster assignment by minimizing the within-group variation (maximizing the cohesion of corporations within the same cluster) and maximizing the between-group variation (maximizing the separation between clusters).[43] For example, analysis of Silhouette coefficients helped to validate the quality of the clusters.[44]

Once the clusters were formed, the potential tax gap for each cluster was estimated based on the ratio between the federal tax adjustments found by audit and the reported revenues of audited corporations at initial assessment. This ratio was then used to estimate the potential federal tax adjustment for each cluster. The main assumption is that the ratio between federal tax adjustment and reported revenues for audited corporations is likely to be the same as for unaudited corporations within the same cluster. The tax gap was derived as the sum across all clusters of the projected federal tax adjustments.[45]

To remain consistent with the CRA's other tax gap estimates, the 2014 tax gap estimate for the large corporate population was derived using the compound annual growth rate of the total federal tax payable at initial assessment for large corporations between 2011 and 2014. As mentioned in Section 4, cluster analysis can overstate the tax gap as it does not account for the fact that large corporations selected for audit tend to have a higher level of non-compliance compared to those that are not audited. Therefore, cluster analysis is used to derive the upper-bound tax gap estimate for the large corporate population.

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https://www.ibm.com/support/knowledgecenter/en/SSLVMB_22.0.0/com.ibm.spss.statistics.help/spss/base/idh_twostep_main.htm

[43] Minimizing the within-group variation and maximizing the between-group variation helps better identify distinct groups of large corporations that may have different compliance characteristics compared to other clusters.

[44] Silhouette coefficient takes into account both cluster cohesion (choosing a model with the most homogeneous observations within a cluster) and cluster separation (choosing a model with the highly separated clusters). Silhouette coefficients ranges from -1 to +1, where a high value indicates that the large corporations are well grouped together and the clusters are adequately distinct from other neighbouring clusters. The Silhouette coefficients for the large corporate income tax gap analysis were around +0.5 or higher which indicates reasonable partitioning of data.

[45] A separate statistical technique, called propensity score matching, was conducted to validate the results from cluster analysis. The large corporate tax gap estimate under propensity score matching was in line with the tax gap estimate presented in Section 4.

Glossary

Term	Definition
Aggressive Tax Planning	Aggressive tax planning or abusive tax avoidance results when actions are taken to minimize tax, and when – while within the letter of the law – those actions contravene the intent and spirit of the law, for example, where a person undertakes a series of transactions that have as a primary purpose to reduce or eliminate tax in a manner not intended by the law.
Assessed Federal Tax	Tax that is determined to be payable based on assessed income. Indicated on a corporation's Notice of Assessment.
Assessed Income	A corporation's reported income after any adjustments made by the CRA through assessments or re-assessments.
Audit	The examination of taxpayers' books and records to determine the taxes, interest and penalties payable under the law.
Base Erosion and Profit Shifting (BEPS)	BEPS refers to the corporate practice of "shifting" paper profits from a higher-tax jurisdiction to a lower-tax jurisdiction, thus "eroding" the tax base of the higher-tax jurisdiction. Paper profits are profits that have been generated by economic activities carried out in a different country from where the profits are recorded, to avoid a high tax rate in the jurisdiction where real production is undertaken. BEPS practices are often not illegal but take advantage of international differences in tax laws and administration and in this respect are contrary to the spirit of fair taxation.
Bottom-Up Methodology	Bottom-up methodology generally uses a tax administrator's taxpayer data (e.g., audit results, accounting data, assessment data) to estimate the amount of taxes theoretically owing.
Canadian-Controlled Private Corporation (CCPC)	CCPCs are generally private corporations that are resident in Canada and were incorporated in Canada. CCPCs cannot be controlled directly or indirectly by one or more non-resident persons and no class of its shares can be listed on a designated stock exchange. A large portion of SMEs are CCPCs.
Capital Cost Allowance	An amount per year a taxpayer can deduct to reduce their tax liability stemming from the depreciation of certain capital assets such as: buildings, furniture, vehicles, or equipment.
Carry Back	The Income Tax Act allows taxpayers to carry back certain unused credits and deductions to use in a previous year.

Carry Forward	The Income Tax Act allows taxpayers to carry forward certain unused credits and deductions to use in a future year.
Cluster Analysis	Cluster analysis refers to a broad set of statistical techniques for identifying subgroups or "clusters" in a population, where objects in the same cluster are more similar to each other than to those in other clusters. In the context of tax gap analysis, clustering techniques were used to determine whether large corporations could be organized into relatively distinct groups or clusters on the basis of certain key variables to estimate the potential level of non-compliance within each cluster.
Common Reporting Standard	An OECD-led initiative that encourages the sharing of financial account information between tax administrations. As of 2018, 100 countries have signed an agreement to implement the Common Reporting Standard. Countries will share the name, address, date, and place of birth of non-resident taxpayers in addition to their account numbers, balances and financial institutions, with other tax jurisdictions that have committed to the Common Reporting Standard.
Country-by-Country Reporting	Country-by-Country reporting requires multinational corporations in participating jurisdictions to complete and file the Country-by-Country Report annually to provide information on their global operations in each tax jurisdiction where they do business. This requirement is part of a global initiative by the OECD and G20 to enhance transparency in order to reduce tax avoidance.
Extreme Value Methodology	In the context of tax gap analysis, the extreme value methodology assumes that the majority of tax non-compliance in the large corporate population is concentrated in a relatively small number of corporations. It also assumes that the magnitude of non-compliance will tend to drop off exponentially when ranking corporations according to their level of non-compliance as one moves down the ranks of corporations from the most to the least non-compliant (highest to lowest). Based on the ranking of audited large corporations and the amount of federal tax adjustments identified from audit, a regression analysis is then used to extrapolate tax non-compliance to the rest of the large corporate population in order to obtain an estimate of the tax gap for large corporations.
Federal Tax Adjustment	A change to federal income tax liability due to a reassessment (e.g., audit).
Incorporated Business	Incorporated businesses are businesses that have been incorporated at the federal, provincial, or territorial level.

Joint International Taskforce on Shared Intelligence and Collaboration (JITSIC)	An OECD group composed of 40 national tax administrations that have committed to developing more effective and efficient ways to deal with tax avoidance. It offers a platform to enable its members to actively collaborate within the legal framework of effective bilateral and multilateral conventions and tax information exchange agreements – sharing their experience, resources and expertise to tackle the issues they face in common.
Large Corporation	For the purpose of this report, large corporations are incorporated businesses with gross revenues of more than $20 million, except those in certain designated industries where the limit is more than $50 million (i.e., manufacturing, transportation and allied services, wholesale trade, and retail and services).
Materially Non-Compliant	For the purposes of the random audits referred to in Section 3, a taxpayer was considered to be materially non-compliant if the audit result reached or exceeded either of the following thresholds: (1) a federal tax adjustment of at least $1,000 AND this amount was at least 11% of the reported taxable income; OR (2) a federal tax adjustment of at least $5,000.
Offshore Tax Informant Program	This program allows the CRA to make financial awards to individuals who provide financial information related to major international tax non-compliance that leads to the collection of taxes owing.
Post-Stratification	Post-stratification is a bottom-up, statistical method for adjusting a sample to account for underrepresented groups in the population and to reduce selection bias in operational audit data. First, taxpayers are divided into subgroups based on characteristics that are relevant to the audit selection process. Risk-based audit results from audited taxpayers are then used to impute the level of non-compliance among unaudited taxpayers within the same group.
Random Audit	An audit where the entity audited is selected based on a random and representative sample of the target population.
Reassessed Taxes	When the CRA reviews already assessed tax returns and assesses a different amount of taxes owed by the taxpayer.
Risk-based Audit	An audit where the entity audited is selected based on risk factors determined by the tax administrator.
Small Business Deduction	This deduction reduces the corporate income tax that a corporation would otherwise have to pay in a taxation year throughout which it was a CCPC. For CCPCs, the first $500,000 of qualifying active business income is eligible for the

	deduction and reduces the net federal tax rate from 15% to 9% as of January 2019.
Stratified Random Sampling	Stratified random sampling is a statistical technique that separates the population into subgroups, or "strata", based on certain common characteristics. Random samples are then taken from each stratum.
Small and medium-sized enterprises (SME)	SMEs are incorporated businesses with gross revenues of less than $20 million, except those in certain designated industries where the limit is less than $50 million (i.e., manufacturing, transportation and allied services, wholesale trade, and retail and services).
Tax Compliance	A taxpayer is compliant when they provide accurate, timely information to the CRA, and pay all their outstanding tax liabilities
Tax Credit	Tax credits are amounts that taxpayers can use to reduce their tax liability. Certain unused tax credits can be carried forward and applied to future years. In certain instances, tax credits can also be carried back and applied to past years.
Tax Gap	The tax gap represents the difference between the taxes that would be paid if all obligations were fully met in all instances, and the tax actually paid and collected.
Tax Non-Compliance	Taxpayers who do not comply with tax laws intentionally or unintentionally. Tax non-compliance can occur at any point – for example, failing to file a return, incorrect use of deductions, credits or income, or for failing to pay all taxes due.
Top-Down Methodology	Broadly speaking, top-down methodology uses independent external data (usually national accounts data) to estimate the tax base, a figure that is then used to calculate a theoretical value of tax that should be paid and collected, by applying the appropriate tax rate to a high level figure.
Underground Economy (UE)	The UE is commonly understood as economic activity or income that is purposely hidden from public authorities, which can include working under the table or skimming (when revenues are under-reported or costs over-reported to understate net income). A variety of definitions for the UE exist – depending on the context, it may include activities that are officially measured and unmeasured, taxable and non-taxable, legal and illegal, or even very small-scale economic activities that generate income. From the CRA's perspective, the UE includes any activity that is unreported or under-reported for tax purposes.

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