

Ontario's Tax Plan for Jobs and Growth

Technical Paper
on How the Tax Changes Affect People

Ontario Ministry of Finance
June 2010



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SUMMARY

The Ontario Government has introduced a Tax Plan for Jobs and Growth that will improve the competitiveness of Ontario businesses and encourage more investment in the province. The tax plan includes the Harmonized Sales Tax (HST), corporate income tax cuts for business, and permanent and temporary tax relief for people.

The Ministry of Finance developed a comprehensive model to estimate how the tax changes will affect Ontario households. This paper summarizes the key findings and describes the methodology and assumptions used in the analysis.

The starting point for estimating the effect of these changes is the Ministry's existing model, which is used for personal income tax and benefit program analysis. That model contains income tax, property tax and benefit data for 5.3 million Ontario households. Consumer spending data from Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) were added to the model to estimate the sales tax impact on each household.

Two years were chosen to illustrate how families are affected with and without the temporary tax relief. The analysis illustrates the progressive nature of the tax changes.

During the first full year of the HST, households across most income ranges will on average see a net saving, which declines as income rises.

In the third year, when the temporary tax relief is no longer available, lower-income households will on average continue to pay less. The impact on middle-income households with incomes between \$40,000 and \$80,000 will on average be roughly neutral. Higher-income households will on average pay more.

These effects on households do not include the benefits to Ontarians from the higher incomes and more jobs that will arise due to a more competitive economy.

Average Overall Annual (Saving)/Cost by Household Income

| Annual Income ¹ | % of Households ² | Overall Average (Saving)/Cost (\$) | |
|----------------------------|------------------------------|------------------------------------|---------------------|
| | | Year 1 | Year 3 ³ |
| \$4,000–\$40,000 | 32% | (510) | (205) |
| \$40,000–\$80,000 | 31% | (435) | (25) |
| \$80,000–\$125,000 | 21% | (260) | 200 |
| \$125,000–\$300,000 | 16% | 30 | 405 |

¹ Household income is the sum of pre-tax market income and includes provincial and federal transfers.

² Percentage of households included in the analysis. Households with income below \$4,000 or above \$300,000 are not included due to sampling limitations.

³ Year 3 figures do not take into account the expected income growth resulting from the tax plan. The HST estimates include additional home purchases and renovations from year 1 to year 3, while the number of households is held constant.

TABLE OF CONTENTS

| | |
|--|----|
| Introduction | 1 |
| Summary of the Model and Results | 2 |
| Estimation of the Effect of the HST on Households | 9 |
| Estimation of the Effect on Households from the Permanent and Temporary Tax Cuts for People | 16 |
| Estimation of the Pass-Through of Business Savings | 16 |
| Pass-Through of HST Savings..... | 17 |
| Percentage of Business Savings Passed Through | 17 |
| Amount of HST Savings Passed Through | 23 |
| Pass-Through of Corporate Income Tax and Capital Tax Savings | 24 |
| Summary of Pass-Through of Business Savings to Households..... | 29 |
| The Increase in Personal Income due to the Tax Plan..... | 29 |
| Annex A — SPSD/M Household Expenditure Categories | 31 |
| Annex B — HST Revenue Allocation Framework | 33 |
| Annex C — Input-Output Methodology..... | 36 |

INTRODUCTION

Ontario's Tax Plan for Jobs and Growth consists of a package of tax measures designed to significantly improve the competitiveness of Ontario's business sector and the attractiveness of Ontario as a place to invest, while providing new permanent and temporary tax relief for people. The tax plan will lead to more jobs and higher incomes, and help sustain key public services such as health care and education, by creating a stronger, more competitive economy.

The tax plan builds on measures the government has taken to increase Ontario's competitiveness through investments in key areas such as education, innovation and infrastructure, together with strategic tax cuts. These tax cuts include the elimination of the capital tax by July 1, 2010 and the reduction in business education tax rates by 2014.

The Tax Plan for Jobs and Growth:¹

- Replaces Ontario's eight per cent Retail Sales Tax (RST) with a value-added tax that will be combined with the five per cent federal Goods and Services Tax (GST) to create a 13 per cent federally administered Harmonized Sales Tax (HST), starting July 1, 2010;
- Cut the tax rate on the first personal income tax bracket from 6.05 per cent to 5.05 per cent, giving Ontario the lowest provincial tax rate in Canada on the first \$37,106 of taxable income, starting January 1, 2010;
- Increases the amount of relief provided to low- to middle-income individuals and families for energy costs, property tax and sales tax, starting in 2010;

¹ For further details on the tax measures, visit ontario.ca/taxchange.

- Provides transitional payments in June 2010, December 2010 and June 2011, totalling \$300 for eligible single individuals with net incomes of up to \$80,000 and \$1,000 for eligible families (including single parents) with net incomes of up to \$160,000, to help in the adjustment to the HST (the maximum benefit will be reduced or eliminated for incomes over these thresholds); and
- Cuts corporate income taxes for large and small businesses, starting July 1, 2010.

The Ministry of Finance developed a comprehensive model to analyze the effect of the tax plan on Ontario households. The purpose of this paper is twofold:

- To present the impacts on households in the first and third years of the HST, excluding the higher income growth that is expected due to the tax plan; and
- To describe the methodology and assumptions underlying the analysis.

Key assumptions used in the Ministry's analysis are more cautious than research studies on issues such as the pass-through of business savings to consumers would suggest. As a result, the estimates in this paper likely understate average benefits and overstate average costs for Ontario households.

SUMMARY OF THE MODEL AND RESULTS

This section outlines the method used to develop the Ministry of Finance estimates and the results. Sections that follow provide more detail on the underlying methodology and assumptions.

The analysis was undertaken using the Ministry's existing tax and benefit model. The model includes data on personal income tax, property tax assessments and the Canada Child Tax Benefit.

The model is based on income tax and benefit data for all individuals who filed a 2007 Ontario income tax return. These individuals were then placed into households using property tax assessment data. Income tax parameters and benefits were adjusted for more recent changes to create a 2010 environment. Ontario population growth and macroeconomic growth factors were projected to simulate the Ontario population and income levels in the 2010 tax year.

The model was then augmented using data from Statistics Canada's Social Policy Simulation Database and Model (SPSD/M) to estimate the impacts on households from the replacement of the RST with the HST and the pass-through of business cost savings due to the HST and other tax reductions.

The calculation of tax and benefit changes on individual households depends on their specific household expenditures and personal tax liabilities. The estimates of household impacts were developed using average tax and expenditure profiles and statistical techniques described in this paper.

Also, the estimated impacts on households reflect the assumption that the number of households and incomes in 2010 remain constant over the time periods examined and without adjustment to the income tax parameters in the third year. This allows the impacts to be evaluated in isolation from other economic and demographic changes.

However, two elements change from one period to the next:

- First, the cumulative number of families purchasing homes or undertaking major renovations increases year over year. This recognizes that each year approximately 17 per cent of households either purchase or renovate a house.² The effect is to increase the total direct HST impact each year, while the total value of the tax cuts for people remains fixed.
- Second, the pass-through of business savings from the HST and other tax cuts increases over the period.

Table 1 summarizes the total impacts derived from the model during the first year of the HST when two of the three transitional payments are paid and during the third year when the transitional payments are no longer available. In the first year following the implementation of the HST, households are estimated to see total savings of \$1.3 billion. By the third year, assuming static incomes, static population, and increased home purchases and renovations, households will in aggregate pay an additional \$385 million.

² Based on Statistics Canada's Survey of Household Spending and property tax assessment data.

There are various definitions of households and families. These definitions include the nuclear family, tax family, economic family and the broader household. The nuclear family definition used by Statistics Canada and tax family both include only those related by marriage or common-law and dependent children under age 18. Both the nuclear and tax family definitions present a larger number of one-person families than the household and economic family definitions. The number of tax families is slightly less than the number of nuclear families due to non-filers for income tax purposes. The economic family as defined by Statistics Canada includes only those related by marriage, common-law, blood or adoption within the same dwelling. The broader household definition includes all single individuals, couples and children, related or unrelated, living in a single dwelling.

For the purposes of this analysis, the broader definition of household was used. This definition allows for the alignment of results between data sources. The estimates for the mix of goods and services purchased by households were developed from the SPSD/M with underlying data from the Survey of Household Spending (SHS), which are collected on a household basis. The personal tax savings, tax credits and transition benefits were calculated at the individual and tax family level and “rolled up” to the household level. The impacts in Tables 2 and 3 are based on the broader household definition.

Table 2 shows that Ontario's tax system will be more progressive as a result of the tax plan. In year 1, households across most income ranges will on average see a net saving, which declines as income rises. In the third year, when the transitional benefit is no longer available, lower-income households will on average continue to pay less. The impact on middle-income households with incomes between \$40,000 and \$80,000 will on average be roughly neutral. Higher-income households will on average pay more.

**Total Annual (Saving)/Cost to Households
from the Tax Plan**
\$ Millions

Table 1

| | Year 1 | Year 3 ¹ |
|--|----------------|---------------------|
| Tax Shift to Consumer Base | 4,240 | 4,680 |
| Personal Income Tax Cut | (1,130) | (1,130) |
| Ontario Sales Tax Credit Enhancement | (825) | (825) |
| Ontario Energy and Property Tax Credit Enhancement | (455) | (455) |
| Ontario Sales Tax Transition Benefit | (2,785) | – |
| Total Tax Relief for Households | (5,195) | (2,410) |
| Pass-Through of Business Savings | (370) | (1,885) |
| Total (Saving)/Cost to Households (\$ Millions) | (1,325) | 385 |

¹ Year 3 figures do not take into account the expected income growth resulting from the tax plan. The HST impacts account for additional home purchases and renovations from year 1 to year 3, while the number of households is held constant.

Average Overall Annual (Saving)/Cost by Household Income

Table 2

| Annual Income ¹ | % of Households ² | Overall Average (Saving)/Cost (\$) | |
|----------------------------|------------------------------|------------------------------------|---------------------|
| | | Year 1 | Year 3 ³ |
| \$4,000–\$40,000 | 32% | (510) | (205) |
| \$40,000–\$80,000 | 31% | (435) | (25) |
| \$80,000–\$125,000 | 21% | (260) | 200 |
| \$125,000–\$300,000 | 16% | 30 | 405 |

¹ Household income is the sum of pre-tax market income and includes provincial and federal transfers.

² Percentage of households included in the analysis. Households with income below \$4,000 or above \$300,000 are not included due to sampling limitations.

³ Year 3 figures do not take into account the expected income growth resulting from the tax plan. The HST estimates include additional home purchases and renovations from year 1 to year 3, while the number of households is held constant.

A more detailed distribution by income is provided in Table 3.

| Annual Income ² | Year 1 | | | Year 3 ¹ | | |
|----------------------------|--------------------------|-----------------------------|---------------------------|--------------------------|-----------------------------|---------------------------|
| | HST ³ (\$) | Total Tax Relief (\$) | Overall Impact (\$) | HST ³ (\$) | Total Tax Relief (\$) | Overall Impact (\$) |
| \$4,000–\$20,000 | 265 | (685) | (420) | 200 | (365) | (170) |
| \$20,000–\$30,000 | 350 | (895) | (550) | 255 | (485) | (235) |
| \$30,000–\$40,000 | 440 | (1,025) | (585) | 320 | (535) | (210) |
| \$40,000–\$50,000 | 515 | (1,045) | (525) | 385 | (520) | (135) |
| \$50,000–\$60,000 | 590 | (1,035) | (445) | 440 | (480) | (40) |
| \$60,000–\$70,000 | 660 | (1,035) | (375) | 490 | (445) | 45 |
| \$70,000–\$80,000 | 720 | (1,065) | (345) | 535 | (440) | 95 |
| \$80,000–\$90,000 | 780 | (1,080) | (300) | 580 | (445) | 135 |
| \$90,000–\$100,000 | 855 | (1,115) | (260) | 655 | (455) | 195 |
| \$100,000–\$125,000 | 945 | (1,185) | (240) | 725 | (485) | 240 |
| \$125,000–\$150,000 | 1,055 | (1,265) | (205) | 815 | (520) | 295 |
| \$150,000–\$300,000 | 1,280 | (1,095) | 185 | 1,000 | (520) | 480 |

¹ Year 3 figures do not take into account the expected income growth resulting from the tax plan. The HST estimates include additional home purchases and renovations from year 1 to year 3, while the number of households is held constant.

² Household income is the sum of pre-tax market income and includes provincial and federal transfers.

³ HST is net of pass-through of business savings.

Note: Totals may not add due to rounding.

Households with income under \$4,000 or over \$300,000 have been omitted from the presentation of household-level results shown in Tables 2 and 3. This is due to an unexplainable variation in the SPSPD/M survey-based results at the low and high ends of the income distribution.

At the low end of the income scale, variation may be caused by a household's access to other financial resources such as savings, loans or gifts. These financial resources are not captured in the annual tax data used to develop these estimates. Additional variation may be caused by deductions for income tax purposes such as business losses, rental income losses and capital losses. These deductions can give the appearance of low income to households with high expenditures and correspondingly high sales taxes.

At the high income end, variation may be caused by outliers in the SPSPD/M survey-based data that suggest a non-linear relationship between the survey results on household expenditures and household characteristics. This causes difficulty in applying the statistical technique used for projecting sales taxes on the broader population.

Overall, estimates developed for households outside the \$4,000 to \$300,000 range are not statistically reliable. Separate models and additional data would be required to adequately estimate sales taxes paid by these households. A similar concern was raised in an evaluation of the tax plan by Ernie Lightman and Andrew Mitchell where the authors excluded those with incomes of less than \$10,000 from their results.³

The following sections describe the methodology and assumptions used in estimating the impacts of the HST, the permanent and temporary tax relief measures for people, and the pass-through of business savings.

³ Ernie Lightman and Andrew Mitchell, "Not a Tax Grab After All: A Second Look at Ontario's HST," Canadian Centre for Policy Alternatives, December 2009, p. 17.

ESTIMATION OF THE EFFECT OF THE HST ON HOUSEHOLDS

The Ministry of Finance's existing tax and benefit policy evaluation model was enhanced to include estimated household expenditures and sales taxes based on the survey data in the SPSD/M and regression analysis.

Statistics Canada's SPSD/M version 16.2 was used to estimate RST and HST impacts by income and family type. The SPSD/M provides an integrated framework for tax and benefit analyses using micro-level survey and sampled administrative data on personal income taxes, major benefit programs, commodity taxes, family incomes and expenditure patterns.

The SPSD/M relies on the results from Statistics Canada's Survey of Household Spending. This survey provides detailed information on spending and dwelling characteristics at the household level.

To provide a more detailed and complete representation of the effects of the tax package by household characteristics and spending patterns, a method was developed to incorporate an estimated sales tax burden before and after the HST for each household in the Ministry's model.⁴

This method involved using key determinants of the sales tax burden, such as household size and income, which are present in both the SPSD/M sample and the Ministry's model. Results from a multivariate regression using sales taxes and other characteristics from the SPSD/M were applied to the Ministry's model. This method benefits from using the mix of expenditures and tax treatment available from the SPSD/M, and the more comprehensive tax and benefit data in the Ministry's model.

⁴ SPSD/M is a weighted sample containing income and expenditure information for 26,187 Ontario households. The Ministry's model contains tax and benefits information on 5.3 million Ontario households.

For the purposes of estimating household sales taxes, projected household spending for 2010 by 48 expenditure categories was retrieved from the SPSD/M. (See Annex A for a listing of the expenditure categories.) Effective provincial direct RST and HST rates, temporary restricted input tax credit rates, and rates for the pass-through of business savings were applied to each expenditure category. These tax rates take into account the portion of each spending category that is subject to the current RST and the provincial portion of the HST, including the estimated embedded taxes. The calculated household-level taxes along with the corresponding household characteristics were used in the regression analysis.

Table 4 contains descriptions of the independent variables used in this analysis.

| Independent Variables from the SPSD/M Used in Regression Analysis | | Table 4 |
|--|--|----------------|
| Household Total Income (IMMTOT) | All income received by individuals in the household from earnings, investment, government transfer payments and other sources. It is the sum of market income and transfer income. | |
| Size of Urban Area (HDURB) | The population of the area in which the household resides. | |
| Number of Adults in Household (HDNADULT) | The number of persons aged 18 or over in the household. | |
| Number of Kids in Household (HDNKIDS) | Number of census family children under age 18 in the household. | |
| Number of Elderly in Household (HDNELD) | The number of persons aged 65 or over in the household. | |
| Household Type (HDTYPE) | Household classification based on the number of adults, children and elderly in the household. Note that the presence of children takes precedence over the presence of elderly for families with both children and elderly. Note that children are persons under age 18 who have never been married, adults are persons aged 18 or over (including elderly), and elderly are persons aged 65 or over. | |
| Household Tenure (HDTENUR) | Indicates whether the dwelling is owned by a member of the household or whether it is rented. | |
| Education Status (Based on IDESTAT) | Indicates whether the head of household or spouse is a student. | |

Source: SPSD/M Variable Guide.

Through the testing of various combinations of socioeconomic characteristics, regression models for estimating a household's sales taxes were determined. The significant explanatory variables were income, urban area with population of less than 30,000, number of adults in the household, number of children, number of seniors, and status as an owner or renter.

Regression equation results were applied to the household characteristics in the Ministry's model to estimate household sales taxes before and after the implementation of the HST. Amounts were scaled to meet control totals to ensure that the sum across all households equalled the total amount of sales tax on households, before accounting for the pass-through of business savings.

To obtain the control total for the total amount of RST currently paid by households, the most detailed provincial Input-Output tables for Ontario suggest that 57 per cent of total RST falls on consumer spending. For 2010, this means that \$9.9 billion of the estimated \$17.4 billion in total RST revenue is from households.

A component of the HST revenue allocation formula within the Comprehensive Integrated Tax Coordination Agreement between the governments of Canada and Ontario was used for the control total of sales tax on households after harmonization. Under the formula, the amount of Ontario HST revenue is calculated as the sum of all revenue collected under the GST/HST by the Canada Revenue Agency across Canada multiplied by Ontario's share of this revenue pool.

The revenue allocation formula includes the Consumer Expenditure Tax Base (CEBASE), which captures the tax paid by people on everyday purchases. The CEBASE estimates can be broken down into spending on durable goods, semi-durable goods, non-durable goods and services, which are derived from personal expenditure data contained in Statistics Canada's Provincial Economic Accounts and provincial Input-Output tables.

There are three main components in the derivation of the CEBASE: net expenditures, taxable proportions and an expenditure adjustment factor. The net expenditures by households on goods and services from the Provincial Economic Accounts form the starting point for estimating the CEBASE. The taxable proportions of each category of consumer expenditure are determined by applying a “tax blueprint” to detailed commodity data contained in the final demand matrix of the provincial Input-Output tables. The expenditure adjustment factor was incorporated to account for the differences in definitions between Statistics Canada’s national accounts and the GST tax base. (See Annex B for the precise CEBASE formula.)

The CEBASE for 2010 was adjusted to account for Ontario-specific measures, such as point-of-sale rebates, maintaining alcohol revenue, and maintaining the RST on certain insurance premiums and the private sale of used vehicles. (See Table 5 below.)

| Sales Tax Control Totals for 2010 (Full Year) | Table 5 |
|---|--------------|
| \$ Millions | |
| HST from CEBASE | 12,700 |
| Adjustment for Ontario-Specific Measures* | 750 |
| Total HST on Consumer Expenditures (before Business Pass-Through) | 13,450 |
| Less: RST on Consumers (excluding Embedded RST) | (9,860) |
| Change to Consumer Tax Base before Housing and Business Pass-Through | 3,590 |

* Includes Ontario point-of-sale rebates, maintaining RST on certain insurance premiums and the private sale of used vehicles, and maintaining revenue from alcohol sales. For more information on these measures, visit ontario.ca/taxchange.

The control totals in Table 5 do not include the HST payable on consumer purchases of new and existing housing and major renovations. Since spending on housing is not available in the SPSPD/M, property tax assessment data and Statistics Canada’s Survey of Household Spending were used to estimate the HST impact.

The provincial portion of the HST will affect the following consumer expenditures on housing (the federal GST currently applies to these expenditures):

1. New Homes — purchases of new homes will be subject to the eight per cent provincial portion of the HST. There is a rebate for new homes purchased as primary residences. With the Ontario HST rebate, the provincial portion of the HST will effectively be applied at two per cent on the first \$400,000 of the purchase price of a new home and at eight per cent on the portion above \$400,000. The rebate will apply across all price ranges to a maximum rebate of \$24,000.
2. Closing Costs — certain costs associated with buying or selling a new or resale home, including legal and accounting services, housing inspections and real estate commissions, will now be subject to the provincial portion of the HST.
3. Major Renovations — the provincial portion of the HST will apply to contractor services.
4. Services to Dwellings — the provincial portion of the HST will apply to services such as minor repairs, security services, etc.

The total for the first three categories is obtained from the HOUSING BASE, another component of the HST revenue allocation formula. (See Annex B for the precise HOUSING BASE formula.) These values were adjusted to reflect the estimated 75 per cent of these transactions that occur for consumer purposes as opposed to business purposes⁵ (i.e., landlords, apartment dwellings).

⁵ The 75 per cent allocation was calculated by taking the share of spending on the Gross Imputed Rent and Gross Paid Residential Rent commodities from the Input-Output tables for Ontario, with Gross Imputed Rent representing home ownership (a consumer activity) and Gross Paid Residential Rent representing rental and leasing of real estate (a business activity).

The Services to Dwellings is obtained from the Owner-Occupied Dwellings industry of the provincial Input-Output tables.

To estimate the effect of these transactions on households, the following assumptions were used in the model:

- Based on 2008 property tax assessment information, households were allocated new home purchases. These purchases were amortized to reflect a 10 per cent down payment, 25-year mortgage term and 5.15 per cent mortgage rate.⁶
- Closing costs for both new and resale homes were allocated based on 2006–2008 property tax assessment data. These costs were amortized to reflect a 10 per cent down payment, 25-year mortgage term and 5.15 per cent mortgage rate.
- Major renovations were allocated to homeowners based on the proportion of households from the 2007 Survey of Household Spending that spent on alterations and improvements. Renovations under \$5,000 were fully allocated to the year they took place, while renovations over \$5,000 were amortized over five years using a 5.15 per cent borrowing rate.
- Services to dwellings were allocated to all homeowners as a percentage of their assessed housing value.

Once these adjustments are included, the direct HST impact on the consumer tax base is \$4.2 billion in year 1 and \$4.7 billion in year 3, as presented in Table 1.

⁶ Represents the most recent five-year mortgage rate quoted by institutional lenders in CMHC's Monthly Housing Statistics, May 2010 (Table 11).

ESTIMATION OF THE EFFECT ON HOUSEHOLDS FROM THE PERMANENT AND TEMPORARY TAX CUTS FOR PEOPLE

Using personal income tax filer data in the Ministry's model, the benefit from the measures in Table 6 were estimated by comparing the impact on family income in 2010 with and without those measures.

| Tax Plan for Jobs and Growth Permanent and Temporary Tax Relief ¹ | | Table 6 |
|--|---|--|
| | | Effective Date |
| Reduced first personal income tax bracket rate | From 6.05% to 5.05% | January 1, 2010 |
| Proposed Ontario Energy and Property Tax Credit (OEPTC) | New maximum: \$900 for eligible non-seniors and \$1,025 for eligible seniors | January 1, 2010 |
| Ontario Sales Tax Credit | New maximum: \$260 per eligible adult and child in a family | August 2010 |
| Ontario Sales Tax Transition Benefit | Three payments totalling up to \$1,000 per eligible family and up to \$300 per eligible single individual | June 2010, December 2010 and June 2011 |

¹ Benefits exclude the increase in the Ontario Senior Homeowners' Property Tax Grant that takes effect in 2010 and the proposed Northern Ontario Energy Credit.

ESTIMATION OF THE PASS-THROUGH OF BUSINESS SAVINGS

Corporations will experience significant cost reductions under the tax plan. In addition to the HST input tax credits, corporations will see cost savings starting July 1, 2010 from the corporate income tax cuts and elimination of the capital tax.

In estimating the benefits to households from these cost savings, two questions are:

- What percentage of the cost savings will be passed through as lower prices?; and

- Of the percentage that will be passed through, what amount will accrue to Ontario households?

This section examines these questions first for the HST and then for the corporate income tax and capital tax.

PASS-THROUGH OF HST SAVINGS

Percentage of Business Savings Passed Through

Economic theory is unequivocal in its prediction that, in a competitive economy, prices charged to consumers reflect the cost of production. As wages and other input costs change, or technology affects the cost of production, this feeds into prices. In fact, with globalization, most aspects of the economy have become subject to even stronger competition. The prices of many consumer goods have been steadily falling for over a decade due to technological advances and competition from emerging economies. Canadian businesses of all types have been vying to reduce costs to stay competitive.

The RST on business inputs has been a significant cost of doing business for many companies and there is no reason to doubt that this cost reduction will be quickly reflected in lower prices. One example is the telecommunications market, where new companies are entering different fields, with cable television operators competing against former telephone monopolies for home phone service, and new cell phone providers offering lower rate plans. The RST has been a particularly significant cost for telecom providers as this is a capital-intensive sector where capital equipment purchases have been subject to an eight per cent RST. This is an example where the savings to consumers are likely to be even larger than the amount of the short-run tax savings to the industry. New companies that are expanding, and buying all their equipment at the new lower cost, will set the competitive bar for the existing companies, which will be forced to match the lower prices despite the fact that much of their equipment was purchased in the past with RST charged on it.

Empirical studies have found that businesses react fairly quickly in passing through savings in the cost of business inputs.

The most relevant study, which is widely cited in the current context, relates to the implementation of the HST in the Atlantic provinces in 1997.⁷ This is the closest analogy to what will happen in Ontario, as these provinces replaced RSTs much like Ontario's (albeit at higher rates) with an eight per cent HST similar to what will be implemented in Ontario on July 1, 2010.

Professors Smart and Bird noted the problem that, in the first instance, the elimination of the RST must be offset by revenue from somewhere else. There would be an adverse effect on the consumer sector unless the cost savings to business were reflected either in higher wages or lower consumer prices. In their study, they focused on the latter, obtaining Input-Output data from Statistics Canada that measured the RST on business inputs as a component of the underlying production costs for different types of consumer purchases. They conducted regression analysis for the sample of all provinces, to see how prices changed relative to the changes in underlying costs, including the RST.

⁷ Michael Smart and Richard Bird, "The Economic Incidence of Replacing a Retail Sales Tax with a Value-Added Tax: Evidence from Canadian Experience," *Canadian Public Policy*, Vol. 35, No. 1, March 2009.

They found that prices fell in the HST provinces compared to the non-HST provinces, and there was a close enough correlation between cost changes and prices to conclude that between 60 per cent and 100 per cent of the cost savings were passed through in the first year following HST harmonization.⁸ For some categories of consumer spending, the price declined even more than would have been expected based on a straight cost pass-through.

They concluded as follows:

“The pattern of reform-induced tax changes would presumably be somewhat different if harmonization were extended to the remaining RST provinces, since their economic structures and current sales-tax systems differ to some extent from those that were replaced in the 1997 reform we examine here. Nonetheless, our principal result — that sales taxes are fully shifted forward (or even “overshifted”) in most sectors, so that the change in statutory burdens that occurs when a province moves from an RST to a VAT would not result in large distributional effects — seems likely to be as valid today in provinces such as Ontario or British Columbia as the evidence we discuss here suggests that it was a decade ago in the three eastern HST provinces.”⁹

A study conducted by the Consumer and Corporate Affairs Department of the federal government in 1992 looked at the replacement of the previous federal sales tax on manufactured goods with the GST and its effect on the Consumer Price Index (CPI). They found that there was only a small net increase in consumer prices, consistent with the removal of the federal sales tax being mostly passed on to consumers. They produced “base-case” projections of 46 detailed categories of the

⁸ The Atlantic provinces also cut the provincial portion of the tax rate, which led to an absolute drop in CPI in those provinces. However, the analysis by Smart and Bird found that the CPI fell even more than would have been expected simply based on the lower tax added on to the price, and that reflected the pass-through of cost savings from elimination of the tax on inputs used in production.

⁹ *Ibid.*, p. 95.

consumer goods and services tracked by detailed components of the CPI. For each category, they based the projection on the past trend of its inflation rate, adjusted downward for an estimate of the impact of the recession. This adjustment was based on inflation in the 1981–82 recession when there was no GST. They then compared the actual inflation to this projection and found that it was actually slightly lower than what had been estimated by the federal government as the net tax increase implicit in the GST. In the absence of the pass-through of savings from the elimination of the federal sales tax, the increase in the CPI would have been considerably higher. Hence, this study concluded that “most of the savings” were passed on in the first year.¹⁰

Other studies also suggest that the savings to business from the HST will be quickly passed on to consumers. A particularly relevant study analyzed consumer prices for a number of easily comparable consumer goods and services (e.g., automotive wheel balancing) in 155 different U.S. cities, controlling for different costs, including different approaches to the use of the retail sales tax.¹¹

The study found that consumer prices generally reflected the retail sales tax by at least 100 per cent and in some cases even more than 100 per cent: “For some commodities, we cannot reject that taxes are shifted on a one-for-one basis. For others, commodity taxes are overshifted — a ten-cent increase in the revenue extracted from the sale of these commodities leads to an increase in their prices of more than a dime. The finding that some commodities exhibit overshifting is robust to a number of reasonable alternative specifications of the estimating equation.”¹²

¹⁰ “The Effect of the GST on Consumer Price Index for 1991,” Consumer and Corporate Affairs Canada, 1992.

¹¹ Timothy J. Besley and Harvey S. Rosen, “Sales Taxes and Prices: An Empirical Analysis,” *National Tax Journal*, Vol. 52, No. 2, June 1999.

¹² *Ibid.*, p. 175.

Their empirical observations about the impacts of retail sales tax on consumer prices implicitly support the case for a value-added tax: “The policy implications of our results are striking. Distributional tables for proposed policy changes typically assume that commodity taxes increase consumer prices on a one-for-one basis. If, in fact, prices on some commodities go up more than on a one-for-one basis, then taxes on these items are more burdensome than the usual analyses would suggest. To the extent that our findings for food items hold more generally, taxes that fall on them are likely to be more regressive than is conventionally thought. Such considerations might be important in thinking about recent proposals to introduce a value-added tax in the United States.”¹³ The Ontario RST did not apply to most food items but hidden costs from the RST on inputs in the production process were embedded in the price of food produced in Ontario. With the HST, producers will receive input tax credits that remove these hidden costs to consumers.

Estimates by other experts also suggest that the savings to business from the HST will be quickly passed on to consumers. The TD Bank, in a report devoted to looking at the impact of harmonization on the CPI, estimated that 80 per cent of the pass-through of cost savings will occur by the end of the first year, and 95 per cent within three years. Another study, by the Centre for Spatial Economics, estimated that 100 per cent of pass-through would occur by the end of the second year (even in the more pessimistic case of relatively slow price adjustment). This is also of major interest to the Bank of Canada, which closely monitors the inflation rate for the purpose of setting monetary policy. The Bank of Canada did not directly comment on the amount of pass-through, but full and rapid pass-through is implicit in its forecast of core inflation published in the April 2010 *Monetary Policy Report*.

¹³ Ibid., p.175.

For purposes of this analysis, the Ministry has assumed a smaller degree of pass-through than evidenced from empirical studies in Canada and other HST-specific estimates.¹⁴ Table 7 compares the various pass-through estimates.

During year 1, a 20 per cent pass-through is assumed. This was set by taking the lowest estimate in Table 7 (50 per cent) and reducing it by more than half, in part to provide a more cautious assumption and to reflect that the full compliance savings might not be achieved in that year. For year 3, the pass-through of 90 per cent was set slightly below the lowest estimate for that year (95 per cent), to again provide a more cautious estimate for modelling purposes.

| Period | Ministry of Finance Modelling Assumption | TD Bank ¹ | Bank of Canada ² | Smart and Bird ³ | Centre for Spatial Economics ⁴ | Consumer and Corporate Affairs Canada ⁵ |
|--------|--|----------------------|-----------------------------|-----------------------------|---|--|
| Year 1 | 20% | 80% | 100% | 60%–100% | 50% | Most |
| Year 3 | 90% | 95% | | | 100% | |

¹ TD Economics Special Report, "The Impact of Sales Tax Harmonization in Ontario and B.C. on Canadian Inflation," September 18, 2009.

² Bank of Canada, *Monetary Policy Report*, April 22, 2010; page 22, Table 4, compares CPI with and without the effect of HST.

³ Michael Smart and Richard Bird, "The Economic Incidence of Replacing a Retail Sales Tax with a Value-Added Tax: Evidence from Canadian Experience." *Canadian Public Policy*, Vol. 35, No. 1, March 2009.

⁴ "Made in Ontario: The Case for Sales Tax Harmonization" Prepared for the Ontario Chamber of Commerce by the Centre for Spatial Economics, 2009.

⁵ "The Effect of the GST on Consumer Price Index for 1991," Consumer and Corporate Affairs Canada, 1992.

¹⁴ There is a different class of studies, looking at pass-through of exchange-rate changes to consumer prices, which finds that there is often less than full pass-through. These findings, however, are not relevant to the issue at hand. Exchange rates are volatile and can move in both directions. Therefore, sellers may expect the exchange rate to reverse itself and so it may make sense for them not to fully pass through its effect, except perhaps with a very long time lag. By contrast, elimination of the RST is a one-time, permanent policy change.

Amount of HST Savings Passed Through

Total business savings were estimated using the provincial Input-Output tables. At the most detailed level of the Input-Output framework, direct annual sales tax savings of over \$4.2 billion in full input tax credits are allocated to 303 industries and 719 goods and services (or commodities). In addition, over \$500 million in annual compliance cost savings were allocated to industries and commodities, for total annual business savings of \$4.8 billion in 2010 dollars.¹⁵

The Input-Output framework describes how these tax savings can be linked to the commodities purchased by Ontario households, government and exports, and how they are passed along through the production cycle.

This approach captures the many and complex iterations of businesses passing savings to each other and to final users. The results show that Ontario consumers will receive about 30 per cent of the total business HST savings through lower prices, while 37 per cent will go to reducing the costs of international and interprovincial exports, improving Ontario's competitiveness and boosting Ontario exports. About 14 per cent will go to reduced prices for government purchases, and 19 per cent to reducing the cost of residential construction (which will also benefit consumers). It should be noted that pass-through savings that accrue to exports and government could also benefit Ontario consumers, which is not captured in this analysis.

During the first three years, the total annual business saving (including compliance cost savings) is reduced from \$4.8 billion to \$3.9 billion due to temporary restrictions in claiming certain input tax credits.

¹⁵ The estimated compliance cost saving takes into account the lower savings to businesses subject to the temporary restriction on input tax credits. Compliance cost savings were allocated in proportion to each industry's share of overall tax savings.

The estimated pass-through of business savings to consumers in year 1 is \$310 million. This is derived by applying the 20 per cent pass-through in year 1 to the shares of the \$3.9 billion in business savings that accrue to consumers and residential construction. The 19 per cent share for residential construction is applied to housing expenditures using the same allocation method described on page 15.

Similarly, the estimated pass-through in year 3 with a 90 per cent pass-through is over \$1.5 billion.

For the detailed methodology, see Annex C.

PASS-THROUGH OF CORPORATE INCOME TAX AND CAPITAL TAX SAVINGS

On July 1, 2010, corporations will begin to benefit from reductions in the corporate income tax rate (CIT), elimination of the small business deduction surtax, and reductions in the corporate minimum tax. In addition, capital tax will be eliminated on July 1, 2010.

It is widely accepted that capital is highly mobile in the global economy, with few restrictions, while labour has much less mobility due to immigration restrictions and community ties. The economic concept that describes the difference between the two is “elasticity,” referring to the percentage change in the quantity supplied in response to a percentage change in the price paid.

The supply of capital is highly elastic, meaning that a small change in the after-tax rate of return, upwards or downwards, will lead to a relatively large change in the amount of investment taking place. By contrast, the supply of labour is quite inelastic, as most people have no choice but to work for a living, and the number of people willing to work will change relatively little due to changes in the wage rate.

Economic models indicate that the different relative elasticities have important consequences for the impacts of tax changes on the incomes of workers versus capital. Specifically, economics uses the concept of “incidence,” which measures who bears the actual cost of a tax. The incidence of a tax may end up being quite different from the person who is in the first instance legally required to pay the tax. Specifically, the much higher elasticity of supply of capital implies that capital will have to earn about the same after-tax rate of return in every country (after adjusting for differing risk factors).

How would businesses in Ontario achieve the same rate of return as the global average if corporate tax rates in Ontario were much higher than the global average (as they were prior to the recent reforms)? They would respond by limiting their investment to the relatively few projects in Ontario that were profitable (e.g., because they have some special advantage due to geography, resources, etc.) The lower rate of investment implies lower demand for workers, and the wage rate is thereby lower. In the end, the reduction in the average wage rate of workers in Ontario (relative to what it would otherwise have been) must be enough to offset the higher corporate tax rates.

The results are aptly summed up by Professor Jack Mintz: “Recent economic studies suggest that taxes on investments by larger companies tend to fall on workers, who either are paid less compensation or face higher domestic prices on consumer goods purchased from their pay cheques.”¹⁶

¹⁶ Jack Mintz, “Ontario’s Bold Move to Create Jobs and Growth,” School of Public Policy, University of Calgary, Vol. 1, Issue 4, November 2009.

This is echoed in numerous empirical studies that have been done in various countries. A paper prepared for the United States Treasury summed up this research as follows: “Overall, the recent empirical evidence, the open economy computable general equilibrium models of tax incidence, and the sensitivity of the amount of capital investment within a country suggest reconsidering the assumption that the corporate income tax falls on the owners of capital; labor may bear a substantial portion of the burden from the corporate income tax.”¹⁷

This paper went on to make the same point as Mintz: “A naïve view of the incidence of the corporate tax is that shareholders bear the burden of the tax through lower after-tax rates of return. This naïve view ignores the possibility that the tax will be shifted onto consumers through higher prices, workers through lower wages (possibly due to a fall in capital accumulation), or other types of capital as capital shifts out of the corporate sector in response to the lower after-tax return offered by corporations.”¹⁸

Economic theory’s prediction of the incidence is couched in terms of real income, which in this case is the wage rate of workers divided by the price level. It is reasonable to expect that the lower real income due to higher tax rates will flow through a combination of lower wage rates and higher prices. The reason for the latter is that a significant proportion of what consumers buy is produced in Ontario, and the cost of capital (including the corporate tax rate paid by companies) is part of the cost of production in Ontario.

Higher corporate taxes reduce the amount of investment in Ontario, and therefore reduce productivity and increase the cost of producing goods and services in Ontario that are purchased by Ontario consumers.

¹⁷ William M. Gentry, “A Review of the Evidence on the Incidence of the Corporate Income Tax,” Office of Tax Analysis, U.S. Department of Treasury, December 2007, p. 2.

¹⁸ *Ibid.*, p 4.

To some extent, the impact on prices is limited by foreign competition. Prices for domestic production that faces competition from foreign sources cannot be raised to offset the tax, and instead workers are forced to accept lower wages (or else the company would be unable to compete and would go out of business).

However, there is less foreign price competition for services and for goods that are costly to transport (e.g., building materials), and in these areas a higher corporate tax rate would lead to a mix of higher prices for consumers and lower wages.

In most instances, Ontario products can only be exported if they are sold at the price set by global competition. Therefore, costs in Ontario for the most part do not affect the price at which goods are exported, but rather whether they are produced in Ontario at all. Cost savings from lower taxes eventually lead to more investment, more demand for workers and a higher wage rate.

The importance of the cost of capital for consumer prices is greatest in the case of services. About 56 per cent of Ontario consumer spending consists of services, the bulk of which are produced in Ontario.

Therefore, tax changes that affect the cost of production are likely to have a significant impact on consumer prices.

The recent tax cuts are focused on the service sector, which had previously paid a higher CIT rate, and this increases the likely share of the benefit that will ultimately go to consumers. Over 75 per cent of the CIT and capital tax cuts will go to the service sector and about 75 per cent of services produced in Ontario are consumed by Ontario residents. There would also be some savings on goods produced for domestic consumption, but that would be modest compared to the service cost savings.

In this analysis, a small and cautious amount of pass-through to prices from the CIT and capital tax cuts was assumed. By the third year, only \$345 million out of CIT and capital tax cuts totalling \$2.7 billion is passed through in lower consumer prices. The actual proportion is uncertain and depends on the timing and sectoral distribution of the tax cut on investment, which in turn depends on factors such as business confidence and global economic conditions.

To model the CIT and capital tax pass-through that will benefit Ontario consumers, the amount of these tax cuts for each industry (as defined in the Input-Output tables) was first determined. These benefits were derived from the Ministry's Corporate Tax Micro-Model, based on 2007 corporate tax returns, and projected forward to 2010. Based on the preceding discussion, it is assumed that one-third of these tax savings are used to reduce prices (the other two-thirds are flowed through to labour and shareholders). These tax savings were then allocated in the Input-Output framework as price reductions through the production cycle to non-business final demand categories: government, exports and domestic (Ontario) consumption. (See similar methodology in Annex C.)

The results show that about 40 per cent of the total corporate tax savings would benefit domestic consumption, while 49 per cent goes to international and interprovincial exports, seven per cent goes to government spending, and three per cent to residential construction.

The same 20 per cent and 90 per cent pass-through assumptions for years 1 and 3 that were used for the HST savings are applied to these amounts.

Summary of Pass-Through of Business Savings to Households

Table 8 summarizes the amount of business savings that are passed through to consumer expenditures and housing. Of the total business savings of \$6.1 billion in year 1, only six per cent is assumed to benefit Ontario consumers in the form of lower prices. By year 3, business savings total \$6.5 billion a year, of which 29 per cent is passed through in lower domestic consumer prices.

| Pass-Through of Business Tax Savings | | | Table 8 |
|--------------------------------------|-------------|---------------------|---------------------------------|
| \$ Millions | | | |
| | HST Savings | CIT and Capital Tax | Total Pass-Through ¹ |
| Year 1 | 310 | 60 | 370 |
| Year 3 | 1,540 | 345 | 1,885 |

¹ Excludes business savings that flow to government and exports, which could result in additional benefits to consumers.

THE INCREASE IN PERSONAL INCOME DUE TO THE TAX PLAN

Private-sector economists have generally commented very favourably on the government's tax plan and suggest that it will lead to a substantial increase in the standard of living for Ontario residents.

A study by Jack Mintz concludes that the HST and Ontario corporate income tax cuts, together with other recent tax changes, will lead to substantial benefits for Ontarians. He estimates that within 10 years, the lower tax burden on business investment will lead to increased capital investment of \$47 billion, almost 600,000 net new jobs and

higher annual incomes of between 4.4 per cent and 8.8 per cent.¹⁹ Recent studies by accounting firm KPMG also show that the tax plan improves Ontario's competitiveness as a location for investment.²⁰

The benefits to Ontarians in terms of higher incomes and more jobs were not factored into the results presented in this paper. These benefits will grow over time, increasing the estimated tax savings or offsetting the cost increases for many Ontario households.

¹⁹ Jack Mintz, "Ontario's Bold Move to Create Jobs and Growth," School of Public Policy, University of Calgary, Vol. 1, Issue 4, November 2009.

²⁰ KPMG, *Competitive Alternatives: Focus on Tax, 2009 Update for Ontario Ministry of Finance*, November 2009; and *Competitive Alternatives 2010 Special Report: Focus on Tax*, May 2010.

ANNEX A — SPSD/M HOUSEHOLD EXPENDITURE CATEGORIES

| Variable Name | Description |
|---------------|--|
| ctnsna0 | Food and Non-alcoholic Beverages |
| ctnsna1 | Alcoholic Beverages |
| ctnsna2 | Tobacco Products |
| ctnsna3 | Men's and Boy's Clothing |
| ctnsna4 | Men's and Boys' Clothing Repair and Alteration |
| ctnsna5 | Women's and Children's Clothing |
| ctnsna6 | Women's Clothing Repair and Alteration |
| ctnsna7 | Footwear |
| ctnsna8 | Footwear Repair |
| ctnsna9 | Gross Imputed Rents |
| ctnsna10 | Gross Paid Rents |
| ctnsna11 | Other Shelter Expenses |
| ctnsna12 | Electricity |
| ctnsna13 | Natural Gas |
| ctnsna14 | Other Fuels |
| ctnsna15 | Furniture and Floor Coverings |
| ctnsna16 | Upholstery and Furniture Repair |
| ctnsna17 | Household Appliances |
| ctnsna18 | Household Equipment Repairs |
| ctnsna19 | Semi-durable Household Furnishings |
| ctnsna20 | Non-durable Household Supplies |
| ctnsna21 | Domestic and Child Care Services |
| ctnsna22 | Other Household Services |
| ctnsna23 | Medical Care |
| ctnsna24 | Hospital Care and the like |
| ctnsna25 | Accident and Sickness Insurance |
| ctnsna26 | Drugs and Pharmaceutical Products |
| ctnsna27 | New and Net Used Motor Vehicles |
| ctnsna28 | Motor Vehicles Parts and Accessories |
| ctnsna29 | Motor Vehicle Repairs |
| ctnsna30 | Motor Fuels and Lubricants |

| Variable Name | Description |
|---------------|--|
| ctnsna31 | Other Motor Vehicle Related Services |
| ctnsna32 | Purchased Transportation |
| ctnsna33 | Communications |
| ctnsna34 | Recreation, Sporting and Camping Equip. |
| ctnsna35 | Recreation Equipment Repair and Rentals |
| ctnsna36 | Reading and Entertainment Supplies |
| ctnsna37 | Recreational Services |
| ctnsna38 | Education and Cultural Services |
| ctnsna39 | Jewelry and Watches |
| ctnsna40 | Jewelry and Watch Repair |
| ctnsna41 | Leather Goods and Other Personal Effects |
| ctnsna42 | Toilet Articles and Cosmetics |
| ctnsna43 | Personal Care |
| ctnsna44 | Restaurants and Accommodation Services |
| ctnsna45 | Financial, Legal and Other Services |
| ctnsna46 | Operating Expenditures of Non-profit Organizations |
| ctnsna47 | Net Expenditure Abroad |

Source: SPSD/M Commodity Tax User's Guide.

ANNEX B — HST REVENUE ALLOCATION FRAMEWORK

The HST on consumer expenditures and housing was derived from portions of the revenue allocation framework, the detailed economic formula used to allocate HST revenues to the participating provinces.

The following formulas were extracted from the Comprehensive Integrated Tax Coordination Agreement between the Government of Canada and the Government of Ontario:

(Note: CVAT refers to the total amount of GST collected by the Canada Revenue Agency)

Formula E

$$CEBASE_{t^o}^i = \sum_j NETEXPCE_{t^o}^{i,j} \times \tau_{t^o}^{i,j} \times \Delta_{t^o}^j$$

where

$NETEXPCE_{t^o}^{i,j}$

means the total expenditures in calendar year “t^o” for personal expenditure category “j” in province “i”, exclusive of any federal or provincial commodity or sales tax, other than a federal or provincial sales or commodity tax that is included in the base amount or consideration amount on which CVAT is determined, using the most recent Provincial Accounts data as provided by Statistics Canada;

$\tau_{t^o}^{i,j}$

means the proportion of personal expenditure in a category “j” in province “i” which is subject to CVAT in the calendar year that includes the tax entitlement year or sub-period “t”, as calculated by Statistics Canada, in consultation with Finance (Canada), using detailed commodity expenditure information valued at purchaser's price contained in the latest available provincial input-output tables for calendar year “t^o”, exclusive of any federal or provincial commodity or sales tax, other than a federal or provincial sales or commodity tax that is included in the base amount or consideration amount on which CVAT is determined.

Statistics Canada will be provided with data

which describes the degree to which specific commodities within Statistics Canada's provincial input-output tables do not attract the CVAT in the calendar year that includes the tax entitlement year or sub-period "t" as determined by Finance (Canada) in consultation with the Province together with the other participating provinces. This data will allow Statistics Canada to identify the non-taxable expenditures in personal expenditure category "j" in province "I". Thus, the remaining commodity expenditures in that category "j" would be subject to tax. A particular taxable proportion may be greater than 0%, notwithstanding that the commodity in question is an exempt supply, to reflect taxes levied on the inputs used in the provision of that exempt supply; and

$\Delta_{t^o}^j$

means an adjustment to the expenditures captured in personal expenditure category "j", for calendar year "t", as determined by Finance (Canada) in consultation with the Province and the other participating provinces. Such an adjustment factor will exclude expenditures which do not form part of the tax base in the calendar year that includes the tax entitlement year or sub-period "t" derived for consumer expenditures including, but not limited to, those expenditures of public sector bodies which are included in personal expenditures reported by Statistics Canada.

Formula F

$$\text{HOUSINGBASE}_{t^{\circ}}^i = \frac{\text{HOUSINGGST}_{t^{\circ}}^i}{\text{AVGFEDTXR1}_{t^{\circ}}^i}$$

where

HOUSINGGST_{t^o}ⁱ

means the estimated gross CVAT payable to Canada in calendar year “t^o” in province “i” associated with expenditures on residential construction, which includes expenditures on new housing construction, alterations and improvements, and transfer costs, prior to taking into account any rebates related to housing payable under the Excise Tax Act, as determined by Finance (Canada) based on data provided by Statistics Canada.

Gross CVAT payable to Canada is determined by taking into consideration CVAT levied on land for new construction as determined by Statistics Canada; and

AVGFEDTXR1_{t^o}ⁱ

means the CVAT rate in effect throughout calendar year “t^o” or, where there has been a change in the CVAT rate in that year, the weighted average CVAT rate for that year in province “i”, utilized by Statistics Canada in determining

HOUSINGGST_{t^o}ⁱ,
as provided by Statistics Canada.

ANNEX C — INPUT-OUTPUT METHODOLOGY

The central task in estimating the pass-through of business savings to Ontario consumers was to allocate the net sales tax savings realized on business intermediate inputs and investment to final demand categories.

The first task was to compute a vector of net tax savings by industry. The total amount of business tax savings equates to the RST saved, net of the remaining HST burden. This was determined by adding the RST savings by industry in the intermediate inputs tax matrix and subtracting the remaining HST burden, by industry, to derive an intermediate net tax savings vector by industry.

However, businesses also realize savings on their capital investment ($FDB_{m\&e,con}$). These savings were compiled from the final demand table and allocated to industrial users of these capital goods based on a “capital-use-matrix by industry” ($FD2IND_{kshare}$). Once allocated to industries, they were added to the vector of net RST savings by industry to form a vector of total net tax savings (TiV_{rst}).

The next step was to allocate these savings to industry outputs (pass-through) by spreading them across a matrix with the commodity shares of production (from Make/Output matrix). If an industry makes \$75 of cars and \$25 of balloons, 75 per cent of the tax savings go to car production commodity and 25 per cent to balloons. This assumes that businesses will spread tax savings across all the commodities they produce.

$$TOM_{rst} = D_{share} * TiV(D)_{rst}$$

Where:

TOM_{rst} is a matrix of tax savings by industry and by commodity;
 D_{share} is a 719x303 matrix with the share of commodity output by industry; and

$TiV(D)_{rst}$ is the industry vector of net tax savings converted into a 303x303 diagonal matrix.

TOM_{rst} was then added into a vector showing the total tax savings accruing to each commodity produced domestically (TOV_{rst}).

Commodities are used for both intermediate inputs and final demand in the economy. The tax savings by commodity were distributed to all users of this output (including intermediate inputs, personal consumption, investment, government and exports) according to the shares that each industry and final demand category had of economy-wide usage (UFD_{share}).²¹ For example, if 20 per cent of cars are used by intermediate industries, 50 per cent by consumers and 30 per cent are exported, the tax savings on the commodity “cars” were spread in the same proportions.

$$TSFD_{rst} = TOV(D)_{rst} * UFD_{share}$$

Where:

$TSFD_{rst}$ is a matrix of tax savings by final demand category by industry and by commodity;

$TOV(D)_{rst}$ is a diagonal matrix with the total net savings by commodity; and

UFD_{share} is a “super” matrix of both intermediate and final demand shares by commodity.

In the above equation, these initial tax savings accrue to intermediate inputs and all final uses (personal consumption, business investment, government and exports). The savings that accrue to personal consumption, government and exports are left to accumulate in these categories ($FD_{pe,g,x}$), however, savings also accrue to other industries in the intermediate input and to investment categories in final demand.

²¹ Imports were not considered because domestic tax savings do not accrue to exports to Ontario.

These tax savings were aggregated as before to form a vector of “2nd round” industry tax savings (with savings falling on final demand investment multiplied by a “capital-use-matrix by industry” to convert into industry savings).

These savings were then reallocated across the economy in a second iteration in the same way as the first. The savings to business from this second iteration were then passed on in a third iteration, and so on until all of the business savings were allocated to non-business categories (consumption, government) and exports.

$$\mathbf{TSFDi}_{rst} = \sum_i \{ \mathbf{FD}_{pe,g,x(i)} \} + \sum_i \{ (\sum_c (\mathbf{FDB}_{m\&e,con(i)} * \mathbf{FD2IND}_{kshare}) + \mathbf{USV}) * \mathbf{D}_{share} \}_{-d} * \mathbf{UFD}_{share}$$

Where:

\mathbf{TSFDi}_{rst} is a matrix of tax savings by final demand category and by commodity;

\sum_i goes from 1 to n, with “n” being the number of iterations until all business savings are exhausted (passed-through), \sum_c sums columns and $_{-d}$ is a diagonal operator;

$\mathbf{FD}_{pe,g,x(i)}$ is the accumulated tax savings accruing to personal consumption, government and exports;

$\mathbf{FDB}_{m\&e,con(i)}$ is the businesses savings on capital investment

$\mathbf{FD2IND}_{kshare}$ is a capital use matrix by industry; and

\mathbf{USV} is a row vector with savings accruing to intermediate inputs.

The final amount of tax savings accruing to each of the 48 expenditure categories of consumption were converted to “net pass-through” rates. These rates were then applied to the corresponding expenditure categories in 2010 to estimate the net benefit of business HST pass-through on consumers in 2010 dollars. These savings were allocated to the households in the Ministry’s model as outlined on page 9.