

Measuring the Non-Neutralities of Sales and Excise Taxes in Canada

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PRÉCIS

Cet article propose un cadre théorique pour évaluer les taux effectifs des taxes de vente fédérale et provinciales sur les articles destinés à la vente aux consommateurs. Il tient compte de la taxe de vente prélevée sur les intrants d'entreprises et sur les biens d'investissement utilisés dans le processus de la fabrication et de la distribution. L'analyse révèle que l'application de la taxe de vente fédérale entraîne d'importantes distorsions économiques. Cette conclusion s'applique également à tous les autres impôts du système fiscal canadien applicables aux denrées. Une des constatations les plus importantes est que le total combiné des taxes de vente fédérale et provinciales sur les intrants d'entreprises représente un fardeau indirect pouvant constituer jusqu'à 1,3 pour cent du prix de vente des exportations à partir de données pour 1980.

ABSTRACT

This article develops a theoretical framework to measure the effective federal and provincial sales tax rates for final demand commodities. It takes into account the sales taxes levied on intermediate inputs and on capital goods used in the production and distribution process. The analysis indicates that non-neutralities exist not only in the federal sales tax but also in all other taxes in the Canadian commodity tax system. One of the most significant findings (based on data for 1980) is that the combined hidden federal and provincial sales tax content of exports may be as much as 1.3 percent of their sales value.

INTRODUCTION

Sales taxes in Canada consist of the federal manufacturers' sales tax, provincial retail taxes, and a range of sales and excise levies on specific products or services. Although sales taxes are an important source of revenue to

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the two levels of government, they are significantly non-neutral in their application and cause major distortions in the economy.

The non-neutralities in the present federal sales tax (FST) arise from several factors. First, since the FST is applied to the manufacturer's sale price of goods produced in Canada and to the duty-paid value of imported goods,¹ wholesale and retail margins are excluded from the tax base. Since trade margins vary from commodity to commodity, the tax is not a uniform percentage of the final consumer price of taxable commodities. The federal government allows manufacturers to assign notional values to their products in order to adjust their tax liabilities for differences among the trade channels through which goods flow,² but in spite of this arrangement significant non-neutralities arise in the application of the tax to competing manufacturers. Second, the government specifically exempts some goods from the tax. There are both unconditionally exempt goods, such as food and clothing, and goods that are exempt when acquired by specific persons, such as hospitals and municipalities, for use in specified activities.³ Third, the tax is biased in favour of imports. The bias results from the fact that imports are taxable on their duty-paid value, which does not include the marketing and distribution costs that the importers incur in Canada. In the case of domestic goods, the marketing and distribution costs incurred by manufacturers are generally included in the sale price of the goods.⁴ Fourth,

¹There are, however, goods that are taxed on the wholesaler's price. Examples include cosmetics, gasoline, and automobiles.

²The notional values are defined by Revenue Canada to include both established price and determined value. When a manufacturer makes sales in representative quantities to independent wholesalers and also sells to retailers and perhaps to users, he may use the price at which he sells to wholesalers for calculating the tax on sales to retailers and users. This price is known as an established price to wholesalers. Similarly, a manufacturer may use an established price to retailers if it is customary for him to sell goods to retailers and users only. Representative quantities are defined as quantities sold to two or more customers over a preceding twelve-month period that amount to no less than 15 percent of the manufacturer's total dollar volume of domestic sales of that specific good in that period. If, however, a manufacturer does not sell to wholesalers (and therefore is unable to establish his own wholesale value) but sells directly to firms beyond this level in the distribution sequence and if, in his industry, sales are made in representative quantities to wholesalers, Revenue Canada may give him a determined wholesale value for tax that he may use on his sales to retailers and users. In some industries there is no representative wholesale situation, but if sales are made in representative quantities to retailers, Revenue Canada applies the same principle to sales to users and allows a determined retail value. For details, see Revenue Canada, Customs and Excise, *Memorandum ET-202, "Values for Tax,"* December 1, 1975.

³Details can be found in the Excise Tax Act RSC 1970, c. E-13, as amended.

⁴This has been pointed out in many papers. See, for example, Canada, Department of Finance, *Report of the Commodity Tax Review Group* (Ottawa: the department, 1977), and *Draft Amendments to the Excise Tax Act: Proposed Legislation To Shift the Federal Sales Tax to the Wholesale Level* (Ottawa: The department, April 1982). See also Malcolm Gillis, "Federal Sales Taxation: A Survey of Six Decades of Experience, Critiques, and Reform Proposals" (January-February 1985) 33 *Canadian Tax Journal* 68-98. The extent of the disparity in favour of imported goods was estimated to be approximately one-third of the domestic effective FST rate in 1984. This estimate was computed from a very comprehensive FST survey undertaken by Woods Gordon and commissioned by the Department of Finance.

the FST applies to a range of intermediate inputs and capital goods used in the production and distribution of goods and services. The consequent tax pyramiding or cascading compounds the bias in favour of imports, since foreign manufacturers do not face the same amount of hidden costs on business inputs. What is more important, this hidden tax significantly increases the cost of exports from Canada and hence weakens the competitive position of Canadian firms in international markets. Finally, non-neutralities also arise from the application of the tax at multiple statutory rates rather than at a single rate.⁵

Provincial sales taxes (PSTs) are imposed at the retail level at rates that vary from province to province. Although PSTs are free from many of the distortions that arise under the FST, they are far from neutral in their application. The provinces exempt a range of consumer goods and services from sales tax and apply the tax to many intermediate inputs and capital goods.

Finally, sales and excise levies on specific goods and services are non-neutral by virtue of their very design; that is, their narrow application.

Although the distortions associated with sales taxes are generally well recognized, little is known about their magnitude. There are no statistical data available that allow one to quantify readily the variation in the federal and provincial sales tax burden across industries or commodities. As well, no attempt has yet been made to determine the magnitude of tax cascading (through the application of tax to business inputs as well as to sales) and how it affects final effective sales tax rates on a given product.

This article attempts to fill the gap in information about the impact of federal and provincial sales taxes. It develops a methodology that enables us to quantify effective federal and provincial sales tax rates, which reflect sales tax distortions in the economy of the type noted above. Effective tax rates are defined as the ratio of direct and hidden (or indirect) sales taxes paid on a given commodity to the final consumer expenditures on that commodity, exclusive of the taxes. If one assumes that taxes at the intermediate level are wholly shifted forward to consumers in the form of higher prices, then these rates measure the actual tax burden on final consumers for various commodities. An analogous measure for exports and inventories shows the magnitude of the indirect sales tax content that would be absent under a neutral system.

The next section describes the methodology used to estimate effective sales tax rates by commodities. The third section presents the empirical results for the various commodity taxes. The final section offers some summary remarks.

⁵The following rates have applied since January 1, 1988: an 8 percent rate for construction materials, a 10 percent rate for cable television, and telecommunication services, an 18 percent rate for tobacco and alcoholic beverages, and a 12 percent rate for all other taxable goods.

METHODOLOGY

We use the Canadian input-output model to derive effective sales tax rates. The calculation of effective rates depends to a great extent upon the assumptions made about how supply and demand elasticities and other market factors cause the taxes to shift forward and backward.⁶ The calculation becomes extremely complex, however, if one tries to take into account the supply and demand elasticities of each commodity. In any case, no reliable data are available for price elasticities for a broad range of commodities. For simplicity's sake, therefore, this article adopts the assumption generally used in partial equilibrium incidence analysis of sales taxes that all such taxes are fully shifted forward to consumers.⁷

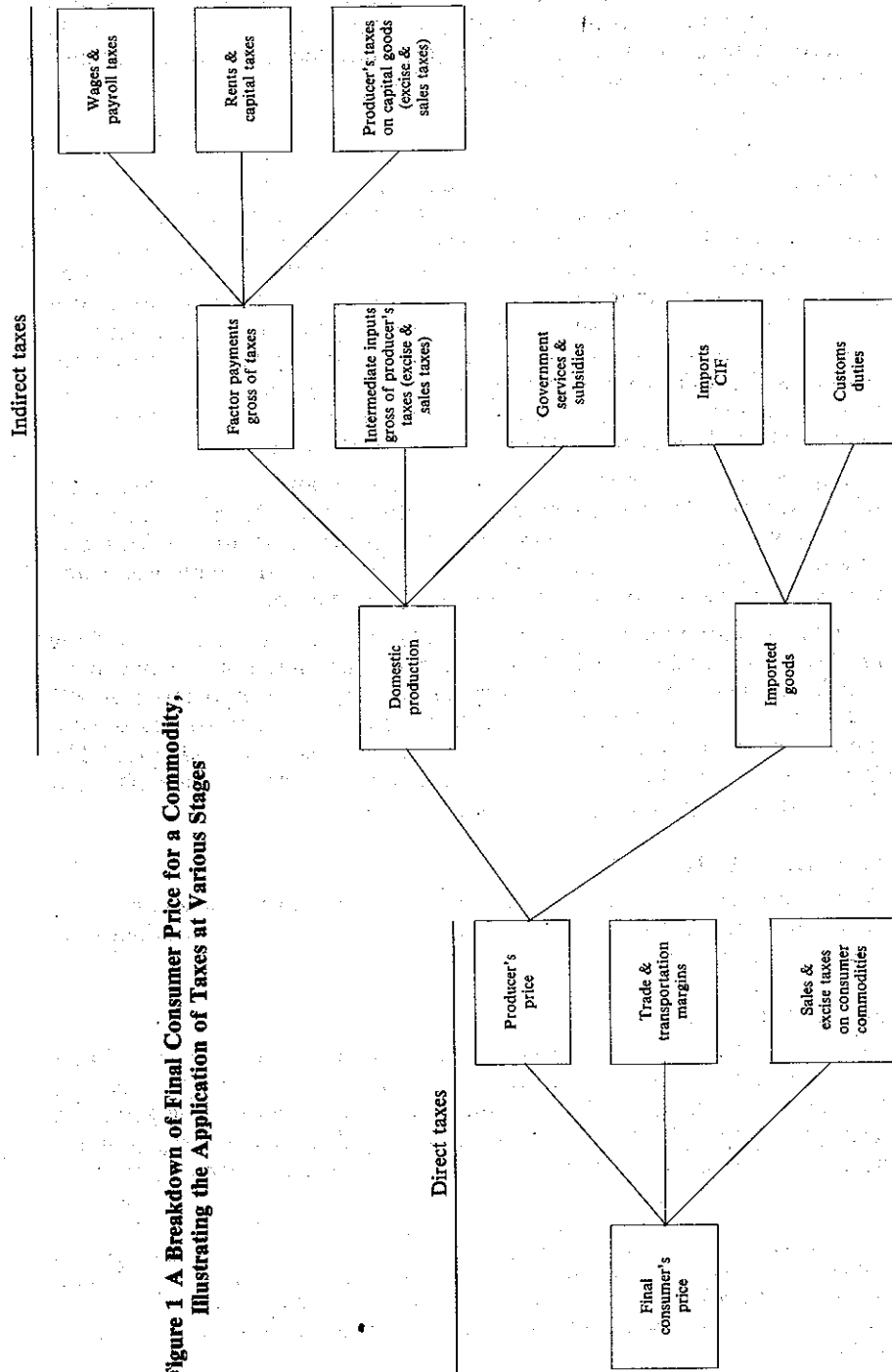
The analysis derives the final consumption expenditures used to calculate the effective tax rates from the input-output model. To be specific, final expenditures include (1) personal expenditures on goods and services, and (2) expenditures made by governments and non-profit organizations on goods, services, machinery and equipment, and construction. The sum of these amounts provides the tax base for a comprehensive consumption tax.

Figure 1 illustrates our approach to the calculation of effective sales tax rates by showing the composition of the price of a typical commodity purchased by final consumers. The price includes the producer's price, the trade and transportation margins, and the various excise and sales taxes applicable to the finished product. The producer's price for a domestically produced commodity equals the sum of payments to primary factors, intermediate inputs (gross of all taxes), and government services, less any government subsidies provided to producers. For imports, the producer's price is defined as the duty-paid price. Payments to primary factors can be disaggregated into wages (gross of payroll taxes), capital costs (gross of capital taxes), and excise and sales taxes paid on capital goods used in current production.⁸

⁶A detailed discussion can be found in John Whalley, "Regression or Progression: The Taxing Question of Incidence Analysis" (November 1984), 17 *Canadian Journal of Economics* 654-82.

⁷See, for example, Joseph A. Pechman and Benjamin A. Okner, *Who Bears the Tax Burdens?* (Washington: The Brookings Institution, 1974); W. Irwin Gillespie, "On the Redistribution of Income in Canada" (July-August 1976), 24 *Canadian Tax Journal* 417-50; and Edgar K. Browning, "The Burden of Taxation" (August 1978) 86 *Journal of Political Economy* 649-71. This assumption is usually justified on the ground that Canada is a small, open economy, in which the pre-tax prices of most goods are set by the world markets. Consequently, a uniform tax on both domestic and imported goods would be fully shifted on to the final consumers. The Canadian federal sales tax, however, does not apply uniformly to imports and domestic goods, and it could be argued that any differential tax on domestic goods (over and above the tax applicable to competing imports) is being absorbed by the producers. Data limitations do not permit proper consideration of these factors in our analysis. In any case, it is not likely that the use of alternate assumptions would in any way change this article's main conclusions about the variation in effective tax rates across commodities.

⁸It should be pointed out that the trade and transportation margins embodied in the price of a commodity also include indirect FST payments arising from intermediate inputs and capital purchases.



**Figure 1 A Breakdown of Final Consumer Price for a Commodity,
Illustrating the Application of Taxes at Various Stages**

The effective sales tax rate for each commodity (t_i) is defined as the ratio of direct (T_{di}) and hidden or indirect (T_{hi}) taxes on the commodity to the final consumer price of the commodity (or, equivalently, the final consumer expenditure) net of all sales taxes (E_i).⁹ That is,

$$t_i = \frac{T_{di} + T_{hi}}{E_i} = \frac{T_{di} + T_{hi}^m + T_{hi}^k}{E_i}, \quad (1)$$

where T_{di} is the direct tax levied on the i 'th commodity purchased by final consumers and T_{hi} is the tax imposed on current material and other non-capital inputs (T_{hi}^m) and on capital inputs (such as machinery and equipment and buildings) consumed by the business sector in the current production process (T_{hi}^k). It is important to note that we do not include in indirect taxes the full amount of taxes paid on purchases of capital goods in a given year, but rather only the amount paid on the portion of capital purchases in the current and previous years that depreciates during the year. For the purposes of these effective tax rate calculations, in other words, the taxes paid on capital goods are amortized over the life of the goods.

Exports and additions to inventories are generally exempt from direct sales taxes (with the notable exception of the federal sales and excise taxes that apply to additions to wholesalers' and retailers' inventories). They are, however, subject to indirect taxes attributable to intermediate inputs and capital goods used in their production and distribution.

Indirect taxes on inputs include not only the taxes on inputs used in the production of final domestic demand, exports, and additions to inventory, but also the taxes on inputs used in the production of inputs themselves. We used input-output tables to estimate the indirect sales taxes associated with the current inputs and capital investment at all stages of production. The methodology we followed in order to capture these intermediate effects is discussed in an appendix to this article.

EMPIRICAL ESTIMATION

We obtained all of the data used to estimate the effective sales tax and other commodity tax rates from the 1980 input-output tables produced by Statistics Canada.¹⁰

Federal Sales Tax

In 1980, the federal sales tax was imposed at three statutory rates: a 12 percent rate on alcoholic beverages and tobacco, a 5 percent rate on construction materials, and a 9 percent standard rate on all other taxable goods. In aggregate, the FST directly imposed on final consumer expenditures accounted for slightly over 51 percent of the total FST revenues collected.

⁹This value can also be measured by summing the producer's prices, federal excise levies (other than general sales taxes), retail, wholesale, transportation, storage, pipeline, and gas margins, petroleum levies, air transport taxes, and oil export charges.

¹⁰Statistics Canada, *The Input-Output Structure of the Canadian Economy*, catalogue no. 15-201E.

The remaining revenues came from indirect sales taxes levied on intermediate inputs (36 percent) and on machinery and equipment purchased by the business sector (13 percent).

The input-output tables show that most of the FST paid on intermediate inputs was collected from a select group of industries. The construction, travel, advertising, and office supplies industries accounted for three-quarters of the total FST collected on intermediate inputs. This statistic may be misleading, however, since the travel, advertising, and office supplies industries are "dummy industries" in the input-output tables. For example, Statistics Canada has created the office supplies industry to account for the purchases of all office supplies by all industries, since it is difficult to apportion precisely to each industry the share of office supplies that it purchases. Thus the sales tax shown for a dummy industry is actually incurred by all of the industries that use the output of that industry.

Table 1 summarizes the effective FST rates for 1980, by commodity, for final domestic consumption, exports, and additions to inventories.¹¹ As might be expected, the direct effective FST rates are zero for all services and for exempt commodities such as food and clothing (see column 1 of table 1). For taxable goods, the direct effective tax rates are positive, but non-uniform across commodities. Alcoholic beverages and tobacco have the highest direct effective tax rates (9.2 percent and 6.9 percent, respectively). This is not surprising, given that they are taxed at the highest statutory rate—12 percent in 1980. The effective tax rates are lower than the statutory rate because trade margins, including the profits of provincial liquor authorities, are exempt from the tax base. The vast majority of the remaining taxable goods have direct effective tax rates in the range of 3.0 percent to 6.5 percent. The fact that the range of rates is so wide is attributable to a number of factors, including differences in tax-exempt wholesale and retail markups across commodities, discounts allowed in computing tax payable, and the existence of conditional and unconditional sales tax exemptions.

Column 2 of table 1 indicates that most commodities have an indirect FST content, which in 1980 was on average 0.75 percent of total consumer expenditures. The indirect FST rate is highest, at about 2.1 percent, for residential and non-residential construction. The high rate in this case is explained by the fact that almost all construction materials are subject to sales tax. Other commodities that have a high indirect sales tax content are transportation and storage services and communication services; the indirect rate for both commodities is approximately 1.3 percent.

Although exports are exempt from the FST, business inputs used in their production and distribution do attract tax. This indirect tax on Canadian exports is approximately 0.69 percent of export revenues, net of the indirect tax content. Assuming that Canada does not have any control over the

¹¹ The effective tax rates were originally calculated to the medium-sized M-level of commodity aggregation (100 commodities and 43 industries) but compressed to the small-level aggregation for the purposes of this presentation. Those interested in the M-level disaggregation data can obtain it from the authors.

world market prices of tradeable goods, much of the burden of indirect sales taxes is borne by Canadian producers. The indirect tax on exports represents a substantial fraction of their real profit margin, which was estimated to be 3.5 percent of sales over the period 1965-1981 (calculated on an inflation-adjusted basis).¹²

As column 4 of table 1 shows, the indirect FST rates for several commodity categories of exports are significantly higher than the average rate. The highest indirect FST rate, 2.6 percent, applies to transportation and storage services. The high rate in this case was predictable, given that business inputs such as office supplies, motor fuels, transportation repair parts and supplies, and warehouse construction materials are subject to the FST. Communication services such as telephone and telegraph, television broadcasting, and postal services rank second with a rate of about 1.3 percent. They are closely followed by other non-metallic mineral products, for which the rate is 1.2 percent.

The last column of table 1 presents the indirect FST embodied in additions to inventories. In total, inventories in the Canadian economy carry an indirect FST of 0.48 percent. As in the case of exports, this tax burden varies from commodity to commodity. The tax embodied in additions to inventories will be passed on to final users, but only in future years as goods are removed from the inventory. This tax is not allocated to other final demand categories in the current year, consistent with our treatment of taxes on other undepreciated capital goods.

Provincial Sales Taxes

The following analysis includes provincial tobacco taxes and local amusement taxes with provincial retail sales taxes. Data limitations imposed by the structure of the input-output tables made separation of the taxes impracticable.

Like the FST, provincial sales taxes are levied on a range of intermediate commodity inputs and capital goods. Although the impact of these taxes on business inputs may not be as substantial as the impact of the FST, it is still significant. In 1980, taxes on business inputs accounted for almost 37 percent of PST collections. Of the PST paid on intermediate inputs, the construction industry accounted for nearly 45 percent; the "dummy" industries—office supplies, travel, and advertising—accounted for an additional 45 percent. The PST levied on capital goods was concentrated in the commercial services industry (32 percent), the communications industry (14 percent), and the electrical power industry (12 percent).

We used the same analytical framework to calculate effective PST rates as we used to estimate effective FST rates. Table 2 summarizes the effective PST rates for 1980 by commodity. Cigarettes and other tobacco products

¹²These estimates were derived using the SOCRAT data base of the Tax Policy and Legislation Branch of the Department of Finance.

have the highest direct effective tax rate, 32.4 percent. The high rate was to be expected, given that tobacco products are one of the major revenue sources for provincial governments. Alcoholic beverages follow tobacco products with an effective tax rate of approximately 12 percent (not including provincial markups on alcohol sales). Some provinces tax alcoholic beverages at rates higher than the standard PST rate. The effective rates for the remaining taxable goods range from 3 percent to 7 percent. Certain services are also subject to provincial sales taxes, with effective tax rates that range from 3.9 percent for communication services to 1.9 percent for personal and other miscellaneous services.¹³

The weighted average indirect PST rate on final domestic consumption is about 0.75 percent, approximately the same as the indirect FST rate. Construction commodities have the highest indirect PST rate, 2.5 percent. For communication services and other utilities, the indirect PST rate is almost 1 percent.

Although exports are exempt from direct provincial taxation, they are subject to provincial sales taxes indirectly. The weighted average of the indirect provincial tax rates is approximately 0.6 percent of export sales. As table 2 shows, export commodities with a high indirect PST rate include transportation and storage services at 1.9 percent and communications and other utilities at approximately 1 percent.

The last column of table 2 displays the indirect PST content for additions to inventories. On average, inventories carry an indirect PST of 0.4 percent.

Total Canadian Commodity Taxes

Several commodities are subject not only to both FST and PST, but also to federal excise duties or excise taxes.¹⁴ Most of these taxes are imposed on goods purchased by final consumers; the notable exception is the federal excise tax imposed on motor fuels, which are purchased by both consumers and businesses.

Provincial governments too impose additional taxes on specific goods and services. Important examples are gasoline taxes (commonly called road taxes) and liquor gallonage taxes. In addition, the provinces receive significant revenues in the form of profits earned by their liquor commissions. These profits can be viewed as a form of tax.¹⁵

¹³At a further level of disaggregation, the effective sales tax rates are 5 percent for telephone and telegraph, 3 percent for electric power, 6 percent for amusement and recreation services, and 5 percent for accommodation and food services.

¹⁴An excise duty is imposed on spirits, beer, cigars, and cigarettes and manufactured tobacco. An excise tax is levied on cigars, cigarettes and manufactured tobacco, wine, gasoline, automotive air conditioners, jewellery, clocks, and watches, among other goods.

¹⁵In 1980, provincial gasoline taxes, liquor gallonage taxes, and profits of the liquor commissions amounted to \$3.3 billion. This amount is equal to about 47 percent of provincial retail sales tax revenues.

The methodology used earlier can be applied to the Canadian commodity tax system as a whole,¹⁶ an exercise that yields the total effective tax rates presented in table 3. If it is assumed, as before, that all commodity taxes are fully shifted forward to consumers, then tobacco products and alcoholic beverages have direct effective tax rates of more than 100 percent. They are followed by petroleum and coal products, for which the rate is 24 percent. In 1980, the direct effective tax rate for the economy as a whole was slightly more than 6 percent.

The average indirect tax rate for the final domestic consumption of goods and services was about 2.3 percent in 1980. Although residential construction and non-residential construction are not taxed directly, they bear the highest indirect tax rate—5.5 percent. The high rate is attributable to the fact that construction materials are subject to both federal and provincial sales taxes.

CONCLUDING REMARKS

In this article, we have developed a theoretical framework for measuring effective consumption tax rates for final demand commodities. Our analysis has taken into account the taxes attributable to intermediate inputs and capital goods used in the production process. The results indicate that the Canadian commodity tax system is not neutral. Non-neutralities exist not only in the federal sales tax system but also in the provincial sales tax systems.

Since the federal sales tax is levied on intermediate inputs and capital goods, even goods and services that are exempt from the tax face a positive effective tax rate. One of our most significant findings is that the hidden indirect FST embodied in the value of final consumption and exported goods is not only positive but relatively large—that is, about 0.7 percent of the total value of sales exclusive of direct and hidden FST.

When the analysis is extended to include the PST and other federal and provincial commodity taxes, the results indicate that there is a further significant indirect tax component embodied in the prices of both final consumer goods and exports. In 1980, the combined indirect tax content of exports under the existing federal and provincial sales tax systems was 1.3 percent of export revenues net of taxes. These indirect taxes would be eliminated if the current commodity tax system were replaced with a comprehensive value-added tax or a neutral retail sales tax.

¹⁶ There are other taxes that could be regarded as commodity taxes but that, for various reasons, we have not included in our analysis. For example, customs duties on imports are not included in the analysis because the assumption of full forward shifting may not be appropriate in their case, given that they do not apply to domestic production. Property taxes are excluded because it is more common to regard them as a tax on capital than as a commodity tax.

Table 1. Effective Federal Sales Tax Rates by Commodities, 1980

Commodities	Consumer goods			Exports	Inventories
	Direct	Indirect	Total		
	<i>percentages</i>				
Grains	—	—	—	0.79	0.82
Other agricultural products	—	0.70	0.70	0.82	0.81
Forestry products	—	0.88	0.88	0.96	0.94
Fishing and trapping products	—	0.81	0.81	0.91	0.56
Metallic ores and concentrates	—	—	—	0.69	0.37
Mineral fuels	—	0.52	0.52	0.73	0.50
Non-metallic minerals	—	0.49	0.49	0.70	0.62
Meat, fish, and dairy products	—	0.72	0.72	0.76	0.68
Fruit, vegetables, feed, miscellaneous food products	0.01	0.66	0.67	0.76	0.67
Soft drinks	—	0.75	0.75	0.75	0.53
Alcoholic beverages	9.16	0.50	9.66	0.72	0.57
Tobacco and tobacco products	6.94	0.47	7.41	0.76	0.68
Rubber, leather, plastic fabricated products	2.36	0.51	2.88	0.64	0.53
Textile products	4.94	0.48	5.43	0.52	0.38
Knitted products and clothing	—	0.49	0.49	0.37	0.27
Lumber, sawmill, other wood products	2.47	0.70	3.17	0.83	0.72
Furniture and fixtures	6.14	0.49	6.63	0.47	0.44
Paper and paper products	5.27	0.63	5.90	0.76	0.69
Printing and publishing	0.21	0.45	0.66	0.56	0.44
Primary metal products	0.44	0.29	0.73	0.66	0.43
Metal fabricated products	4.97	0.38	5.35	0.51	0.40
Machinery and equipment	3.31	0.26	3.57	0.51	0.24
Autos, trucks, and other transportation equipment	6.16	0.26	6.42	0.50	0.22
Electrical and communication products ..	5.28	0.41	5.69	0.52	0.38
Non-metallic mineral products	3.53	0.65	4.18	1.20	0.82
Petroleum and coal products	4.60	0.56	5.16	0.66	0.55
Chemicals, chemical products	3.27	0.70	3.97	0.80	0.65
Miscellaneous manufactured products ..	3.90	0.41	4.31	0.54	0.27
Residential construction	—	2.11	2.11	—	—
Non-residential construction	—	2.11	2.11	—	—
Repair construction	—	2.11	2.11	—	—
Transportation and storage	—	1.28	1.28	2.56	—
Communication services	0.26	1.29	1.55	1.32	—
Other utilities	—	0.72	0.72	0.76	—
Imputed rent on owner-occupied development	—	0.31	0.31	—	—
Other financial services, insurance, real estate fees	—	0.55	0.55	0.56	—
Business services	—	0.74	0.74	0.90	—
Personal and other miscellaneous services	—	0.80	0.80	0.57	—
Total	1.36	0.75	2.11	0.69	0.48

Table 2 Effective Provincial Sales Tax Rates by Commodities, 1980

Commodities	Consumer goods			Exports	Inventories
	Direct	Indirect	Total		
	<i>percentages</i>				
Grains	—	—	—	0.45	0.48
Other agricultural products	0.09	0.47	0.56	0.49	0.47
Forestry products	0.32	0.86	1.18	0.88	0.92
Fishing and trapping products	—	0.55	0.55	0.55	0.19
Metallic ores and concentrates	—	—	—	0.68	0.37
Mineral fuels	1.18	0.46	1.64	0.71	0.53
Non-metallic minerals	0.28	0.48	0.76	0.56	0.64
Meat, fish, and dairy products	—	0.58	0.58	0.58	0.52
Fruit, vegetables, feed, miscellaneous food products	0.71	0.53	1.24	0.56	0.51
Soft drinks	4.71	0.60	5.31	0.56	0.53
Alcoholic beverages	12.04	0.41	12.44	0.52	0.41
Tobacco and tobacco products	32.38	0.40	32.78	0.61	0.56
Rubber, leather, plastic fabricated products	4.46	0.46	4.92	0.55	0.45
Textile products	5.67	0.43	6.10	0.45	0.32
Knitted products and clothing	2.98	0.44	3.42	0.34	0.27
Lumber, sawmill, other wood products	5.94	0.68	6.62	0.75	0.73
Furniture and fixtures	4.79	0.47	5.26	0.47	0.44
Paper and paper products	4.80	0.60	5.40	0.69	0.66
Printing and publishing	0.48	0.44	0.92	0.52	0.43
Primary metal products	4.36	0.28	4.64	0.61	0.38
Metal fabricated products	5.13	0.35	5.48	0.47	0.39
Machinery and equipment	2.91	0.24	3.15	0.46	0.22
Autos, trucks, and other transportation equipment	6.20	0.21	6.41	0.40	0.18
Electrical and communication products ..	5.89	0.37	6.26	0.48	0.36
Non-metallic mineral products	6.26	0.48	6.74	0.69	0.50
Petroleum and coal products	0.45	0.55	1.00	0.62	0.57
Chemicals, chemical products	3.70	0.61	4.31	0.66	0.53
Miscellaneous manufactured products ...	5.93	0.36	6.29	0.50	0.21
Residential construction	—	2.46	2.46	—	—
Non-residential construction	—	2.46	2.46	—	—
Repair construction	—	2.46	2.46	—	—
Transportation and storage	—	0.79	0.79	1.94	—
Communication services	3.88	0.98	4.86	1.00	—
Other utilities	2.17	0.99	3.16	1.06	—
Imputed rent on owner-occupied development	—	0.36	0.36	—	—
Other financial services, insurance, real estate fees	—	0.66	0.66	0.68	—
Business services	—	0.68	0.68	0.82	—
Personal and other miscellaneous services	1.92	0.73	2.65	0.52	—
Total	2.32	0.75	3.07	0.60	0.42

Table 3 Effective Total Canadian Commodity Tax Rates by Commodities, 1980

Commodities	Consumer goods			Exports	Inventories
	Direct	Indirect	Total		
	<i>percentages</i>				
Grains	—	—	—	2.18	2.24
Other agricultural products	0.09	2.04	2.13	2.34	2.20
Forestry products	0.32	2.97	3.29	3.10	3.18
Fishing and trapping products	—	2.37	2.37	2.61	0.75
Metallic ores and concentrates	—	—	—	1.91	0.91
Mineral fuels	1.19	1.65	2.84	12.84	1.39
Non-metallic minerals	0.28	1.45	1.73	1.78	1.81
Meat, fish, and dairy products	—	2.10	2.10	2.16	1.92
Fruit, vegetables, feed, miscellaneous food products	0.73	1.94	2.67	2.13	1.85
Soft drinks	4.79	2.19	6.98	2.10	2.15
Alcoholic beverages	105.34	1.81	107.15	1.98	1.48
Tobacco and tobacco products	118.10	2.14	120.24	2.10	1.89
Rubber, leather, plastic fabricated products	6.89	1.49	8.38	1.72	1.38
Textile products	10.71	1.39	12.10	1.36	0.96
Knitted products and clothing	3.01	1.42	4.43	0.97	0.75
Lumber, sawmill, other wood products	8.53	2.15	10.68	2.41	2.20
Furniture and fixtures	11.03	1.45	12.48	1.33	1.25
Paper and paper products	10.21	1.94	12.15	2.24	2.08
Printing and publishing	0.70	1.28	1.98	1.50	1.20
Primary metal products	4.83	0.83	5.66	1.84	1.08
Metal fabricated products	10.18	1.10	11.28	1.38	1.10
Machinery and equipment	6.26	0.76	7.02	1.35	0.58
Autos, trucks, and other transportation equipment	12.66	0.70	13.36	1.23	0.51
Electrical and communication products	11.25	1.20	12.45	1.35	0.95
Non-metallic mineral products	9.91	1.72	11.63	2.66	1.77
Petroleum and coal products	24.01	7.34	31.35	13.12	8.92
Chemicals, chemical products	7.09	2.17	9.26	2.53	2.01
Miscellaneous manufactured products	10.84	1.21	12.05	1.51	0.62
Residential construction	—	5.47	5.47	—	—
Non-residential construction	—	5.47	5.47	—	—
Repair construction	—	5.47	5.47	—	—
Transportation and storage	1.26	4.64	5.90	11.03	—
Communication services	4.21	2.71	6.92	2.77	—
Other utilities	2.19	2.32	4.52	2.48	—
Imputed rent on owner-occupied development	—	0.78	0.78	—	—
Other financial services, insurance, real estate fees	—	1.57	1.57	1.61	—
Business services	—	1.85	1.85	2.26	—
Personal and other miscellaneous services	2.47	2.06	4.53	1.52	—
Total	6.12	2.31	8.43	3.30	1.59

APPENDIX

This appendix describes the methodology used to estimate hidden or indirect taxes embodied in the value of final consumption, exports, and additions to inventories. The initial steps in the calculation include the following.

First, the total consumer expenditures are allocated between supply from current domestic production and supply from other sources such as imports, governments, and inventories (referred to as leakages in the input-output system).

Second, the tax on supply from current domestic production is broken down into direct and hidden tax (T_{di} and T_{hi}). The direct tax is simply the tax applicable on the sale of final consumer products. The hidden tax has two components. One is the tax on material and other non-capital input supplies from both current domestic production and other sources (T_{ni}). The other comprises both the direct taxes on capital goods and the indirect taxes applied to material and other non-capital inputs required for the production of these capital goods (T_{hi}^k).

Third, the tax on supply from imports is estimated by taking the direct tax on imports, which is simply the tax paid on acquisition of final consumer goods.

Since the calculation of the direct tax is relatively straightforward, the remainder of this appendix describes the calculation of the indirect taxes.

Indirect Sales Taxes Paid on Intermediate Inputs

The sales tax is paid on the purchase of a range of intermediate inputs either acquired domestically or imported. These inputs include not only direct inputs purchased by a given industry, but also indirect inputs purchased by other industries for the production of direct inputs. Given the methodology employed by Statistics Canada,¹⁷ the domestic industry requirements for the production of one dollar's worth of each commodity demanded by final consumers can be estimated by the following equation:

$$X = [I - D(I - \hat{\mu} - \hat{\alpha} - \hat{\beta})B]^{-1}D, \quad (A1)$$

where X is a vector of production required to satisfy one dollar's worth of consumer demand for each commodity; B is a matrix of m -commodity by n -industry input coefficients, which measure the direct intermediate (non-capital) inputs of each of m commodities required for one dollar's worth of output for each of n industries; D is an n -industry by m -commodity domestic market share matrix, its elements being the coefficients that measure the share of each industry in the production of each commodity; $\hat{\mu}$ is a diagonal m -commodity matrix of import coefficients, which are calculated as the ratios of imports to total use of each commodity; $\hat{\alpha}$ is a diagonal m -commodity matrix of government production coefficients, which are calculated as the ratios of government production to the total use of each commodity; $\hat{\beta}$ is a diagonal m -commodity matrix of inventory withdrawal

¹⁷Statistics Canada, *The Input-Output Structure of the Canadian Economy, 1971-80*, catalogue no. 15-201E, chapter 4.

coefficients, which are calculated as the ratios of inventory withdrawal to the total use of each commodity; and I is a diagonal unity matrix.

The term $(I - \hat{\mu} - \hat{\alpha} - \hat{\beta})$ in equation A1 accounts for intermediate input requirements that are met by current domestic production. To produce output domestically, each production process requires a proportional increase in inputs from imports, supplies by government, and withdrawals from inventory. These requirements (Y) for the production of one dollar's worth of each commodity demanded by final consumers can be calculated as follows:

$$Y = (\hat{\mu} + \hat{\alpha} + \hat{\beta})BX. \quad (A2)$$

Let δ stand for an n -industry vector of input sales tax coefficients that measure the ratios of the sales tax paid on direct intermediate inputs to the output of each industry. Given that the sales tax applies to intermediate inputs regardless of the source of supply, the vector of indirect sales taxes (t) embodied in a dollar's worth of output of each commodity can be estimated as

$$t = \delta(X + Y). \quad (A3)$$

Indirect sales taxes paid on the final demand by consumers (T^n) can then be calculated as follows:

$$T^n = \hat{t}[(I - \hat{\mu} - \hat{\alpha} - \hat{\beta})E], \quad (A4)$$

where $\hat{t}$ is the same as t in equation A3 but is expressed in a diagonal m -commodity matrix, E is a m -commodity vector of final demand by consumers, and $(I - \hat{\mu} - \hat{\alpha} - \hat{\beta})E$ is the domestic demand vector, net of all leakages.

The indirect sales tax component embodied in exports and additions to inventories can be calculated in the same fashion.

Indirect Sales Taxes Paid on Capital Goods

The production of commodity outputs for final consumption requires not only intermediate inputs but also capital goods. These capital goods include machinery and equipment and buildings. As was discussed earlier, sales taxes paid directly on the purchase of capital goods used in current production and sales taxes attributable to intermediate inputs required for production of these capital goods can be regarded as indirect sales taxes embodied in the commodity's final price.

From the final demand matrix in the input-output tables, one can obtain both the capital expenditures and the associated sales tax paid, by industry, on machinery and equipment and construction commodities. One then sums all of the sales tax paid across commodities to obtain total sales tax paid directly on industrial capital purchases. Multiplication of this sum with the ratio of capital consumption allowances to capital expenditures of the corresponding industry yields the approximate sales tax associated with capital consumption allowances by industry, denoted by F_j for the j th industry.¹⁸ It should be noted that no direct sales taxes are imposed on structures.

¹⁸This calculation is appropriate, since capital consumption allowances for each industry

(Continued on next page.)

The indirect sales tax (G) associated with intermediate inputs required for the production of domestic capital goods can be calculated in the same way as equation A4. Summing these estimates of sales tax over commodities for each industry yields the total indirect sales tax paid by that industry; that is, $G_j = \sum_i G_{ij}$ for the j th industry.

The sum of F_j and G_j constitutes the total direct and indirect FST associated with capital goods used in the j th industry. Given that capital goods are not used exclusively to produce final consumption goods, the tax on these goods must be apportioned not only to current expenditures on domestic consumption, exports, and additions to inventories but also to capital expenditures on machinery and equipment and construction. The portion associated with the production of capital goods should then be further distributed until it is fully allocated among commodities that enter other components of final demand. This process is outlined in the following steps:

1) Allocate the sales tax, $F_j + G_j$, of the j th industry across commodities to derive the share of the sales tax associated with each of the commodities that the j th industry produces.

2) For each commodity, sum all of the sales tax in (1) across industries to derive the sales tax imposed on that commodity.

3) Allocate the sales tax in (2) across final consumption, exports, additions to inventories, and capital expenditures on machinery and equipment and construction.

4) Sum the sales tax across commodities in (3) for machinery and equipment and construction to derive the amount of sales tax by industry. Note that these sales tax amounts have not been allocated to consumption, exports, and inventories in the first round.

5) Allocate the remaining sales tax on capital goods from (4) among commodities by going back to (1) and repeating the same process until all sales tax is fully allocated to consumption, exports, and additions to inventories.¹⁹

Substitution of the value of direct sales tax and indirect sales tax, as calculated above, into equation (1) yields effective sales tax rates across the various commodities that enter final domestic consumption. The indirect sales tax rates for exports and inventories are obtained by dividing the corresponding computed indirect taxes by the value of exports and the value of inventories net of all indirect taxes, respectively.

Our analysis applied the methodology outlined above to the federal sales tax, provincial retail sales taxes, and a combination of all Canadian commodity taxes.

¹⁸Continued . . .

represent a good proxy for capital actually consumed in current production. The underlying assumptions are that the tax rate does not change through time and that the base of tax is relatively stable with respect to capital goods. These assumptions allow us to use the rate of tax for capital purchases as an approximation of the rate of tax on capital consumption allowances. Capital consumption allowances for machinery and equipment and structures for each industry can be found in Statistics Canada, *Fixed Capital Flows and Stocks*, annual, catalogue no. 13-211.

¹⁹It would take approximately seven iterations to complete the FST allocation.