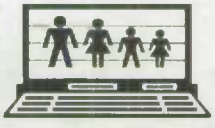
SPSD/M 

Commodity Tax User's Guide

This guide describes the commodity tax Input-Output model associated with the SPSM. It combines commodity taxes levied at the industry level with those levied directly on households to produce the retail-equivalent effective sales tax rates. These rates are used in the SPSM to compute 'consumable income'.

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Statistics Canada Statistique Canada

Canada

Table of Contents

Release Summary

Commodity tax changes through 1995 are all up-to-date. However all changes beyond 1995 have yet to be modeled. There are two notable exceptions to this. First, the HST is implemented for the Atlantic Canada in a rudimentary fashion as a factor of the GST for 1998 and after. Secondly, and in a similar fashion, changes to the sales tax rates in Saskatchewan from 9% to 7% has also been implemented.

WARNING: Use the ct model variables for analysis at the household level only. Errors will result if the ct variables are specified in analyses at the individual level or on other family types.

Guide Summary

This guide describes how the SPSD/M commodity tax model parameters are used to calculate the commodity tax liabilities of households and individuals. The guide also discusses the input-output model system which generates these parameters. The commodity tax model distinguishes twelve separate tax types: six federal commodity taxes and six provincial commodity taxes.

Guide Contents

- Section *Introduction to Input-Output Methods* is an overview of input-output techniques.

- Section *Modeling Commodity Taxes Using in SPSD/M* begins with an introduction to commodity tax modeling in the SPSD/M and then describes the model parameters, options, etc. necessary to perform commodity tax simulations in the SPSD/M. There is also descriptions of the commodity tax types.

- Appendix I contains a mathematical description of the input-output accounting framework, a simple commodity tax model, and parameter generation formulas.

- Appendix II provides the contents of the expenditure components and discusses the conceptual differences between expenditure in the input-output accounting framework and the SPSD/M.

Introduction to Input-Output Methods

Through input-output techniques, the taxation of business purchases of goods and services can be associated with the products consumed by households, governments, and foreigners (i.e. exports). These "upstream" or "indirect" taxes can be added to the observed or "direct" taxation of the final demand components to produce the total tax liability which households, governments, etc. face. It is this total commodity tax liability concept which underlies the commodity taxation of households on the SPSD/M. This section is intended to introduce these i-o concepts. Users who wish to learn of the technical details should consult.

Goods and services in the economy are either consumed by the components of final demand (i.e. households, governments, hospitals, exports, and investment in capital stock) or by business in order to produce their outputs. Input-output techniques determine how the commodities consumed for industrial production are embedded in each final demand component. Therefore, one can associate the commodity taxes paid by business on their inputs to the vector of final demand components.

This association assumes that firms engaged in the production process pass the entirety of their commodity tax costs forward down the production stream. Therefore, the components of final demand ultimately bear both the commodity taxes stemming from purchases made directly by households, governments, etc. and the "indirect" commodity taxes found in the business sector purchases. A number of other assumptions associated with input-output methods are discussed in detail in Appendix II.

Federal and Provincial governments use a number of taxes to generate revenues from the sales of specific goods and services. For example, Table 1 shows the total federal and provincial commodity taxes modeled in the SPSD/M by the sector of the economy in which they were directly levied in 1988.

Table 1: 1988 Commodity Tax Revenues by Source
(millions of dollars)

	Federal Taxes	Provincial Taxes	Total
Industrial Sectors:			
(i.e. levied on inputs to production)			
Manufacturing	4544	3412	7956
Utilities	1825	1723	3548
other industries	2800	2451	5251
Use sub-total	9169	7585	16754
Final Demand Components:			
Households	13226	16125	29351
Governments	553	427	980
Investment in Capital Stock	2546	1552	4098
Exports and other	311	0	311
Final Demand sub-total	16635	18103	34738
Grand Total	25803	25688	51491

Note: totals may not add due to rounding

By applying input-output methods, we can associate the taxes levied on industrial use in Table 1 to the final demand components. Table 2 has taken the commodity taxes of Table 1 and re-allocated the taxes on business use to final demand via input-output methods. Note that $3.0 billion in federal taxes and $2.3 billion in provincial taxes on business inputs has been associated to household consumption. The remainder of the taxes on business inputs has fallen onto other final demand categories. It is this first row of Table 2 which is the focus of the following sections as the SPSD/M models only the tax liability of households and not the other components of final demand.

Table 2: I-O Modeled 1988 Commodity Tax Revenues on Final Demand
(millions of dollars)

	Federal Taxes		Provincial Taxes		Total	
Final Demand Components:	indirect	direct	indirect	direct	indirect	direct
Households	2991	13226	2344	16125	5335	29351
Governments	941	553	734	427	1675	980
Investment in Capital Stock	3336	2546	3119	1552	6455	4098
Exports and Other	1990	311	1215	0	3205	311
Grand Total	9169	16635	7413	18103	16582	34738

Note: totals may not add due to rounding

Modeling Commodity Taxes Using in the SPSD/M

Calculating the Commodity Tax Liability of Households

Each household observation on the SPSD/M contains an aggregation of all the purchases that the household has made over a given year into one of forty expenditure components. The commodity tax liability of a SPSD/M household is determined by applying the effective commodity tax rate vector of length forty, generated by the input-output model, to the conceptually equivalent vector of forty expenditure components contained within each SPSD/M household observation.

Our definition of the effective tax rate for each expenditure component is the ratio total commodity taxes paid to the total selling price of the expenditure component exclusive of these taxes. Thus, the denominator of the rate includes all wholesale, retail, transportation, and other margin's value added as well as the original producer's value added for each final demand component. One could alternately describe the rate as a "tax exclusive retail equivalent sales tax rate". More succinctly,

$$\textit{effective sales tax rate} = \frac{\textit{(direct taxes + all taxes re-allocated from the production process)}}{\textit{(producers value added + all trade margins value added)}}$$

Identical effective commodity tax rates are applied to all households who face the same sales and excise tax regimes (i.e. households living in the same province). By contrast, the personal income tax and transfer algorithms generate levels of income tax, received benefits, etc. specifically for each individual or household.

The input-output model produces effective commodity tax rate vectors of length forty for each of the six federal tax types. However, since inter-provincial trade flow data are not available, it is not possible to allocate the provincial commodity taxes levied on business inputs to the province where the final demand component embedding these inputs was consumed. Our solution was to aggregate the provincial tax types levied on production to the Canada total and, via the national i-o tables, estimate average "indirect" tax rates which would be applied to all provinces. Recall that this only applies to the provincial taxation on inputs to production, i.e. sales and gasoline taxes. The six provincial tax types levied directly on the final demand components are completely province specific. See section 4 for the variable names and parameters affected by this aggregation.

Providing effective rates for the range of years 1986 to 1992 is straightforward as the Input-Output division of Statistics Canada has produced national input-output tables and detailed commodity tax tables for these years. For subsequent years, up to 1995, the SPSD/M team has estimated i-o and commodity tax tables based upon the most current economic data available and legislative amendments which pertain to commodity taxation at both the federal and provincial levels.

Commodity Tax Coverage

The following subsections describe the major commodity taxes taken into account in this model. As the SPSD/M provides parameters capable of simulating the commodity tax systems for the period covered, not all of the following tax types apply to every year. All the taxes were implemented up to 1995. The Harmonized Sales Tax in Atlantic Region is implemented in SPSD/M, for 1988 and after, as a growth factor to GST. Table 3 lists the twelve commodity tax types covered by the SPSD/M for the years 1984, 1988, and 1991. A short description of each tax type follows. Users interested in more information underlying the tax types that is described here should contact members of the SPSD/M development team.

Table 3: Total Commodity Tax Revenues by Tax Type
(millions of dollars)

	1984	1988	1991
Federal Commodity Taxes			
Customs Import Duties	3802	4612	3292
Excise Duties	1423	1521	2811
Excise Taxes	14705	4939	6239
Other Energy Taxes	1614	0	0
Manufacturer's Sales Tax	7353	14728	0
GST	0	0	19616
Federal Total	15663	25803	31958
Provincial Commodity Taxes			
Profits on Liquor Commissions	1984	2261	2400
Liquor Gallonage Tax	381	507	614
Gasoline Tax	3161	4158	5008
Amusement Tax	184	219	240
Tobacco Tax	1537	2233	2872
Retail Sales Tax	10496	16309	18837
Provincial Total	17745	25688	29971

Note: totals may not add due to rounding

Federal Government Taxes

Federal Customs Import Duties

Customs import duties are levied on imported goods used for both manufacture and final consumption. They are ad-valorem based. Their impact is being diminished as GATT discussions lead to rate reductions. These duties are incorporated into the producer's price of a good such that subsequent downstream revenues generated by manufacturer's sales taxes, federal excise taxes, and provincial retail sales taxes are affected by the custom import duty rates.

Federal Excise Duties

Under the Excise Act duties are levied on tobacco products and alcoholic beverages (other than wines) made in Canada. These duties, like the customs import duties, are included in

the producer's price of the commodity. They typically take the form of specific quantity rates; they are not an ad-valorem tax. By being incorporated into the initial sale price their levels affect the revenue generated by the manufacturer's sales taxes and provincial retail sales taxes.

Federal Excise Taxes

A collection of tax types defined in the Excise Tax Act have been merged under this heading. These taxes are not directly applied to exported goods.

Gasoline, Diesel, and Aviation Fuel Excise Tax - this was originally levied on the non-commercial use of these fuels as a specific $ rate per litre basis.

Tobacco Excise Tax - these commodities are taxed ad-valorem under this scheme.

Alcohol Excise Tax - Only domestically produced wines are taxes in this way as they were exempt from any import or excise duty. The tax is on a $ per litre basis.

Other taxes - They include: Air Transportation Tax; Telecommunications Programing Tax; other excise taxes levied on heavy cars and automobile air conditioners; jewelry; clocks; watches; lighters; playing cards; and smokers' accessories.

Other Federal Energy-based Excise Taxes (phased out in 1986)

These are taxes which were mostly brought in under the 1981 National Energy Program. They had significant impacts on Federal Government revenues through the early 80's ($1.6 billion in 1984) but by 1986 they have been phased out. They are as follows:

- Natural Gas & Gas Liquids Excise Tax
- Oil Export Charge
- Canadian Ownership Special Charge

The Petroleum Compensation Levy has been left out of this framework since its task was to redistribute energy costs from one region of Canada to another. We have not implemented an Regional Input/Output model and therefore cannot track these effects.

Federal Manufacturer's Sales Tax (phased out in 1991)

This tax is replaced by the Goods and Services Tax in 1991. Please note that the manufacturer's sales tax and the goods and services tax are secularly exclusive. In the model, the former is applied up to 1990 and the latter thereafter.

The manufacturer's sales tax has been the largest in the family of federal sales and excise taxes. It is levied on:

- all finished manufactured goods at the producer's sales price irrespective of whether wholesalers, retailers, or individual consumers are the purchasers;

- the customs value of imported goods, inclusive of any custom import or federal excise

duties.

There are exemptions. Most importantly, all consumer service products are exempt. In 1985, partially finished inputs purchased by manufacturers for further processing were exempt as are all machinery and apparatus used directly in the production process. There are a variety of other exemptions such as on site construction materials and equipment, drugs, heating fuels and electricity, food, clothing and footwear, transportation equipment, educational material, farm and forest products, marine and fisheries items, goods manufactured in institutions, and insulation material. Some items have lost their exemption status over the years which adds to the complexity of this tax type.

Federal Goods and Services Tax (effective in 1991)

The GST is levied on the industries gross value added. The tax operates via the application of an ad-valorem tax to the value of their sales while receiving a tax credit for the implicit costs of the GST in the prices of their production inputs.

Provincial Government Taxes

Provincial Profits on Liquor Commissions

These profits are defined as the value of gross sales less the costs of goods sold less administrative and general expenses. The value of the gross sales is, in part, a function of the markups over cost the provincial government applies. Utilizing profits gives governments greater ability to keep revenues on target. Shifts in market demand can be compensated via changes to the markups. These changes do not require statutory revisions.

Provincial Liquor Gallonage Tax

This fee applies to domestic beer producers in only four of the provinces: British Columbia, Ontario, Quebec, and Newfoundland.

Provincial Gasoline Tax

The tax applies to most gasoline use in the production process and all final demand consumption.

Provincial Amusement Taxes

A small amount of revenue is generated in all provinces save Newfoundland through the application of an amusement tax. This tax pertains to admissions to theaters, travelling amusements (i.e. circuses) and the like. This tax is not responsible for revenues earned on pari-mutuel betting activities. There exists as many tax schemes as there are provinces.

Provincial Tobacco Taxes

This tax is applied to cigarettes and cut tobacco. In both cases it is a specific rate tax either

by the cigarette or by the gram.

Provincial Retail Sales Taxes

These taxes apply everywhere except Alberta.

Harmonized Sales Tax (Implemented in SPSD/M in 1998)

The harmonized sales tax is the provincial rate applied to the goods and services covered by the GST. The HST applies to Atlantic Region. The combined rate is 15%.

Local Property Taxes on Owner-occupied Dwellings

This tax type is not generated by the input-output system, but comes directly from the expenditure survey data. It is defined as all property taxes paid by households on their principal residences, vacation homes, and secondary living quarters.

Model Flags, Options, Parameters, and Variables

Commodity tax analysis in the SPSD/M is conducted by applying a series of 40-element vectors of effective commodity tax rates to household observations. These vectors have all been estimated using a time series of input-output data. Table 4 lists all the commodity tax flags, options, parameters, and variables in the SPSD/M. All model flags, options, and parameters are found in the model parameter (`mpr`) files.

WARNING: Use the ct model variables for analysis at the household level only. Errors will result if the ct variables are specified in analyses at the individual level or on other family types.

Model Flags and Options

CTFLAG

controls whether any commodity tax calculations are performed at all. When set to 1 (default value), it calculate commodity tax liabilities.

CTDFLAG

With the CTDFLAG is set to 0 (default value) the SPSD/M produces only the total commodity household commodity tax liability variables cttxfc and cttxpc and the total commodity individual commodity tax liability variables imtxfc and imtxpc. If CTDFLAG is set to 1 then all of the ct and imtx variables are calculated.

CTOPT

For every household observation there is an explicit disposable income / expenditure identity which stems from the source of SPSD/M expenditure information. It is as follows,

```
hhld disposable income = hhld net expenditure on components 0 through 39
 + all federal and provincial commodity taxes
 + local property taxes
 + other household costs
```

CTOPT should always be set to 2 for all simulations. Under this setting the SPSD/M modeled household disposable income replaces the survey disposable income value in the identity. The SPSD/M then ensures the identity is satisfied by scaling all the expenditure components appropriately. Therefore, the estimated commodity tax liabilities are conditioned on the SPSD/M income measure which has been corrected for several sources of income under-reporting inherent in Survey of Consumer Finance (SCF). In addition, the simulation results will be linked to any other user specified tax-transfer parameter changes which affect the SPSD/M level of modeled disposable income.

If CTOPT is set to 1 then the raw survey disposable income concept is used in the identity. This option is designed for testing purposes and should never be specified.

Table 4: Summary of Commodity Tax Model options, parameters, and variables

Model Flags	
CTFLAG	Commodity tax activation flag
CTDFLAG	Commodity tax detailed calculation flag
Model Options	
CTOPT	Commodity tax calculation method
Model Parameters	
CTFCID	effective tax rate: federal custom import duties
CTFEXD	effective tax rate: federal excise duties
CTFEXT	effective tax rate: federal excise taxes
CTFOEN	effective tax rate: federal other energy taxes
CTFMFG	effective tax rate: federal manufacturer's sales tax
CTFGST	effective tax rate: federal goods and services tax
CTPPLQ	effective tax rate: prov profits on liquor commissions
CTPLGL	effective tax rate: prov liquor gallonage tax
CTPAMU	effective tax rate: prov amusement tax
CTPGAS	effective tax rate: prov gasoline tax on hhlds
CTPTOB	effective tax rate: prov tobacco tax
CTPRST	effective tax rate: prov sales taxes on hhlds
CTLPROP	scaling factor: local property taxes'
CTNES	scaling factor: expenditures not elsewhere specified
CTSAVE	scaling factor: household savings
CTTXRM	Base year commodity tax removal factor [com , prov]
Model Tax Variables	
imtxfc	total individual federal commodity tax liability
imtxpc	total individual prov commodity tax liability
cttxfc	total hhld federal commodity tax liability
cttxfc_0 -> cttxfc_39	total hhld fed com tax for expenditure components 0 -> 39
ctfcid	total hhld federal custom import duties
ctfexd	total hhld federal excise duties

ctfext	total hhld federal excise tax
ctfoen	total hhld federal other energy tax
ctfmfg	total hhld federal manufacturer's sales tax
ctfgst	total hhld federal GST
cttxpc	total hhld provincial commodity tax liability
cttxpc_0 -> cttxpc_39	total hhld prov com tax for expenditure components 0 -> 39
ctpplq	total hhld prov profits on liquor commissions
ctplgl	total hhld prov liquor gallonage tax
ctpamu	total hhld prov amusement tax
ctpgas	total hhld prov gas tax levied directly on hhlds
ctptob	total hhld prov tobacco tax
ctprst	total hhld prov sales tax levied directly on hhlds
ctlprop	total hhld local property taxes

Model Other Variables

ctnexp	total hhld expenditure net of all commodity taxes
ctnexp_0 -> ctnexp_39	total hhld net expenditure for components 0 -> 39
ctsave	total hhld savings
ctothmon	household money from other sources
ctnes	hhld costs necessary to complete the income-expenditure identity

Model Parameters

The effective commodity tax rate parameters listed in Table 4.3 are all generated by the input-output system. Users should be wary of making changes to these parameters without first contacting members of the SPSD/M team.

The scaling factor model parameters are supplied to allow the adjustment of household savings, property taxes, and other costs. These parameters could be used to examine the sensitivity of commodity tax liability to changes in the savings rate. Note that the parameters are not used to scale base year savings etc. to the simulation year. That is done through adjustment parameters which are discussed in the sub-section *Adjustment Factors*.

Model Variables: Household Level (all ct variables)

These variables are only valid for household level analysis in the SPSD/M. Simulations specifying ct variables for individual, nuclear, census, or economic family levels will generate double counting errors.

Model Variables: Individual Level (imtxfc imtxpc)

Commodity taxes are allocated to individuals within each household via each member's share of the total disposable income. The income share of the household's head includes three additional variables from the expenditure survey not otherwise included in the SPSD disposable income concept but necessary to complete the income - expenditure identity. They are: dissavings, other money receipts, and net sales of durables. The individual shares reflect the within family income distribution after this modification.

Adjustment Factors

Some modifications to the household expenditure observations are performed before the commodity tax calculations can be done. The following adjustment parameters, found in the apr files, control these modifications. These factors should not be modified without first contacting the SPSD/M development group.

Growth Factor Parameters

The `apr` files also contain a set of growth factor parameters which take the raw expenditure data on the SPSD/M and scale it to match the expenditure levels of the year to be simulated. These variables are named GFxxx and should not be changed.

CTTXRM (adjustment parameter)

The SPSD/M expenditure components must be stripped of their original commodity tax content to get net expenditure values before the effective commodity tax rates can be applied. The SPSD/M accomplishes this by applying the input-output computed commodity tax removal parameter CTTXRM found in the apr file to expenditures. Appendix I describes mathematically how this commodity tax removal parameter is calculated. The results are stored in the ctnexp variable.

CTCFALC, CTCFTOB, CTCFGAS (adjustment parameters)

The sum of the expenditure observations on the SPSD/M for the alcohol, tobacco, and gasoline components is well below the levels of known control totals. The role of these three adjustment parameters is to scale the consumption of these goods on the SPSD/M to meet the controls. These adjustments are province specific.

CTFAMSNA (adjustment parameter)

There exist some conceptual differences between the input-output expenditure components and the SPSD/M observations stemming from survey data. Appendix II discusses these differences in more detail. This adjustment parameter is used to bring the SPSD/M observations into alignment with the input-output framework. This ensures that the commodity tax revenues generated by the SPSD/M are consistent with the input-output model results.

Appendix I - The Input-Output Framework and Commodity Tax Modeling

Note: This section is not intended to detail the conceptual nature of the i-o system, but to describe one particular application. Although a general overview of the accounting framework is provided here, users requiring more detail as an aid to comprehension should consult the Statistics Canada publication 15-510 "*The Input-Output Structure of the Canadian Economy 1961-1981*". Matrix algebra is used in this section. Upper case variables denote matrices; lower case represent vectors.

General Overview of the Accounting Framework

The definitions which follow all pertain to the schematic representation of the Canadian input-output (i-o) accounting framework given in Figure 1.

The i-o tables contain two sets of interrelated accounts, the commodity accounts and the industry accounts. The former details the supply and disposition of individual commodities (goods and non-factor services). The latter details the commodity composition of production (including profits) of industries. For more details concerning the accounting structure see the i-o publication referenced above.

Define V to be the matrix of the values of commodity outputs; also called the "make" matrix. In it, each row shows the distribution by commodity of the aggregate output of each industry, each column shows the distribution by industry of the aggregate output of a commodity. The gross output of an industry is the aggregate value of goods and services produced and work done by the industry. It is equal to the value of industry's sales plus any increase (less any decrease) in the value of physical change in stocks of finished products and work in progress.

Define U to be the matrix of intermediate commodity inputs; also called the "Use" matrix. In it, each row shows the distribution by industry of the input of a commodity, each column shows the distribution by commodity of the input of the industry.

Define F to be the matrix of the values of commodity inputs of final demand categories: personal expenditure on consumer goods and services; fixed capital formation, business and government; value of physical change in inventories, withdrawals and additions; gross government current expenditure on goods and services; exports; imports; and government revenue from the sales of goods and services. It is also called the "Final Demand" matrix. The classification that describes all possible consumers of goods is called the "activity" dimension. It consists of the set of all industries, together with the set of all final demand categories.

Define YI to be the matrix of the values of primary inputs of industries. Primary inputs are those inputs which are not current outputs of other industries. These are indirect taxes, subsidies, wages and salaries, supplementary labour income, net income of unincorporated business, and other operating surplus.

Define *YF* to be the matrix of the values of primary inputs associated with final demand categories. These consist of indirect taxes, labour income, and depreciation (part of the surplus). Labour income in YF includes wages and salaries and supplementary labour income paid by the government and personal sectors. The surplus portion of YF relates to the government sector and non-profit institutions in the personal sector.

Figure I: The Accounting Framework of Canadian Input-Output Tables

	Commodities	Industries	Final demand categories									Row Total
			PE	FCF	Less VPCW (v)	VPCA	GGCE	X_D (x)	X_R (r)	Less M (m)	Less GR (a)	
Commodities		U					F					q
Industries												g
Commodity indirect taxes												
Other indirect taxes												
Less subsidies												
Wages and salaries												
Supplementary labour income		YI					YF					n
Net income of unincorporated business												
Other operating surplus												
Column Total	q'	g'					z'					

Final Demand Categories

PE - Personal expenditure on goods and services
FCF - Fixed capital formation, business and government
VPCW - Value of physical change in V: is a matrix of the values of outputs
Also denoted as the vector v in the mathematical
VPCA - description which follows.
GGCE - Value of Physical change in inventories, additions
X_D - Gross government current expenditure on goods and services
Domestic exports of goods and services
Also denoted as the vector x in the mathematicaldescriptiog:
X_R - which follows.
re-exports of goods and services
Also denoted as the vector r in the mathematical description:
M - which follows.
Imports of goods and services
Also denoted as the vector m in the mathematical description
GR - which follows.
Government revenue from sale of goods and services
Also denoted as the vector a in the mathematical descriptions which follows.

Notation

V: is a matrix of the values of outputs
U: is a matrix of the values of intermediate inputs
F: is a matrix of the values of commodity inputs of final demand categories
YI: is a matrix of the values of primary inputs of industries
YF: is a matrix of the values of primary inputs of final demand categories
q: is a vector of the values of total commodity outputs
is a vector of the values of total industry outputs
z: is a vector of the values of total inputs (commodities plus primary) of final demand categories
is a vector of the values of total primary inputs (industries plus final demand categories)
e: (not shown) is a vector of the values of total inputs by commodity of final demand categories. It is equal to the sum across final demand categories of F.

Margins and Commodity Tax Matrices

The i-o tables described above are given in producer's prices. This valuation method maintains the link between the original sources of supply of a good (domestic industries or imports) and the intermediate and final consumer of the goods, with the additional cost elements incurred by the purchaser recorded as separate purchases of commodities. These additional cost elements between the producer's price and the purchaser's price are called margins. In the Use and Final Demand matrices the entries for the margin vectors reflect the total of each type of margin purchased by that industry or category of final demand on all of its commodity purchases.

There are seven margins in all: a retail margin, a wholesale margin, a commodity and other indirect tax margin, a transportation margin, a gas margin, a storage margin, and a pipeline margin. The framework has been extended to add to each element of the Use and Final Demand matrices (valued in producer's prices) their respective value of the seven margins. This adds a third dimension to the framework depicted in Figure 1 with the first "slice" of the matrix being the producer's price valuation and the seven subsequent "slices" corresponding to the margins. Summing across this "slice" dimension produces purchaser price Use and Final Demand matrices valued in purchaser's prices.

A further articulation of the commodity margin "slice" or matrix is available. The single commodity indirect tax margin has been disaggregated into 12 distinct tax types (6 federal taxes and 6 provincial taxes), often by activity (industry and final demand categories) and by commodity. For all tax types we have detail by activity but not necessarily by commodity.

The Input-Output Model

The i-o modeling approach provides a method by which all direct and indirect domestic production activities are associated with final demand requirements. For example, if a household purchases an automobile, then the level of activity in the Steel, Rubber, etc. industries required to produce this product can be determined. Furthermore, Mining, Smelting, etc. are required for the production of steel. Therefore, an increase in the demand for automobiles leads to increased activity in various sectors of the economy. This secondary production requirement can be associated with the responsible final demand category using i-o modeling.

In the same way that one can associate production requirements with final demand goods and services, the commodity indirect taxes associated with production processes can also be linked to final demand. It will be shown below that by constructing tax rates by industry, one can associate these production-related taxes with final demand categories using certain modeling assumptions.

In the following discussion, two input-output models are presented. The first is a simple open model, and is used primarily to introduce the basic i-o identities and concepts. The second model incorporates production leakages. Finally, we show how to compute retail equivalent sales tax rates for each final demand category.

A Simple Open Model and Assumptions

The first assumption involves the allocation of commodity production among industries. It is assumed commodity irrespective of the levels of production. The mathematical expression of this assumption is the following equation:

$$g = D * q \quad (1)$$

As Figure 1 depicts, vector g represents the value of industry outputs and vector q the value of domestically-produced commodity outputs. The matrix D, denoted as the *market share*

matrix, is a coefficient matrix constructed by dividing each element in a column of the output matrix V by the corresponding total commodity output.

The second assumption relates to the production functions of each industry. It is assumed that the values of the inputs of each industry are fixed proportions of the value of the total output of the industry and are therefore independent of the composition, or level, of this output. The mathematical expression of this assumption is the following equation:

$$U * I = B * g \quad (2)$$

In this equation i is a column vector, equal in dimension to the number of industries, whose elements are equal to 1. The matrix product on the left hand side of the equation represents a vector containing the sum of the intermediate inputs of all industries classified by commodity. Matrix B, termed the industry technology matrix, is obtained by dividing each element in a column of matrix U by the corresponding industry output.

If the economy is a simplified one in which no leakages (i.e. imports, exports, government production, withdrawals from inventories) exist, then the identity of total supply versus total disposition would be:

$$q = B * g + e \quad (3)$$

which reads: *the commodity vector of domestic output of an economy is equal to the transformed industrial production requirements , i.e. intermediate outputs, plus a commodity column vector of final demand requirements, denoted as e.*

Using the basic assumptions of equations (1), (2), and (3) we now proceed to the formulation of a simple open input-output model which computes the level of industrial activity (g) from the level of Final Demand (e).

Pre-multiply equation (*3*) by D, to get:

$$D * q = D * B * g + D * e$$

Substitute using equation (1) to get:

$$g = D * B * g + D * e$$

Rearrange terms to get:

$$(I - D * B) * g = D * e$$

The final simplified I-O model equation becomes,

$$g = (I - D * B)^{-1} * D * e \quad (4)$$

The Leakage Adjusted I-O Model

In order to perform commodity tax modeling, the following enhancement to the above system must be made. First, the introduction of a more detailed supply versus disposition identity is necessary. It is as follows:

$$q + m + a + v = B * g + e^* + x + r \quad (3a)$$

where,

e^* = domestic final demand vector

= personal expenditure

+ fixed capital formation

+ additions to inventories

+ total government current expenditure

m = imports

a = government production

v = withdrawals from inventories

x = domestic exports

r = re-exports

Using this extended notation, the equation for the simple open model becomes:

$$g = (I - D * B)^{-1} * D * (e^* + x + r - m - v - a) \quad (4a)$$

This model does not account for any leakages from domestic industries. To the extent that imports, and/or withdrawals from inventories, and/or government production of goods and services share with the domestic industries in the supply of a commodity, the impact in the increase of the final demand on domestic industries will be reduced. These leakages are specified in the three following equations.

$$m = \mu * (B * g + e^* + r) \quad (5)$$

In this equation, the vector m represents imports and μ is a diagonal matrix of coefficients whose elements are calculated as the ratios of imports to the total domestic market by commodity, defined as $B * g + e^* + r$. This import share assumption implies that domestic exports of a commodity are supplied from domestic industries that produce the commodity. Of course, exports may have imports directly embodied in them to the extent that producing industries import their intermediate inputs.

$$a = \alpha * (B * g + e^* - x) \quad (6)$$

In this equation, the vector a represents government production of goods and services and α is a diagonal matrix of coefficients whose elements are calculated as the ratio of government production to use, use being defined as $B * g + e^* + x$.

$$v = \beta (B * g + e^* + x) \quad (7)$$

In this equation, the vector v represents withdrawals from inventories (VPC) and β is a diagonal matrix of coefficients whose elements are calculated as the ratio of withdrawals to use, use defined as $B * g + e^* + x$.

Equations (3a) and (4a) can now be rewritten as,

$$q = B * g + e^* + r - \mu * (B * g + e^* + r) - \alpha * (B * g + e^* + x) - \beta (B * g + e^* + x) \quad (3b)$$

$$g = (I - D * (I - \mu - \alpha - \beta) * B)^{-1} * D * [(I - \mu - \alpha - \beta) * e^* + (I - \alpha - \beta) * x + (I - \mu) * r)] \quad (4b)$$

Calculating Commodity Taxes Using the I-O Model

The commodity taxes collected from intermediate use are "pushed forward" to final demand space using equation (4b) with an articulated e^* that is not collapsed over its commodity dimension. Define the leakage-adjusted Final Demand matrix F^* as follows using the notation for sub-matrices of the Final Demand matrix F given in Figure 1.

$F^*_{PE} = (I - \mu - \alpha - \beta) * PE$ *adjusted personal expenditure sub-matrix*

$F^*_{FCF} = (I - \mu - \alpha - \beta) * FCF$ *adjusted investment sub-matrix*

$F^*_{VPCA} = (I - \mu - \alpha - \beta) * VPCA$ *adjusted additions from inventories vector*

$F^*_{GGCE} = (I - \mu - \alpha - \beta) * GGCE$ *adjusted current government expenditure matrix*

$F^*_{Xd} = (I - \alpha - \beta) * x$ *adjusted exports vector*

$F^*_{Xr} = (I - \mu) * r$ *adjusted re-exports vector*

Note that F^* is simply an articulation, into final demand categories, of the term in square brackets in equation (4b). Therefore, the other sub-matrix components of F^* are set to zero. They are: *VPCW* (withdrawals from inventories), *m* (imports), and *GR* (government production).

F^* and equation (4b) can be combined to give an industry output matrix whose dimensions are industry by final demand category. Denote this matrix as *G*. Note that the row sum of this matrix exactly equals the vector *g*.

$$G = (I - D * (I - \mu - \alpha - \beta) * B)^{-1} * D * F \quad (8)$$

For a given commodity tax margin matrix, *T* levied on business inputs, we can compute a

vector whose elements are the ratios of commodity taxes to industry outputs with i and j denoting the commodity and industry dimensions respectively,

$$\theta_j = \sum_i Tij \ / \ g_j$$

If we pre-multiply the G matrix by this vector of ratios we obtain a vector whose elements are the "indirect" commodity taxes associated the vector of final demand components.

$$\underline{t} = \theta * G$$

The commodity tax incidence tax associated with each final demand category is completed by adding the "indirect" taxes to the observed "direct" taxes associated with final demand purchases. With S denotes the tax margin matrix for final demand components with dimension h, we have

$$t_h = \sum_i Sih + \underline{t}_h$$

The above three equations have been repeated for each commodity tax type since separate commodity tax matrices are available for each tax.

Calculating the GST

The calculation of the GST follows the methodology described above but requires a more complex i-o system and treatment of tax-exempt goods. The details are not presented here, but they can be obtained by contacting the SPSD/M team.

The Effective Commodity Tax Rates and Tax Removal Rates

The tax-exclusive retail-equivalent effective tax rates for each federal level tax type can be written as,

$$\theta_h = t_h \ / \ \sum_p Nhp$$

Provincial tax-exclusive retail-equivalent effective tax rates are written in the same fashion except they include a provincial dimension, p

$$\theta_{hp} = t_{hp} \ / \ N_{hp}$$

The calculation of these rates require, N, the matrix of expenditures net of both indirect and direct commodity taxes by expenditure component and province. N is calculated through the following identity.

expenditures net of commodity taxes = gross expenditures

- (indirect + direct federal commodity taxes)

- (indirect + direct provincial commodity taxes)

$$or \quad N_{hp} = E_{hp} - \underline{t^{f}_{hp}} - \underline{t^{p}_{hp}}$$

Unfortunately, the federal taxes are not observed by province. Therefore, we solve for *N* the following way,

$$let \quad n_h = e_h - \underline{t^{f}_{h}} - \underline{\sum_{p} t^{p}_{hp}} \quad \text{and} \quad \lambda_h = \underline{t_h} \; / \; n_h$$

$$then \quad n_h = e_h \; / \; (1 + \lambda_h)$$

which can be extended to the provincial dimension in the following manner,

$$N_{hp} = (E_{hp} - \underline{t^{p}_{hp}}) \; / \; (1 + \lambda_h) \quad for\ all\ p$$

The SPSD/M contains expenditure information which includes direct and indirect commodity taxes. In the base year, it is necessary to remove the taxes from each household's expenditure before applying any alternative effective tax rate. This matrix of tax removal rates, the CTTXRM adjustment parameter, is simply,

$$\delta_{hp} = N_{hp} \; / \; E_{hp}$$

Appendix II - Details on the Expenditure Components

Contents of the Expenditure Components

Table II.1 lists the 40 household expenditure components for the years 1984, 1988, and 1991. Additional information on the contents of the expenditure components follows.

Table II.1: Household Expenditure Components
(millions of dollars)

Expenditure Component	1984	1988	1991
0 food & non-alcoholic beverages	31324	39002	45281
1 alcoholic beverages	7962	9956	10965
2 tobacco products	5192	7260	11319
3 men's and boy's clothing	5353	7023	7416
4 women's&children's clothing	7583	10144	10898
5 footwear and shoe repair	2289	3016	3111
6 gross imputed rents	32800	45569	58299
7 gross rent paid	12510	16959	21779
8 other lodging	919	1097	1325
9 electricity	4988	6984	9521
10 natural gas	2272	2462	2610
11 other fuels	2569	2157	2586
12 furn.,carpets&floor coverings	3728	5443	5327
13 durable hhld. appliances	3678	5298	5252
14 semi-dur hhld furnishings & supplies	6533	9178	9791
15 non-durable hhld. supplies	5208	7166	8097
16 laundry & dry cleaning services	742	1015	1309
17 domestic & child care services	2229	3677	5204
18 other household services	760	1237	1377
19 medical care	5248	6948	8908
20 hospital care and the like	1274	1793	2268
21 other medical care expenses	544	986	1038
22 drugs and sundries	3248	5149	6063
23 new & used (net) motor vehicles	12050	19458	19368
24 motor vehicles repairs & parts	5007	7991	8479
25 motor fuels and lubricants	9643	10437	11693
26 other auto related service	1802	2999	4301
27 purchased transportation	5033	7347	8463
28 communications	4222	5720	6342
29 rec., sports & camping equipment	8620	13752	15004
30 reading & entertainment supplies	4324	5996	6561
31 recreational services	5721	9206	11423
32 education &cultural services	7570	9910	11801
33 jewellry,watches & repairs	1616	2270	2196
34 toilet articles,cosmetics	2226	3212	3867
35 personal care	1973	3091	4134
36 restaurants & hotels	15634	22381	24600
37 financial,legal & other services	11114	18011	23745
38 oper. exp. non-profit orgn	4876	6809	8204
39.Net expenditures abroad (=0)			
Total	250383	348109	409925

0 - food and non-alcoholic beverages

- locally and on day trips
- while on trips overnight or longer

1 - alcoholic beverages

- beer
- wine & cider
- liquor

2 - tobacco products

- tobacco
- cigars & similar products
- cigarettes

3 - mens and boys clothing

- leather or fur coats & jackets
- winter-weight coats & jackets
- raincoats (incl. all-weather coats)
- other light-weight coats & jackets
- suits
- sport jackets & blazers
- jeans
- other pants (incl. shorts)
- dress shirts
- woven sport shirts
- knitted sport shirts
- sweaters
- socks
- underwear
- pyjamas & loungewear
- skiwear
- other active sportswear
- other specialized clothing
- gloves & mitts
- neckties
- belts and wallets
- other accessories

4 - womens and childrens clothing

- leather coats & jackets
- fur coats & jackets
- winter-weight coats & jackets
- raincoats (incl. all-weather coats)
- other light-weight coats & jackets
- suits (incl. pant suits)
- dresses
- jeans
- pants & shorts (excl. jeans)
- skirts
- blouses & shirts
- t-shirts & other tops
- sweaters
- skiwear

- beachwear
- other active sportswear
- other specialized clothing
- foundation garments
- lingerie
- hosiery
- sleepwear
- loungewear
- gloves & mitts
- headwear & scarves
- belts, handbags & wallets
- other accessories
- skirts, slacks, shorts & beachwear
- socks, other hosiery & underwear
- sweaters, headwear & mittens
- sleepwear
- other infants
- dressmaking & tailoring
- apparel (ex. laundry & dry-cleaning

5 - footwear and repair

- shoes & fashion boots
- insulated boots, work & hiking boots
- athletic shoes
- other footwear

6 - gross imputed rents

- outdoor patios, fences & driveway
- exterior walls
- repairs & maintenance
- complete re-roofing
- other repairs and maintenance
- outdoor patios, fences & driveway
- condominium charges
- first mortgage
- second mortgage
- mortgage insurance premiums
- maintenance,repairs & replacements
- mortgage interest
- other expenses
- interest
- other expenses n.e.s.
- water & fuel

7 - gross paid rents

- rent
- rented vacation homes
- rental of heating equipment
- furnishings & equip incl hhld applian
- other equipment

8 - other lodging

- other accommodation away from home

9 - electricity

10 - natural gas

- piped gas

11 - other fuels

- fuel oil and other liquid fuel
- bottled gas
- fuel wood
- other fuel and heating costs

12 - furniture, carpet, and floor repairs

- convertible sofas
- chesterfields(incl. matching chairs)
- other upholstered furniture
- bedroom furniture
- living room furniture
- dining room furniture
- kitchen furniture
- bookcases, wall units, desks, etc
- other eg nursery & bathroom, etc.
- outdoor furniture
- dining room and kitchen furniture
- other indoor furniture
- outdoor furniture
- springs, mattresses, bases and frames
- replacement of carpeting
- room-size and area rugs & mats
- furnishings

13 - household appliances

- refrigerators & refrigerator-freezers
- freezers
- washing machines
- clothes dryers

- cooking stoves and ranges
- microwave ovens & convection ovens
- replacement built-in appliances
- room air cond portable humid/dehumidifiers
- gas barbecues
- vacuum cleaners & rug cleaning equipment
- automatic dishwashers
- electric sewing machines
- non-electric laundry equipment
- major household appliances
- other for cooking & warming food
- electric appliances for food preparations
- electric irons
- other electric equipment & appliances
- home security equipment
- electric hair-styling equipment
- repairs & maintenance
- major household appliances
- lawn & garden tractors and tillers
- power lawn-mowers
- snow-blowers

14 - semi-durable household furnishings

- notions
- material (for curtains,draperies etc.)
- yarn (excl. craft)
- suitings and coatings
- dress material
- other clothing material
- painting (interior & exterior)
- wall papering
- other interior walls & ceiling
- carpentry (incl. wooden flooring)
- eavestroughing & other roof repairs
- caulking & weather stripping
- exterior walls
- curtains
- draperies
- other (shades & blinds)
- sheets and pillow cases
- other bedding
- tablecloths, napkins, etc.
- towels, washcloths, bathmats, etc.
- other household textiles

- mirror and picture frames
- art goods & decorative ware
- original works of art
- antiques
- glass mirrors
- curtain rods, tracks, etc.
- clocks,timers, kitchen scales etc.
- miscellaneous household equipment
- other hhld furnishings & equipment
- luggage
- china, porcelain & other ceramic
- glass and crystal
- replacement of fixtures
- replacement of fixtures
- electric light bulbs and tubes
- dry-cell batteries
- portable electric lamps
- cooking utensils
- food preparation utensils
- food storage utensils
- precious metal
- stainless steel & other metal
- other (excl. disposable)
- hand operated kitchen tools etc.
- power driven hand tools
- other power tools & equipment
- other tools and equipment
- other power tools & equipment
- other tools & equipment(incl. parts)
- collectors
- tools & equipment purchased for work

15 - non-durable household supplies

- canned dog and cat food
- other dog and cat food
- other pet food
- laundry detergent (incl. soap)
- liquid detergent (excl. laundry)
- automatic-dishwasher detergent
- toilet-bowl cleaner
- cleaning and scouring powders
- polishes and waxes
- other cleaning & polishing supplies
- bleach

- fabric softeners
- disinfectants and deodorizers
- other chemical specialties
- toilet & other personal soap
- paper towels
- facial and bathroom tissue
- gift-wrap paper
- other paper supplies
- plastic garbage bags
- other plastic supplies
- foil supplies
- other supplies
- brooms, brushes & mops (ex.per. care)
- disposable diapers
- matches & other smokers
- seeds
- nursery & greenhouse stock(shrubs,trees)
- potted plants, cut flowers, etc.
- herbicides, insecticides & rodenticides
- fertilizers, soil, & soil conditioners

16 - laundry and dry-cleaning

- laundry service
- dry-cleaning service
- self service laundry & dry-cleaning

17 - domestic and child care services

- domestic & other custodial services
- week-day child care in the home
- other child care in the home
- day-care centres & day nurseries
- other child care outside the home

18 - other household services

- tenants
- homeowners insurance premiums
- insurance premiums
- veterinarian and other services
- horticultural services & snow removal
- home security services
- other services (eg. making of draperies)
- clothing storage
- other clothing services

19 - medical care

- physicians care
- orthodontic & periodontic procedures
- prescription & fitting of dentures
- other dental procedures
- other health care practitioners
- other medical services

20 - hospital care and the like

- hospital care
- public hospital & medical plans

21 - other medical care expenses

- supplementary coverage (incl. drug)
- dental plans (separate policy)
- accident & disability insurance

22 - drugs & sundries

- health care supplies
- prescribed
- other
- eye glasses
- contact lenses
- other eye-care goods
- other health-care goods

23 - new and net used motor vehicles

- automobiles
- separate sale of automobiles
- trucks (incl. vans)
- separate sale of trucks
- motor homes
- truck campers
- purchase of accessories & attachments

24 - motor vehicle repairs and parts

- oil changes & lubrication
- tune-ups
- other mechanical & electrical
- body (incl. painting)
- other maintenance & repair
- automobile radios & tape players
- other accessories & attachments
- tires

- batteries
- other maintenance & repair supplies

25 - motor fuel and lubricants

- gas & other fuels
- automotive fuels

26 - other auto related services

- private & public insurance premiums
- insurance premiums
- at dwelling (not incl. in rent)
- other parking
- other operation services
- driving lessons
- rental fees (incl.basic insurance)
- optional insurance charges
- other expenses
- leasing fees for automobiles & trucks
- rental & leasing fees

27 - purchased transportation

- packages including meals
- packages excluding meals
- sightseeing tours & excursion pkgs
- street car, city bus & subway
- commuter bus & train
- other local transportation
- rail
- highway bus
- other passenger transportation
- air
- other inter-city transportation
- local taxi service
- household movers, storage, & delivery
- household movers & storage

28 - communications

- purchase of telephones etc.
- installation and repairs
- basic charge
- other local charges
- long distance toll charges
- postal & other comm. serv.(ex. parcels)

29 - recreation sporting and camping eq.

- bicycles
- motorcycles
- bicycle maintenance & repairs
- radios (incl clock & tel. combinations)
- audio components
- audio combinations
- records,c.d.s & pre-rec. audio tapes
- blank audio tapes
- other home entertainment equipment
- parts purchased separately
- television sets (incl combinations)
- videotape recorders/players
- television/video components
- blank & pre-rec. videotapes & discs
- boats (incl. canoes)
- outboard motors
- 35-millimetre cameras
- other cameras
- camera parts & accessories
- other photographic goods (excl. film)
- golf
- ice hockey equipment (excl. skates)
- ice skates
- downhill skiing
- cross-country skiing
- fishing
- home exercise equipment
- other sporting & athletic equipment
- playground equipment incl. abovegrd pools
- tents, back packs, sleeping bags
- other camping & picnic equip. & accesssirues
- supplies & parts for recreational equipment
- snowmobiles
- calculators
- typewriters
- computer hardware
- computer software
- computer supplies
- pianos & organs
- other musical instruments
- parts & accessories
- travel trailers
- tent trailers

- other recreation vehicles
- maintenance & repair supplies &parts
- maintenance & repair jobs
- other expenses
- maintenance & repair jobs
- other services re h.e. equip & supplies
- rental, maintenance & repairs
- rental of videotape recordings
- rental of other home entertainment equipment

30 - reading and entertainment supplies

- dolls (incl. clothing)& stuffed toys
- toy vehicles & construction toys etc.
- other toys
- sleighs, toboggans & childrens vehicles
- electronic games & parts
- handicraft kits
- handicraft materials
- artists
- other games & puzzles
- other recreation equipment
- films (excl. processing)
- greeting cards and postcards
- stationery (excl. school supplies)
- office-type supplies n.e.s.
- newspapers
- subscriptions paid
- purchase of single copies
- paper backed
- hard cover
- maps, music & other printed matter
- services: duplication, library fees, fines
- nursery, elem. & secondary education
- post-secondary
- purchase of pets & related goods

31 - recreational services

- government-run pool & lottery tickets
- other lottery, pool & raffle tickets
- other live sports spectacles
- football
- hockey
- baseball
- live staged performances(eg.concerts)

- golfing
- bowling
- skiing
- racquet sports
- health clubs & recreation assoc.
- other sports facilities & services
- other recreation facilities
- coin-operated amusement games, etc.
- other recreation facilities & serv.
- admission to museums, exhibitions etc
- other recreation services
- contributions & dues for social clubs etc
- cablevision
- motion picture showings
- film processing (incl. film)
- other photographic services

32 - education and cultural services

- nursery, elem. & secondary education
- post-secondary
- other lessons & courses (excl. driving)
- other education services

33 - jewellery watches and repairs

- watches
- precious jewellery
- other jewellery (incl. costume)

34 - toilet articles and cosmetics

- creams & lotions
- eye make-up
- lip preparations
- other make-up
- perfumes, toilet water & colognes
- other fragrance preparations
- hair conditioners & creme rinses
- shampoos
- home permanents, hair tints & dyes
- other hair preparations
- manicuring preparations
- personal deodorants
- shaving cream & soap
- pre-shave & after-shave products
- other toilet preparations & cosmetics

- toothpaste
- other oral hygiene products
- disposable razors & razor blades

35 - personal care

- mens hair
- womens hair
- other hair grooming services
- other personal care supplies & equipment
- other personal grooming services
- other miscellaneous services

36 - expenditures in restaurants and hotels

- while on trips overnight or longer
- at work
- at school
- other meals out
- between-meal food
- on a job
- at school & college
- on vacation & other trips
- hotels
- motels
- campgrounds
- tourist homes & other acc.
- board pd by fam. members incl. roomers

37 - financial and other legal services

- financial services: bank, tax advice, etc
- legal fees related to accommodation
- legal services n.e.s.

38 - operating expenses of non-profits org.

- dues to unions & professional association
- religious organizations
- other charitable organizations

39 - Net Expenditures Abroad (=0)

- Since there is no commodity taxes associated with expenditures abroad we have set this variable to zero.

other hhld costs

- replacements
- replacement of equipment
- other replacements

- commissions for sale of real estate
- interest on personal loans
- life insurance premiums
- annuity contracts
- other (excl. rrsp)
- drivers
- registration fees (excl. govt ins.)
- registration fees & licences
- forfeit of deposits, fines, money lost etc
- other miscellaneous goods
- gifts to persons living inside canada
- gifts to persons living outside canada
- other gifts eg. flowers, clothing, toys

Differences Between the Input-Output and Expenditure Survey Data

The input-output based commodity tax model calculates tax rates for 40 personal expenditure categories. The tax rates are based upon gross personal expenditure whose source is the System of National Accounts (SNA). These rates are applied to SPSD/M households to analyze their impact at the micro level. However, the personal expenditure components of the SPSD are derived solely from the Survey of Family Expenditures (FAMEX). The following table presents a detailed comparison between the two sources of personal expenditure data in 1986.

Table II.2: Differences between the Expenditure Components - 1986
System of National Accounts (SNA)
Canadian Survey of Family Expenditures (FAMEX)
millions of dollars

	FAMEX	SNA	% Diff.
0 - food and non-alcoholic beverages	33407.9	34942.1	-4.4
1 – alcoholic beverages	4605.0	9093.9	-49.4
2 - tobacco products	4579.2	6433.5	-28.8
3 - mens and boys clothing	5464.5	6232.7	-12.3
4 - womens and childrens clothing	8752.6	9102.4	-3.8
5 - foolwear and repair	2656.6	2676.6	-0.7
6 - gross imputed rents	12612.9	38361.9	-67.1
7 - gross paid rents	15986.2	14329.5	11.6
8 - other lodging	493.2	943.5	-47.7
9 – electricity	5269.7	5889.6	-10.5
10 - natural gas	2025.8	2398.2	-15.5
11 - other fuels	1757.8	2392.6	-26.5
12 – furniture, carpet, and floor repairs	4371.6	4387.6	-0.4
13 – household appliances	3644.1	4551.0	-19.9
14 - semi-durable household furnishings	6330.4	7759.9	-18.4
15 - non-durable household supplies	6362.1	6068.2	4.8
16 - laundry and dry-cleaning	1020.3	874.6	16.7
17 – domestic and child care services	2351.9	2840.9	-17.2
18 - other household services	2612.3	1045.2	149.9
19 – medical care	1721.3	5952.3	-71.1

20 – hospital care and the like	882.0	1732.8	-49.1
21 - other medical care expenses	1149.8	814.8	41.1
22 - drugs & sundries	2052.3	4076.2	-49.7
23 - new and net used motor vehicles	18065.8	16596.9	8.9
24 - motor vehicle repairs and parts	4844.5	6169.1	-21.5
25 - motor fuel and lubricants	9147.7	9531.9	-4.0
26 - other auto related services	6274.3	2255.2	178.2
27 – purchased transportation	4149.7	6178.2	-32.8
28 – communications	4382.5	4958.9	-11.6
29 – recreation sporting and camping eq.	7828.7	10883.2	-28.1
30 - reading and entertainment supplies	4089.2	4833.0	-15.4
31 – recreational services	6185.2	7672.5	-19.4
32 – education and cultural services	2091.6	8622.5	-75.7
33 – jewellery watches and repairs	1445.9	2038.6	-29.1
34 - toilet articles and cosmetics	2898.1	2771.5	4.6
35 – personal care	3000.0	2594.6	15.6
36 – expenditures in restaurants and hotels	15538.4	18865.7	-17.6
37 – financial and other legal services	1361.0	14686.0	-90.7
38 – operating expenses of non-profits org.	3968.3	5876.4	-32.5
Total	225380.6	297434.2	-24.2

Users should remember that the FAMEX data apply only to the household sector alone while the personal sector is the scope for SNA personal expenditure. The personal sector includes self-employed professionals and non-profit organizations as well as the household sector. This partially explains the differences in appliances, recreation equipment, business, and automobile purchase items. Users interested in a more general discussion of these sectoral differences should consult: Adler, H., Wolfson, M. [1987]:"A Prototype Macro-Micro Link for the Canadian Household Sector", Statistics Canada, Analytical Studies Branch Research Paper Series #7, Ottawa, Canada or Review of Income and Wealth December, 1988. The remainder of this section details some specific differences.

1 Alcohol and 2 Tobacco

It is well known that FAMEX under-reports these two series. The SNA uses provincial government sales numbers. Note that in the default modeling setting described in the next section we have adjusted the SPSD figures to concord exactly with that of the SNA. This was done due to the importance of these two commodities within the current tax structure. In effect, uniform proportional under-reporting has been assumed.

6 Gross Imputed Rents

The FAMEX does not impute the rent of any owner-occupied dwellings. There is a secondary difference: house insurance premiums are net of claims in the SNA and not in FAMEX.

14 Semi-Durable Supplies

It is not known why this major discrepancy exists although it is often difficult to distinguish between some imputed rent items and semi-durable items. In the default modeling setting described in the next section we have adjusted the SPSD figures to

concord exactly with that of the SNA. This was done due to the importance of this component within the current taxation structure.

19 Medical Care

Most often visits to Health Care professionals and clinics. The SNA figures are the gross sales by these agents. The FAMEX is the personal contribution alone.

20 Hospital Care

The SNA figures are gross sales of profit making hospitals, and special care facilities. The FAMEX is the personal contribution alone.

21 Other Medical Care

Mostly private insurance schemes (plus Worker's Compensation) so SNA nets out claims while the FAMEX does not.

26 Other Auto Related Services

FAMEX is greater as it does not net claims on auto insurance.

27 Purchased Transportation

There are two differences: 1) FAMEX distinguishes packaged trips from other air travel and therefore there exists a blurring between allocating this item between travel & hotel expenses; 2) Foreigners could purchase transportation here which would not be picked up by FAMEX.

29 Recreation, Sports, & Camping Equipment

The SNA estimate is higher as it includes equipment purchases by non-profit organizations as well as households.

30 Books, Magazines, & Stationery

The SNA estimate is higher as it includes books purchased by educational institutions as well as households.

31 Recreation Services

FAMEX may be missing some lottery expenses (however SNA is net of claims) and some pari-mutual betting.

32 Education & Cultural Services

SNA figure is gross expenditures on university and private schools independent of the source of funding. FAMEX is just the personal portion i.e. tuition fees.

36 Expenditures in Restaurants & Hotels

Recall the problem with package trips in the Purchased Travel series. Note that in the default modeling setting described in the next section we have adjusted the SPSD figures to concord exactly with that of the SNA. This was done due to the importance of this component within the current tax structure.

37 Personal Business

The SNA imputes a large number of financial service items, the largest being banking services.