



# Product Overview



Statistics  
Canada Statistique  
Canada

Canada

SPSD/M

Product Overview

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## **Product Description**

The Social Policy Simulation Database and Model (SPSD/M) is a tool designed to assist those interested in analyzing the financial interactions of governments and individuals in Canada. It can help one to assess the cost implications or income redistributive effects of changes in the personal taxation and cash transfer system. As the name implies, SPSPD/M consists of two integrated parts: a database (SPSD), and a model (SPSM). The SPSPD is a non-confidential, statistically representative database of individuals in their family context, with enough information on each individual to compute taxes paid to and cash transfers received from government. The SPSM is a static accounting model which processes each individual and family on the SPSPD, calculates taxes and transfers using legislated or proposed programs and algorithms, and reports on the results. A sophisticated software environment gives the user a high degree of control over the inputs and outputs to the model and can allow the user to modify existing programs or test proposals for entirely new programs. The model comes with full documentation including an on-line help facility.

## **Users and Applications**

The SPSPD/M has been used in hundreds of sites across Canada. These sites have diverse research interests in the area of income tax-transfer and commodity tax systems in Canada as well as varied experience in micro-simulation. Our growing client base includes federal departments, provincial governments, universities, interest groups, corporate divisions, and private consultants.

The diverse applications of the SPSPD/M can be seen in the following examples of studies and published research reports:

- Costing out proposals for amendments to the *Income Tax Act* affecting the tax treatment of seniors and the disabled
- Estimating the fiscal viability of major personal tax reform options, including three flat tax scenarios
- The comparison low income (poverty) measures and their effect on the estimates of the number of poor
- An Analysis of the Distributional Impact of the Goods and Services Tax
- Married and Unmarried Couples: The Tax Question
- Taxes and Transfers in Rural Canada
- Equivalencies in Canadian Public Policy
- When the Baby Boom Grows Old: Impact on Canada's Public Sector

Some potential uses of the model are illustrated by the following list of questions which may be answered using the SPSM:

- ... How large an increase in the federal Child Tax Benefit could be financed by allocating an additional \$500 million to the program?
- ... Which province would have the most advantageous tax structure for an individual with \$45,000 earned income, 2 children and \$15,000 of investment income?
- ... What is the after-tax value of the major federal child support programs on a per child basis, and how are these benefits distributed across family types and income groups?
- ... How many individuals otherwise paying no tax would have to pay tax under various minimum tax systems, and what would additional government revenues be?
- ... How much money would be needed to raise all low income families and persons to Statistics Canada's low income cut-offs in 2014?
- ... How much would average household "consumable" income rise if a province eliminated its gasoline taxes?
- ... How much would federal government revenue rise by if there was an increase in the GST rate?

## The Database

For the most part, microdata collected by different statistical surveys and various administrative procedures were designed for specific purposes. No one dataset from a given survey or administrative source provides a sufficiently detailed and integrated picture of Canadian households to support the analysis of costs and distributional impacts of the entire tax/transfer system as it moderates the flows of money between governments and individuals. The SPSD is the only such integrated database in Canada.

The SPSD was constructed by combining individual administrative data from personal income tax returns and unemployment claimant histories with survey data on family incomes, employment and expenditure patterns. The techniques used to create the database and avoid confidential data disclosure include various forms of categorical matching and stochastic imputation. While no one record on the database contains information for the same individual from the four bases, the database has been constructed in such a way as to provide a micro-statistically representative sample of Canadians.

Certain adjustments have been made to the data which force agreement between data and known control totals. For example, survey weights have been adjusted to ensure that the population by age and sex corresponds to Census data, and the number of high income Canadians corresponds to the number reported by Canada Revenue Agency. Further adjustments have been made to compensate for item non-response in the surveys (e.g. to increase the number of families receiving Employment Insurance). It should be noted that the SPSD coverage does not extend to the Yukon, the Nunavut or Northwest Territories, persons residing on reservations, or armed forces personnel residing in barracks.

Also included in the SPSD package are effective tax rates, including sales taxes, derived from data from Statistics Canada's Input/Output tables. These rates support the commodity tax model which facilitates the analysis of changes in commodity taxes on Canadian households and individuals.

### Database Highlights

- Data for more than 1,000,000 composite individuals residing in over 300,000 households in ten Canadian provinces.
- Preserves the confidentiality of individual information without compromising statistical validity.
- Approximately 600 variables covering detailed socio-economic and demographic data as well as information on weekly employment histories, expenditure patterns and itemized tax deductions.
- Full family structure for each individual on the database allows one to identify the familial relationships between all household members.

- A series of weight files and growth parameters allow analysts to use the database to represent the population of other years.

## **Micro Data Sources**

- Canadian Income Survey (CIS)
  - detailed information on income, family structure
  - Sample of over 50,000 individuals within 25,000 households
- Personal Income Tax Returns (T1 Family File)
  - Detailed distributions derived from personal income tax returns from Statistics Canada's T1 Family File.
  - synthetic information on high income Canadians to supplement CIS
  - over fifty deduction/tax credit items for each synthetic individual
- EI Claimant History Data
  - 200,000 individuals; over 250,000 claims
  - Human Resources Development Canada administrative claim data
  - Benefit type, duration, phase, and repeater status
- Survey of Household Spending (SHS)
  - Household expenditure data for 30 categories (coinciding with I/O concepts)
  - 12,000 households from a 2013 to 2015 diary samples, with emphasis on 2014.

## SPSD Selected List of Variables

<b><u>Household Structure</u></b>	Investment Tax Credit	Marital Status
Household Weight	Labour-sponsored Funds	Years Since Immigration
Household Type	Provincial Tax Credits	Labour Force Status
Relationship to Household Head		Level of Education
Relationship to Economic Family Head	<b><u>Income/Payroll Taxes</u></b>	Educational Status
Relationship to Census Family Head	EI Contributions	Weeks Worked Last Year
	CPP/QPP Contributions	Weeks Unemployed Last Year
	Federal Income Taxes	Last Year Full Time, Part Time
<b><u>Income - Market</u></b>	Provincial Income Taxes	
Employment Earnings		<b><u>Income Components - Deductions</u></b>
Self-employment		RPP Contributions
Retirement Pension Income	<b><u>Housing Characteristics</u></b>	RRSP Contributions
Other Income	Tenure (including institutionalized)	Professional and Union Dues
Interest and Other Investment Income		Child Care Expenses
Dividend Income	<b><u>Commodity Taxes</u></b>	Alimony Paid
Capital Gains/Losses	Federal Custom Import Duties	Business Investment Losses
	Federal Excise Taxes and Duties	Moving Expenses
	Federal GST	Carrying Charges
<b><u>Income - Transfers</u></b>	Total Federal Commodity Taxes	Exploration and Development Expenses
Family Allowances/Child Tax Benefit	Provincial Liquor Gallonage Taxes	Employee Home Relocation Deduction
Old Age Security Benefits (OAS)	Provincial Profits on Liquor Commissions	Stock Option-Deductions
Guaranteed Income Supplement Benefits	Provincial Gasoline Tax	Other Deductions
Spouse's Allowance Benefits	Provincial Amusement Tax	Capital Gains Deduction
Provincial GIS Top-ups	Provincial Tobacco Tax	Northern Residents Deductions
Canada/Quebec Pension Plan	Provincial Sales Tax	Allowable Employment Expenses
Other Transfers	Total Provincial Commodity Taxes	
Social Assistance Income		<b><u>Household Expenditures</u></b>
Unemployment Insurance/Employment Insurance Benefits	<b><u>Individual Social Characteristics</u></b>	Food and Non-Alcoholic Beverages
Worker's Compensation Benefits	Province	Alcoholic Beverages
	Urbanization	Tobacco
	Age	Clothing and Footwear
<b><u>Tax Credits</u></b>	Sex	
Child Tax Credit		
Federal Political Contribution		

Gross Rent Paid	Restaurants and accommodation services	Charitable Donations
Gross Imputed Rent	Life Insurance	Gifts to Canada/Provinces
Water supply and sanitation services, and Maintenance and Repair of the dwelling	Property / Health / Transport Insurance	
Electricity	Financial services	<b><u>EI Claim Data (EI Claimants Only)</u></b>
Natural Gas	Child care services	Claim Type
Other Fuels	Miscellaneous goods and services	Insurable Weekly Earnings
Goods related to the dwelling / property	<b><u>Non-Refundable Tax Credits</u></b>	Effective Weekly Rate
Services related to the dwelling / property	Basic Personal Amount	Repeat Claim Flag
Pharmaceuticals and Therapeutic products	Age Amount	Week Claim Established
Hospital and Out-patient services	Married Amount	Weeks of Benefits
New and used (net) motor vehicles	Amounts for Dependent Children	Weeks of Work Prior to Claim
Motor fuels and lubricants	Medical Expense Deduction Allowed	Benefits Paid in Calendar Year
Motor vehicle goods & services	Pension Income	Local Unemployment Rate
Purchased Air Transportation	Disability Deduction	Exhaustee Flag
Purchased Land and Water Transportation	Tuition Fees - self	Weeks of Training Benefits
Communications	Education Amount - self	Training Benefit Weekly Rate
Books, Newspapers and Periodicals	Tuition Fees and Education Amount Transferred from Child	Benefits Paid on Claim
Goods related to Recreation and Culture	Amount Transferred from Spouse	Received Parental Benefits
Services related to Recreation and Culture	Interest Paid on Student Loans	Weeks of Past EI Benefits
Education	Caregiver Amount	New Entrant Re-Entrant Flag
		Modeled Insurable Weekly Earnings

## The Model Algorithms

The SPSD/M comes with the necessary algorithms and parameters to simulate over 20 years of the Canadian tax/transfer system.

The central program, the SPSM, is a micro-simulation based model which calculates taxes and transfers for individuals and families as appropriate. These calculations are performed for everyone on the SPSD and then aggregated to obtain estimates. The SPSM is a static impact model and is therefore not intended to simulate how an individual's behaviour is likely to change in response to various policy options. A second program, the commodity tax model (COMTAX) is a macro-economic Input/Output based model. COMTAX is intended to provide estimates of effective federal and provincial tax rates by province and commodity type. This model is required because many commodity taxes are levied at intermediate stages of production, not at the final retail stage. Rates calculated by the COMTAX model can be input as parameters into the SPSM to obtain estimates of the commodity taxes paid by any given household.

The SPSM is driven by over 2,000 parameters that control three main processes. Control parameters specify input and output files for a specific model run and are used to activate model software facilities. Database adjustment parameters control the inflation or deflation of money items on the database. Tax/transfer parameters control the specific functioning of the tax and transfer programs. Perusing the included lists of the tax/transfer parameters can give the user a feel for the scope of options available in the tax/transfer algorithms.

The SPSM is written and compiled using the C++ programming language. Changes to the tax/transfer system can be made in two distinct ways: the "black-box" or the "glass box" mode. When using the model in the black-box mode, changes to one or more parameters are specified during a user-friendly dialogue. In this mode the user can change levels and rates affecting various benefits, taxes, and eligibility requirements, and can also specify the population that will be modeled. Most applications are developed using this black-box mode. The glass-box mode is designed for use by persons who wish to develop entirely new algorithms or adjust existing algorithms. Glass-box users can write a new, (or modify an existing) algorithm in the C++ programming language and then recompile the complete system using a simple one word command. The user need not be a C++ language expert in order to use the model in glass-box mode, but should be experienced with some high level computer language. The user requires Microsoft C++ to use the model in glass-box mode.

A set of database adjustment algorithms are included with the model. These algorithms allow the user to "grow" the money items on the current database to some future or past year. The user can select a series of growth rates which are then applied by the model. For most variables a set of province specific growth rates are applied. However for certain important or complex variables more complicated rates are applied. For example, employment earnings are grown by rates specific to the province of employment and sex of the individual. These algorithms can be used



independently of or in conjunction with alternate yearly demographic weights included with the database.

In the historical time period, the growth factors reproduce, on a provincial basis, the growth of the conceptually closest benchmark series in the System of National Accounts (SNA). In future years, the growth factors reproduce the growth seen in an average of public and private sector forecasts at a Canada level.

# Model Algorithm Highlights

## Personal Income Taxes

- Taxation algorithms to represent more than 20 tax years
- Major deduction/tax credit items
- Payroll deductions (CPP/QPP, EI contributions)
- Provincial tax algorithms (Tax on Tax and Tax on Income)

## Cash Transfers

- Unemployment/Employment Insurance Benefits
  - Detailed treatment of eligibility and benefits by:
    - type (regular, maternity, fishing, sickness, parental)
- Old Age Security benefits including partial benefits
- Guaranteed income supplement benefits including partial benefits
- Provincial GIS supplement programs
- Canada Child Benefit and Child Tax Benefit
- Goods and Services Tax Credit
- Provincial tax credit programs

## Database Adjustment Algorithms

- Scaling available for all income and expenditure variables by province
- Wages and Salaries by province and sex
- CPP/QPP Income by age

## Commodity Tax Model

- Eleven different tax types accounted for including:
  - Federal Custom Import Duties
  - Federal Goods and Services Tax
  - Provincial profits on liquor commissions and liquor gallonage tax
  - Federal Excise Taxes and Duties
  - Provincial Amusement Taxes
  - Provincial Gasoline Taxes
  - Provincial Sales Taxes
  - Provincial Tobacco Taxes
  - Provincial Environmental Taxes
  - Determination of expenditures net of "original" taxes

## Selected Parameters Controlling Government Transfer Algorithms

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### Employment Insurance

- EI contribution rate on earnings
- Maximum insurable earnings
- Minimum waiting period all claims
- Maximum number of weeks - regular
- Maximum number of weeks - maternity
- Maximum duration of an EI claim
- EI reform option

### Benefit Rates

- Benefit rate for basic phase
- Benefit rate for quitters in basic phase

### Repayment (through tax system)

- EI benefit recovery base amount factor

### Federal Goods and Services Tax Credit

- GST credit amount for filer
- GST credit amount
- GST credit reduction rate
- GST additional credit amount
- GST additional credit rate of net income

### Federal Child Tax Benefit

- Basic child benefit (per child)
- Child care expense reduction rate
- Federal child benefits family income turndown
- Family income reduction rate
- Child benefits earned income supplement rate
- Child benefits earning supplement reduction rate
- Child benefits earned income supplement

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- Child benefits earning supplement cut-in level
- Child benefits earning supplement turndown level
- Flag for WIS dependent on number of children
- Earnings where WIS phase-in is at maximum
- Enriched WIS for each children
- WIS reduction rate for families with children
- Deflator to calculate previous year income

### Canada Child Benefit

- Canada Child benefit per child
- Family income Canada Child Benefit turndown
- Canada Child Benefit reduction rate

### Old Age Security (OAS)/

#### Guaranteed Income Supplement (GIS)

- Old age security flag
- OAS take-back phase in
- Basic OAS
- OAS reduction rate
- Family income OAS turndown
- Federal GIS/SPA/ESPA flag
- Basic GIS supplement - single
- Basic GIS supplement - married
- Basic GIS portion of extended SPA
- CPI deflator to calculate previous year income
- Basic GIS reduction level: single pensioners
- Basic GIS reduction level: married pensioners
- SPA reduction point: one married/widowed
- Basic GIS reduction rate: single pensioners

- Basic GIS reduction rate: married pensioners

- OAS portion of SPA taxback rate

#### Take-up Rates by Income Group

- GIS take-up rate: single pensioner

- GIS take-up rate: pensioner couple

- GIS take-up rate: one pensioner couple

- SPA take-up rate by income group

- Extended SPA take-up rate by income group

- Ontario GIS supplement: single pensioners

- Ontario GIS supplement: married pensioners

- Manitoba GIS supplement: single pensioners

- Manitoba GIS supplement reduction point: single

- Saskatchewan GIS supplement: single pensioners

- Alberta GIS supplement maximum annual benefit

- British Columbia GIS supplement: single

- British Columbia GIS supplement married

#### **Provincial GIS Supplementation Programs**

Provincial GIS top-up flag

## Selected Parameters Controlling Federal Personal Tax and Commodity Tax Algorithms

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### Calculation of Total Income

- Capital gains inclusion rate
- Federal dividend gross-up rate

### Deductions from Total Income

- Employment Expense Deduction
- Child Care Expense Deduction

### Non-refundable Tax Credits

- Basic Personal Amount
- Age Amount
- Married Amount
- Married Equivalent Amount
- Pension Income Amount
- Caregiver Amount
- CPP/QPP Contributions
- Employment Insurance Contributions
- Medical Expenses
- Interest on Student Loans Amount
- Tuition and Education Amounts
- Charitable Donation Amount

### Deductions from Net Income

- Capital Gains Deduction

### Federal Taxes

- Federal tax table
- Federal non-refundable tax credit rate
- Federal dividend tax credit rate
- Federal Alternate Minimum Tax
- Quebec Tax Abatement

### Commodity Taxes

- Federal custom import duties
- Federal excise duties
- Federal goods and services tax
- Federal excise taxes
- Provincial liquor gallonage tax
- Provincial profits on liquor commissions
- Provincial gasoline tax
- Provincial amusement tax
- Provincial tobacco tax
- Provincial sales tax
- Provincial environmental tax

## Selected Parameters for Provincial Tax Algorithms

### Parameters Common to all Provinces (excluding Quebec)

- Provincial tax fraction
- Provincial tax on taxable income table
- Provincial alternative minimum tax
- Provincial dividend tax credit
- Provincial non-refundable tax credits
  - Basic Personal Amount
  - Age Amount
  - Married Amount
  - Married Equivalent Amount
  - Pension Income Amount
  - Caregiver Amount
  - CPP/QPP Contributions
  - Employment Insurance Contributions
  - Medical Expenses
  - Interest on Student Loans Amount
  - Tuition and Education Amounts
  - Charitable Donation Amount

### Newfoundland

- Sales Tax Credit
- Political Contribution tax credit
- Provincial surtax
- Low-income tax reduction
- Labour-sponsored funds tax credit

### Prince Edward Island

- Political contribution tax credit
- Provincial surtax
- Low-income tax reduction

- Labour-sponsored funds tax credit

### Nova Scotia

- Political Contribution tax credit
- Provincial surtax
- Low-income tax reduction
- Labour-sponsored funds tax credit

### New Brunswick

- Political Contribution tax credit
- Provincial surtax
- Low-income tax reduction
- Labour-sponsored funds tax credit

### Quebec

- Child care expenses
- Living alone exemption/amount
- Disability deduction/amount
- Income tax table
- Dividend tax credit
- Quebec sales tax credit
- Child Assistance refundable tax credit
- Work Premium refundable tax credit
- Basic Personal Amount
- Age Amount
- Married Amount
- Married Equivalent Amount
- Pension Income Amount
- CPP/QPP Contributions
- Employment Insurance Contributions
- Interest on Student Loans Amount

- Tuition and Education Amounts

- Charitable Donation Amount
- Property tax credit
- Political contribution tax credit
- Medical expense tax credit
- Alternative Minimum Tax
- Contribution to the Health Services Fund

### Ontario

- Political Contribution tax credit
- Provincial surtax
- Tax reduction
- Labour-sponsored funds tax credit
- Property tax credit
- Seniors property tax credit
- Sales tax credit
- Seniors sales tax credit
- Ontario Health Premium

### Manitoba

- Political Contribution tax credit
- Provincial surtax
- Tax reduction
- Labour-sponsored funds tax credit
- Personal tax credit
- Property tax credit

### Saskatchewan

- Political Contribution tax credit
- Provincial surtax
- Tax reduction

- Labour-sponsored funds tax credit
- Sales tax credit

### **Alberta**

- Political Contribution tax credit
- Provincial surtax
- Tax reduction
- Labour-sponsored funds tax credit
- Sales tax credit
- Alberta Health Care Insurance Plan premium

### **British Columbia**

- Political Contribution tax credit
  - Provincial surtax
  - Tax reduction
  - Labour-sponsored funds tax credit
  - Sales tax credit
- British Columbia Medical Services Plan premium

## The Model Software

The SPSPD/M comes with a powerful software support environment designed to enhance the range, speed and ease of policy analysis in both black-box and glass-box modes of use. The comprehensive and flexible set of outputs allow for detailed verification of algorithms and results. The software has been designed to work in an integrated fashion at many different family levels (e.g. household, census family, individual, etc.). A user-friendly interface allows the analyst to view and modify parameters, run simulations and examine results. An on-line help facility provides information on the use of the model dialogue as well as a handy reference to variable and parameter descriptions and lists. Some highlights of the model software are given below.

- A generalized expression facility allows the user to create new variables.
- The user can specify a database subset in terms of any combination of database or modeled variables (e.g. all Ontarians with income below \$40,000).
- Marginal tax rate analyses can be performed in a single execution of the model.
- Two distinct tax/transfer systems can be run simultaneously. Base and variant runs may be differentiated on the basis of parameter inputs, alternate algorithms (glass-box), or both.
- Comprehensive set of default tables includes dollar amounts and persons reporting for over 40 variables with breakdowns by province, income class, family type, and proportion above or below specified income levels.
- Built-in custom tabulation routines allow users to specify custom n-dimensional tables with database, model, or user defined variables and statistics. The user is given full control over formats, precision and labeling of the tables.
- Database output interfaces allow the user to create custom files in compressed binary format, ASCII format or as a documented SAS file. These files are for subsequent analysis using the SPSPM or other software packages and may contain any database or modeled variables.



## Documentation

The documentation for the SPSD/M is necessarily extensive due to the complex nature of the database and model. The majority of the documentation is of a reference nature providing definitions of parameters and variables or descriptions of algorithms and programs. The documentation is written and organized in such a way as to provide the analyst first with a conceptual and functional understanding of the product and its use, and then where to find and how to use the detailed operational specifications included in the manuals. The documentation is consequently organized into fourteen separate guides and grouped into three volumes as follows:

### Introduction Manual

Introduction and Overview	Basic concepts and tutorial examples
How to Run the SPSM	Description of the operation of the SPSM
Addendum	Modifications since the last version
How to Use SPSD/M Help	Information relating to the use of the on-line help facility

### SPSD/M User's Manual

Commodity Tax User's Guide	Description and utilization of the commodity tax (COMTAX) Input/Output model
SPSM User's Guide	Reference manual for black-box use
X-tab User's Guide	Reference manual and tutorial
SPSM Programmer's Guide	Reference manual for glass-box use
Growth and Validation Guide	Reference for Aging and Benchmarking SPSD/M
Tools User's Guide	How to use various included software aids

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## **SPSD/M Reference Manual**

Algorithm Guide	Description of the tax/social programs and their specific implementation in the SPSM
Parameter Guide	Detailed descriptions of all parameters
Variable Guide	Detailed description of all variables
Database Creation Guide	Detailed description of the creation and contents of the database

# Package Contents and Ordering Details

## Full SPSD/M

**Cost:** As of November 26, 2013, catalogue no. 89F0002XCB has become free. A Licence Agreement is required before the delivery of this product.

The licence includes the current database, software and documentation plus all updates during the product cycle. A new cycle begins with the creation of a new SPSD/M (database) based on the most recent data (every one to two years).

### Subject

### Details

**Contents:** This product is delivered via electronic file transfer (EFT)  
Does not include consultation or training.

### System

### Requirements:

Windows 7, Windows 8, and Windows 10 compatible computers (Users of other operating system should contact the SPSD/M team for more details). For access to "Glass Box", Visual C++ is needed. Please see the documentation to find the appropriate version.

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