A MICROCONSISTENT EQUILIBRIUM DATA SET FOR CANADA FOR USE IN TAX POLICY ANALYSIS

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In this paper we describe a micro consistent data set for Canada for 1972, assembled with general equilibrium tax policy analysis in mind. We stress the methodology used and in a number of tables report its main features.

In the data set the separate detail contained in input-output transactions tables, national accounts, household income and expenditure data, taxation statistics, foreign trade statistics, flow of funds and other sources is adjusted for mutual consistency. The final result is a micro consistent data set in which demands equal supplies for all products, zero profit conditions hold for industries and all agents' demands satisfy their budget constraints.

The motivation for data assembly is the currently widely used practice of calibrating "empirical" general equilibrium models so as to exactly reproduce a base year data observation as an equilibrium model solution. This procedure enables empirically based models to evaluate counterfactual equilibria in a way which corresponds to comparative static analysis in theoretical literature.

More detail on the data set is available on request in appendices deleted from the published version of this paper due to space constraints.

I. INTRODUCTION

In this paper we describe a micro consistent data set for Canada, assembled with general equilibrium tax policy analysis in mind. We stress the methodology used and in a number of tables report its main features. More detail is available on request in appendices deleted from the revised version of this paper due to space constraints.

The motivation for data assembly is the currently widely used practice of calibrating "empirical" general equilibrium models so as to exactly reproduce a base year data observation as an equilibrium model solution. This procedure enables empirically based models to evaluate counterfactual equilibria in a way which corresponds to comparative static analysis in theoretical literature. Under this approach parameters for underlying demand and production functions which characterize the model are determined directly from the model equilibrium conditions. The model is initially solved for the equation parameters from the assumed equilibrium observation. The parameters are then used to solve the model in the opposite direction for a counterfactual equilibrium typically involving a proposed policy change. Policy evaluation then proceeds by comparing the counterfactual and historical (or benchmark) equilibria. The origins of this approach can be found in Harberger [1962, 1974] and have been taken further in more recent modelling efforts by Fullerton, King, Shoven, and Whalley [1981]

and others. Surveys of recent applied models appear in Fullerton, Henderson, Shoven [1981], Mansur and Whalley [1981], Shoven and Whalley [mimeograph].

The data set we outline has been constructed for Canada for 1972 and the separate detail contained in input-output transactions tables, national accounts, household income and expenditure data, taxation statistics, foreign trade statistics, flow of funds and other sources is adjusted for mutual consistency. The final result is a micro consistent data set in which demands equal supplies for all products, zero profit conditions hold for industries and all agents' demands satisfy their budget constraints. These are the equilibrium conditions which characterize general equilibrium and model calibration requires data for which these hold.

The Canadian input-output tables contain the most detailed information on separate industries and products available in the present national accounting system and provide the starting point for data assembly. We expand the input-output data to incorporate demands and incomes of individual household groups consistent with production side accounts, incorporate financial transactions, impute corporate sector investment via retained earnings as household savings, redefine factor payments and incomes data using more acceptable definitions for our purposes, and explicitly incorporate an external sector balance condition which is not present in the input-output data. Because our ultimate aim is general equilibrium tax policy analysis we incorporate substantially more detail on taxes than exists in the input-output tables or the income and expenditure accounts.

We seek both to provide a data set for Canada to be used in future applied general equilibrium policy analysis of Canadian public sector issues, and also to provide a description of our methodology which can be applied in other cases where general equilibrium policy analysis may be contemplated. We believe these data can play a role in policy appraisal in Canada outside of the specific modelling context we have in mind, even though they have been constructed to provide readily available input for the computer programmes to be used in subsequent work.

In assembling the data set described in this paper we assume a multipurpose modelling effort for Canada whose objective is to provide a capability for counterfactual general equilibrium analysis involving the major elements of the tax system. This would include income and corporate taxes, provincial retail sales and federal manufacturers' sales taxes, excise taxes, and property taxes as well as social security contributions, subsidies and other budget items. We assume a twin objective of evaluation of welfare gains and losses from policy changes along with distributional analysis.

The level of commodity detail we maintain in our data set is the maximum level of detail contained in the small level of aggregation in the Canadian input-output tables which we assume provides sufficient industrial and commodity differentiation for the desired analysis. The remaining data we use are accommodated to this level of detail as far as is possible. The classification of consumer expenditure in family survey data is quite different from the industry classification in the production side data and for this reason our data set simultaneously uses two classifications with a linking concordance. The detail among household groups is an aggregated version of that appearing in family survey data.

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II. The Concept of a Benchmark Equilibrium Data Set

Any interpretation of economic data implies the adoption of a model of the economy, whether it be described formally in algebraic terms or assumed implicitly in choice and interpretation of measurement concepts. The orientation of conventional National Accounts can reasonably be described as the determination of macroeconomic aggregates. The detailed information presented in most National Accounts, while clearly of enormous value to economists, nonetheless is largely a by-product of the process of assembly of macro aggregates and typically does not aim at consistency in the various areas of detail. General equilibrium analysis, perhaps the most widely used theoretical framework for economy-wide microeconomic analysis, is only explicitly recognized in the construction of current national income accounts in the aggregate income-expenditure identity, but not in subaggregate detail.

A natural accounting framework consistent with general equilibrium models is to record transactions occurring in the separate markets which comprise the economy. If equilibrium is reflected in the accounts, then market demands would equal market supplies for all commodities. Supplies and demands could be separately disaggregated by agent, and each agent, in turn, would have incomes and expenditures consistent with their budget constraints.

The only currently available data which are close to such a framework are intermediate transactions accounts from which input-output tables are constructed. In Canada these are available for 1961, and using forward projections from selected years in which a census of production was performed, they are currently published on an annual basis for years up to 1974. We use tables for 1972 as the starting point in our calculations as these provided the most recent set of data available at the time our study was initiated.[1] We substantially extend these accounts and construct a "benchmark equilibrium" data set following the practice evolved over a number of years in use of applied general equilibrium models of assuming that the economy is characterized by a situation of Walrasian equilibrium. The model is then calibrated to this base year observation.

The assumption of equilibrium leads naturally to an accounting scheme and hence to the construction of a data set which fulfills the equilibrium conditions for some form of general equilibrium model. We identify four sets of equilibrium conditions to be satisfied by our benchmark equilibrium data set.

  (i) Demands equal supplies for all commodities
 (ii) Non-positive profits are made in all industries[2]
(iii) All domestic agents have demands which satisfy their budget constraints
 (iv) The economy is in zero external sector balance.

These conditions are not all satisfied in intermediate transactions accounts and associated data derived from current National Accounts. Various adjustments are therefore necessary to the blocks of data involved that are available separately but are not arranged on any synchronized basis. The nature of these

[1]This is also a full employment, relatively low inflation year. Macro disruptions stemming from the 1973 Middle East War are absent. Ideally, our data set should include averaging over a number of years but the time required and complexity of such a calculation preclude it in this case.

[2]This will involve treating the residual profit return to equity as a contractual cost as is implicit in most input-output transactions tables.

adjustments varies from case to case as alternate sets of Walrasian accounts are constructed to fit differing models.

Differences in measurement concepts from current practice arise for particular items. One example is the measurement of input use since unadjusted national accounts measures of the use of capital by industry are inappropriate for use in general equilibrium models. Another example arises with the imputation of retained earnings through to households as savings which is necessary in our data set to examine production and exchange in terms of underlying real counterparts.

Further difficulties arise with differences in classification between the various inconsistent data sets we use. An example is the incompatibility between categories of personal expenditure in family expenditure surveys and the income and expenditure accounts, and the classification of products of industries in GDP accounts on which final consumer expenditures by product are recorded in input-output data. A further difficulty is that producer output classifications refer to measures of value of output on a net of retail and wholesale margins and net of transportation cost basis while consumer expenditure classifications are on a gross basis. Classification difficulties also arise with taxation data which are in a number of instances collected on administrative rather than statistical basis.

Another form of adjustment arises with the need to guarantee mutual consistency between inconsistent data sets. We rely heavily on the 'RAS' adjustment method[3] for these modifications. Examples of areas where this technique is applied are where household demands for individual products do not equal the supplies of firms (after allowance for foreign trade), where costs of industries are no longer equal to sales after modifications to published intermediate transactions accounts, and where household incomes do not equal expenditures.

A simple way of illustrating the concept of a benchmark equilibrium data set is through a numerical example, and in Tables 1 and 2 we provide an example of interlocking accounts for an artificial economy. We consider an economy with three industries, three producer goods, three imported goods, three consumer goods, and two consumer groups. The full range of taxes considered in our data set is incorporated. In the consistent set of production side accounts in this economy the value of GNP is 38 and the total value of production is 65. Zero profit conditions are satisfied for each industry as is a zero external sector balance condition.

On the left-hand side of Table 1 we report production accounts showing outputs and costs by component for each industry, and categories of final demands. On the right-hand side of the table the household income and expenditure accounts are reported disaggregated into two households (labelled "rich" and "poor"). In Table 2 income and outlay accounts by sector are recorded along with the intersectoral financial transactions. These financial transactions preserve the consistency of real transactions in the data set.

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[3]The term "RAS" derives from the Row and Column Sum method explained in detail in Bacharach [1971]. This is a method of using an initial guess of a matrix where given row and column constraints must be met, and moving to a consistent matrix. This procedure is typically followed in updating input-output tables from previous years' tables to take account of new sets of National Accounts data and we use this same form of procedure in resolving inconsistencies between portions of our data set which are linked through marginal conditions.

While this example may appear structurally complex, even it arithmetically simple, it captures the main features of the micro consistent data set for Canada that we have produced and provides a useful frame of reference for the tables which follow.

III. DESCRIPTION OF MAJOR DATA SOURCES USED AND METHODS OF ADJUSTMENT

The System of National Accounts and its related data sets for Canada provide the starting point for our micro consistent 1972 data set for Canada. This system is described in the Canadian National Accounts sources and methods volume and displayed in a summary table on page 322. The input-output accounts which provide the basis for our data set are central to this system and consistent with aggregates in the Income and Expenditure Accounts.[4]

Essentially the procedure required to produce our data set involves extensions, modifications and redefinitions of concepts for portions of the national accounts data; the addition of further detail to this system; and final adjustments between blocks of data in order to restore mutual consistency. After these modifications and adjustments are complete we attempt a reconciliation of the major aggregates in our data set with published national accounts aggregates and quantify the size of the adjustments made in ensuring mutual consistency.

In Table 3 we outline the sequences of calculations involved and their relation to the National Accounts and other data from which we start. The major adjustments we have made in each of the blocks of data may be summarized as follows.

External Sector Data

From the input-output tables we begin by reconciling the export and import (net of customs duties) of goods and services with merchandise and service receipts and payments reported in the balance of payments accounts. The external sector accounts are then completed by incorporating data on capital transactions.

The imports data are disaggregated further by industry and by sector and used to disaggregate intermediate transactions and final demands to separately distinguish demands for domestic and imported products.

Indirect Tax Data

The commodity indirect taxes on final and intermediate demand from the input-output tables are disaggregated by commodity and by type of demand (for domestic or imported products) using the distribution of the corresponding demand matrices. The customs duties deducted from the value of imports are also disaggregated in this way and incorporated into the matrices of indirect taxes on the demand for imports.

Property taxes are deducted from "other indirect taxes" and included as a tax on capital. The rest of "other indirect taxes" paid by industry minus subsidies

[4]However, the separate income and outlay accounts by sector which appear in the latter are not incorporated in the input-output tables although they are included in the data set we produce.
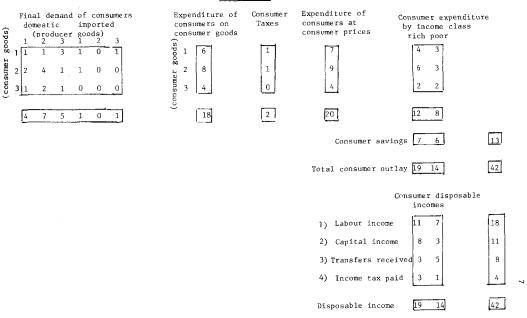
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TABLE 1

A Numerical Example of a Benchmark Equilibrium Data Set in Transaction Form:[1]
Production and Demand Sides

PRODUCTION SIDE

Total production
of industries
(industries)

	1	2	3	
	18	27	20	65

Total production
costs of industries
(industries)

	1	2	3	
	18	27	20	65

Final demand for
domestic products
(sectors)

(products)	C	G	I	X	
1	4	4	6	4	18
2	7	1	4	8	20
3	5	3	2	2	12
	16	8	12	14	50

Total demand
for domestic
products

| 24 |
| 24 |
| 17 |
| 65 |

Intermediate demand
for domestic products

(products)	1	2	3	
1	3	9	12	24
2	8	10	6	24
3	7	8	2	17

	1	2	3	
1	2	2	2	6
2	1	3	0	4
3	1	3	1	5
				15

Tax on intermediate
demand for domestic
products

1	0	0	1
0	1	0	1
0	0	1	1
			3

Tax on final demand
for domestic products

1	0	1	0	2
0	1	0	0	1
0	0	1	0	1
1	1	2	0	4

Intermediate demand
for imported products

0	2	1	3
1	0	1	2
1	1	0	2
			7

Final demand for
imported products

1	0	2	0	3
0	0	1	0	1
1	1	0	0	2
2	1	3	0	6

Total demand
for imported
products

| 6 |
| 3 |
| 4 |
| 13 |

Tax on intermediate
demand for imported
products

0	0	0	0
1	0	0	1
0	1	0	1
			2

Tax on final demand
for imported products

1	0	0	0	1
0	0	0	0	0
0	1	0	0	1
1	1	0	0	2

Composition of value
added by industry

| Labour Income | 5 | 7 | 6 | 18 |
| Capital Income | 3 | 6 | 4 | 13 |

Taxes on value added
by industry

| Labour Taxes | 1 | 1 | 1 | 3 |
| Capital Taxes | 1 | 1 | 2 | 4 |

Tax on production
by industry

0	1	0	1
-1	0	1	0
1	-2	0	1

Final demand of consumers							Expenditure of consumers on consumer goods	Consumer Taxes	Expenditure of consumers at consumer prices	Consumer expenditure by income class
domestic			imported							rich poor
(producer goods)										

(consumer goods)

	1	2	3	1	2	3
1	1	1	3	1	0	1
2	2	4	1	1	0	0
3	1	2	1	0	0	0
	4	7	5	1	0	1

Expenditure of consumers on consumer goods (consumer goods):

1	6
2	8
3	4
	18

Consumer Taxes:

1
1
0
2

Expenditure of consumers at consumer prices:

7
9
4
20

Consumer expenditure by income class (rich poor):

rich	poor
4	3
6	3
2	2
12	8

	rich	poor	
Consumer savings	7	6	13
Total consumer outlay	19	14	42

Consumer disposable incomes

1) Labour income	11	7	18
2) Capital income	8	3	11
3) Transfers received	3	5	8
4) Income tax paid	3	1	4
Disposable income	19	14	42

1) Total labour income = 18
2) Total capital income of consumers = 10 + net investment income from nonresidents 1 = 11
3) Transfers received by consumers = transfers received from government, businesses and from nonresidents 7 + capital assistance 1 + net inheritances and immigrant fund 1 = 8
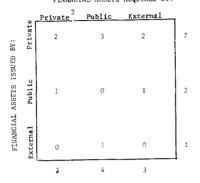4) Income tax + succession duties = 4

[1] All transactions reported are to be interpreted as transactions (products of prices and quantities) in currency units.

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TABLE 2

A Numerical Example of a Benchmark Equilibrium Data Set in Transaction Form:[1]

Budget and Financial Transactions

INCOME AND OUTLAY ACCOUNTS BY SECTOR

CONSUMERS (C)		GOVERNMENT (G)		INVESTMENT SECTOR (I)		EXTERNAL SECTOR (X)	
Final demand domestic	16	Final demand domestic	8	Final demand domestic	12	Exports	14
Final demand import	2	Final demand import	1	Final demand import	3		
Investment income to X	2	Investment income to X	3			Investment income to C	3
						Investment income to G	1
Transfers to X	1	Transfers to C	4	Transfers to C	2	Transfers to C	1
		Transfers to X	1				
Inherit. & immigrant fund	1	Capital assistance to C	1			Inherit. & immigrant fund	2
		Capital assistance to I	2				
Personal income tax	3	Net official monetary					
Succession duties	1	movements—Spec. Drawing Rights	2			Financial investment	5
Taxes on final demand	2			Taxes on final demand	2		
Interest on cons. debt	1						
TOTAL OUTLAY	29	TOTAL OUTLAY	22	TOTAL OUTLAY	19	TOTAL OUTLAY	26
Labour income	18	Imputed capital income	1	Capital assistance from G	2	Imports	13
Capital income	10	Investment income	1			Investment income from C	2
		Retained earnings of G	1			Investment income from C	3
Investment income from X	3	Investment income from X	1				
Capital assistance from G	1						
Transfers from G	4					Transfers from C	1
Transfers from I	2					Transfers from G	1
Transfers from X	1						
Inherit. & immigrant fund	2					Inherit. & immigrant fund	1
Interest on cons. debt	1	Tax on inter. dem. domestic	3			Net offical monetary	
		Tax on inter. dem. import	2			movement—Spec. Draw. Rights	2
		Tax on final demand of C	2				
		Tax on final demand of G	2			Financial investment	3
		Labour taxes	3				
		Capital taxes	4				
		Personal income tax	3				
		Succession duties	1				
TOTAL INCOME	42	TOTAL INCOME	24	TOTAL INCOME	2	TOTAL INCOME	26
NET SAVINGS OF C	13	NET SAVINGS OF G	2	NET SAVINGS OF I	-17	NET SAVINGS OF X	2
						(net financial inv.)	

INTERSECTORAL FINANCIAL TRANSACTIONS

FINANCIAL ASSETS ACQUIRED BY:

		Private[2]	Public	External	
FINANCIAL ASSETS ISSUED BY:	Private	2	3	2	7
	Public	1	0	1	2
	External	0	1	0	1
		3	4	3	8

NET FINANCIAL SAVINGS (Lending or Borrowing)
BY SECTOR = TOTAL ASSETS ACQUIRED - TOTAL ASSETS
ISSUED BY SECTOR:

1) Private sector net savings = 3 - 7 = -4

2) Public sector net savings = 4 - 2 = 2

3) External sector net savings in Canada = 3 - 1 = 2

[1]All transactions reported are to be interpreted as transactions (products of prices and quantities) in currency units.

[2]The consumer and investment sectors are combined.

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received by industry are allocated by producer good using production data by industry.

Value Added Data

The value added data which appear as industry costs in the input-output tables are modified to take account of a number of features which are different from the national accounts treatment. These modifications consist mainly of changes in the treatment of capital income which are significant for our intended use of the data set. Among these are the treatment of depreciation, the allocation of self-employment income between labour and capital return in each industry, the inclusion of the property tax as a factor tax rather than as an indirect tax as in the national accounts, and finally the inclusion of an imputed return on capital used by government.

Taxes on Value Added (Factor Taxes)

Factor taxes on labour consist of total (employer and employee) pension plan contributions, workmen's compensation and unemployment insurance contributions that have been deducted from the value of labour return by industry.

Factor taxes on capital consist of total (federal and provincial) corporation income taxes which have been deducted from the capital return by industry plus estimates of property taxes by industry which have been deducted from other indirect taxes.

Income and Outlay Accounts

Estimates from the Income and Outlay Accounts by sector from the National Accounts along with our data on external sector transactions are used both to allocate our value added data by sector and to complete the accounts on the income and expenditure side by sector. To the data on value added and final demands by sector we add estimates of transfers, personal income tax and interest on debt paid and received by sectors. This enables us to construct a set of complete income and outlay accounts by sector consistent with our value added and final demand data.
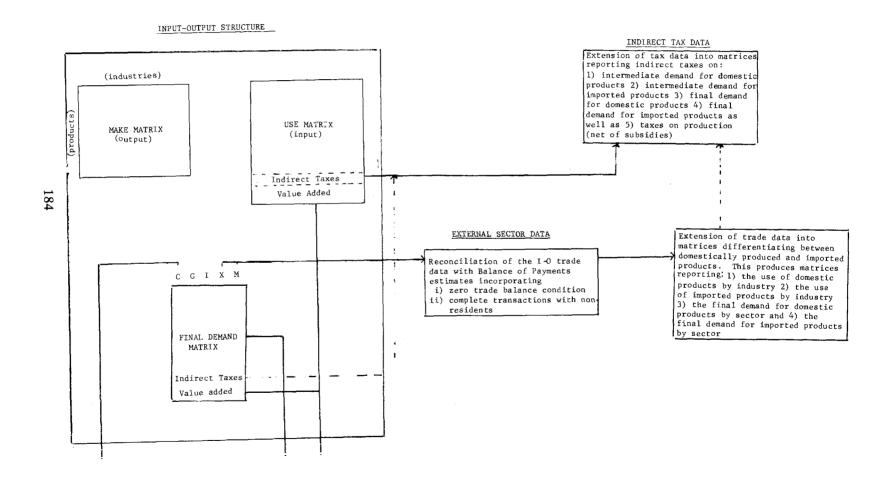
In these accounts financial intermediation by the business sector is removed. Sectors are shown as receiving directly all investment income with no earnings retained by corporations (this item appears as income to households and government). All sectors satisfy budget balance conditions including their saving or dissaving. By construction the sum of net lending is zero.

Financial Flows Accounts

Savings by sector are further disaggregated into a financial flows account showing financial transactions between sectors. The basic source for data on these transactions is provided by the financial flows accounts. The matrices of net increases in assets and liabilities are combined and aggregated to form a matrix of assets issued and acquired by sector. This matrix is then reconciled

Table 3

BASIC DATA SOURCES AND ADJUSTMENTS FOR THE 1972 MICRO CONSISTENT DATA SET FOR CANADA

INPUT-OUTPUT STRUCTURE

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(products)

(industries)

MAKE MATRIX
(output)

USE MATRIX
(input)

Indirect Taxes

Value Added

C G I X M

FINAL DEMAND
MATRIX

Indirect Taxes

Value added

INDIRECT TAX DATA

Extension of tax data into matrices reporting indirect taxes on:
1) intermediate demand for domestic products 2) intermediate demand for imported products 3) final demand for domestic products 4) final demand for imported products as well as 5) taxes on production (net of subsidies)

EXTERNAL SECTOR DATA

Reconciliation of the I-O trade data with Balance of Payments estimates incorporating
 i) zero trade balance condition
ii) complete transactions with non-residents

Extension of trade data into matrices differentiating between domestically produced and imported products. This produces matrices reporting: 1) the use of domestic products by industry 2) the use of imported products by industry 3) the final demand for domestic products by sector and 4) the final demand for imported products by sector

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VALUE ADDED DATA

Reconciliation with National Income and Expenditure Accounts. Adjustments are made for the treatment of self-employment income, real depreciation and property taxes. The value added data include:
- Labour income by source and by industry
- Capital income by source and by industry
- Labour taxes by type and by industry
- Capital taxes by type and by industry

PERSONAL SECTOR

The personal sector is disaggregated by income class. Aggregate expenditure is disaggregated by commodity and income class using as weights estimates from the 1969 Canadian survey of Family Expenditure (consumer good classification). Aggregate income by source is also disaggregated by income class. Savings and personal income tax are included. The budget condition is satisfied in each income class. [The transformation matrix shows the link between the producer good classification (final demand of C) and the consumer good classification.]

INCOME AND OUTLAY ACCOUNTS

Final demand and value added data along with complementary estimates from the National Accounts are used to construct complete Income and Outlay accounts for the personal, the government and the investment sectors. [Financial intermediation through corporations on the income side is removed.] Net financial savings by sector are derived. The budget condition is satisfied.

INCOME TAX DATA

Gross income per household is derived. Assessed and unassessed income is identified. We estimate marginal tax rates on capital return and on labour return by income class using information from Taxation Statistics.

FINANCIAL FLOWS ACCOUNT

A matrix showing financial transactions between sectors is constructed. The sum of net financial savings across sectors equals zero (alternatively the sum of net lending equals zero). Non-financial capital acquisition of sectors also appear in these accounts. The personal and the investment sectors are combined into a single private sector.

with our income and outlay accounts so that for each sector the column sum minus the corresponding row sum gives net lending (saving) for that sector.

Household Incomes and Expenditure by Income Range

The income and outlay account of the personal sector is further disaggregated into detailed accounts by income range using the classification found in the 1969 family expenditure survey data. Expenditure estimates in these data are reported on a consumer good classification which coincides with that of the personal expenditure from the national income and expenditure accounts, as opposed to the producer good classification of our final demands. To accommodate the different expenditure category classifications in these data, we construct a transformation matrix linking the two classifications. Estimates of personal expenditure on consumer goods from the 1972 Income and Expenditure Accounts are then reconciled with total final demand of consumers at consumer prices (gross of taxes and margins). The family expenditure survey data are used for the allocation by income range.

Considerable care is devoted to the allocation of the various income sources (e.g. transfers, retained earnings, imputed rent, self-employment income) by income range since significant differences occur between measurement concepts in our data set and the survey, particularly in the definition of capital income. Disposable income by income range is estimated by deducting personal income tax and net savings from the sum of labour, capital and transfer income by income range.

Income Tax Data

Because of the focus of the data set on eventual tax policy analysis, we also estimate a number of income tax characteristics by household,[5] in particular average rates and marginal rates on components of income (i.e. labour and capital). This also includes estimating the unassessed portion of capital income.

"RAS" Adjustments

After the adjustments, modifications and additions listed above are completed, the remaining inconsistencies in our data set involve major data blocks which need to be realigned so as to satisfy (or restore in certain cases) equilibrium conditions. For example, in the case of the matrix of intermediate transactions, modifications to the estimates of value added by industry require that an adjustment be made so as to restore demand/supply equalities by commodity as well as the zero profit condition by industry. In the case of the disaggregation of the household sector, expenditures should sum to estimated final demand and each household's expenditures must sum to disposable income. Comparable adjustments must be made to other matrices and the "RAS" (row and column sum) procedure is adopted for this purpose.

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[5]The Canadian income tax applies to individual tax filers rather than households. We are unable to adjust our data to fully account for this.

In the "RAS" procedure a non-negative matrix which does not initially meet prescribed non-negative row and column sum constraints is restored to a situation of consistency through a sequence of alternating operations on rows and columns of the matrix. First row constraints are satisfied, then column constraints, then row constraints, and so on until a consistent matrix is achieved. The sums of prespecified row and column constraints must be the same since they both provide the matrix sum. If the matrix is everywhere dense, convergence is assured.

We have applied the RAS procedure to four matrices in the construction of our data set. The largest adjustment occurs with the "use" matrix (intermediate transactions) for domestic products where the sum of the absolute value of deviations between initial and terminal matrices is of the order of 20 percent. This adjustment is accounted for mainly by the fact that real depreciation has been deducted from both capital return and capital expenditure and therefore appears as an intermediate cost of industries in our data set. The adjustments in the other matrices are not of this magnitude and are explained mostly by the reallocations of row and column constraints.

TABLE 4

CONSTRUCTED NATIONAL/DOMESTIC PRODUCT ACCOUNT,[a] CANADA, 1972
AND COMPARISON WITH NATIONAL ACCOUNTS AGGREGATES[b]

(Millions of Dollars)

Net labour return	58,682		
Total taxes on labour return	3,016		
Net capital return	24,727		
Total taxes on capital return	7,858[c]		
Net Domestic Product at Factor Cost	94,283[d]	National Accounts	81,245
Real depreciation	8,878[a]		
Gross Domestic Product at Factor Cost	103,161	National Accounts	92,719
Net domestic product at factor cost	94,283		
Indirect taxes less subsidies	9,938		
Net Domestic Product at Market Prices	104,221	National Accounts	95,311
Real depreciation	8,878		
Gross Domestic Product at Market Prices	113,099	National Accounts	106,785
Net domestic product at factor cost	94,283		
Investment income received from non-residents	943		
Investment income paid to non-residents	−2,521		
Net National Product at Factor Cost	92,705	National Accounts	79,694
Real depreciation	8,878		
Gross National Product at Factor Cost	101,583	National Accounts	91,168
Net national product at factor cost	92,705		
Indirect taxes less subsidies	9,938		
Net National Product at Market Prices	102,643	National Accounts	93,760
Real depreciation	8,878		
Gross National Product at Market Prices	111,521	National Accounts	105,234

[a]*Source*: Value added and tax data from constructed data set.

[b]*Source*: National Income and Expenditure Accounts, 1972, Cat. 13-201, adopted from Tables 1, 3.

[c]Includes property taxes.

[d]Includes real depreciation on government capital stock (1128).

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The modifications made to value added produce different measures of economy-wide aggregates in our data set from National Accounts. We report the alternative measures in our data set and national accounts data in Table 4. We note in passing that national accounts aggregates are lower than the aggregates in our data set by some 8 percent, primarily being accounted for by the imputed return to government capital, and the different treatment of real depreciation.

IV. A SUMMARY OF THE MICRO CONSISTENT DATA SET

In this section we present a summary of our Canadian micro consistent data set; as already noted, the full detail of the data set is contained in a series of appendices available on request. We have chosen to summarize our data set through a number of summary tables, some of which involve aggregations over more detailed classifications in the basic data to make the main features of the data set more readily apparent.

We begin with our production side data. In Table 5 we report production costs by industry. The intermediate costs and taxes on intermediate transactions by industry involve column sums of the intermediate transactions and associated tax matrices. As already mentioned, the value-added data involve some significant departures from National Accounts practice particularly in the treatment of depreciation, self-employment income, and capital use by government. The concentration of value added in the service industry along with high capital tax rates on manufacturing are apparent from the data.

In Tables 6 and 7 we present demand-supply accounts for domestically produced goods and for imports. The data on final demands deviate from national accounts in a number of ways which accommodate changes in value-added data appearing in Table 5. Government expenditures on public administration and defence include the additional costs of purchase of imputed services of government-owned capital. All final demand and value-added items appear as part of the income and outlay accounts by sector.

Table 8 presents a summary of these complete income and outlay accounts by sector. The final demand and value-added data are supplemented by information on transfer payments and receipts, interest on debt, financial investment and monetary movements. Each sector satisfies its budget constraint and the sum of net lending or financial savings across sectors is zero.

Tables 9 and 10 contain detailed income and outlay accounts for the household sector with households stratified by income class. The totals across all households provide the income and outlay for the household sector.

A number of features are worth noting from the expenditure accounts.

1. The expenditure shares by product vary substantially over the income ranges. Thus per household food expenditures change by a ratio of 3 : 1 moving from poorest to richest, while personal services changes by a ratio of 9 : 1.

2. Approximately 50% of households appear in the data as dissavers. This is a smaller fraction than in the basic survey data since measured savings by household are corrected so as to allow for stockholder savings through retained earnings of corporations and reinvestment of sheltered savings (pension funds).

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TABLE 5

PRODUCTION COSTS BY INDUSTRY, CANADA, 1972
(Millions of Dollars)

	(1) Intermediate Cost, Domestic Products	(2) Taxes On Intermediate Demand For Domestic Products[a]	(3) Intermediate Cost, Imported Products	(4) Taxes on Intermediate Demand For Imported Products[b]	(5) Taxes on Production[c]	(6) Total Intermediate Cost of Production[d]	(7) Labour Costs	(8) Labour Taxes[e]	(9) Capital Costs	(10) Capital Taxes[f]	(11) Total Cost of Production[g]
1. Agriculture	3,148.63	18.02	326.89	11.55	−193.92	3,311.17	1,159.00	7.00	844.00	162.00	5,483.17
2. Forestry	925.36	9.52	37.42	2.38	5.07	979.75	602.00	38.00	−102.00[h]	38.00	1,555.75
3. Fishing, Hunting and Trapping	135.67	1.10	8.51	1.72	0.12	147.12	91.00	2.700	15.00	2.00	257.12
4. Mines, Quarries and Oil Wells	2,971.49	13.02	233.91	7.00	25.77	3,251.18	1,308.00	87.00	823.00	251.00	5,720.18
5. Manufacturing	31,344.44	78.35	8,044.88	458.44	48.83	39,974.95	13,966.00	587.00	2,983.00	2,090.00	59,600.95
6. Construction	9,044.54	755.27	1,754.87	274.12	19.37	11,848.16	5,081.00	225.00	473.00	250.00	17,877.16
7. Transportation and Storage	3,407.88	241.74	359.42	58.23	−63.12	4,004.14	3,887.00	151.00	502.00	346.00	8,890.14
8. Communication	940.75	11.88	66.85	7.03	−179.49	847.03	1,478.00	58.00	574.00	184.00	3,141.03
9. Electric, Power, Gas Other Utilities	838.67	6.65	78.14	1.31	−7.37	917.40	820.00	32.00	864.00	99.00	2,732.40
10. Wholesale Trade	1,904.00	73.66	104.35	11.85	−34.19	2,059.67	3,321.00	114.00	599.00	529.00	6,622.67
11. Retail Trade	2,735.90	60.81	143.12	10.79	34.63	2,985.24	4,858.00	167.00	988.00	436.00	9,434.24
12. Finance, Insurance and Real Estate	3,290.53	15.34	120.51	2.39	486.45	3,915.21	3,205.00	106.00	7,189.00	3,164.00	17,579.21
13. Business and Personal Services	4,760.90	61.10	396.41	20.05	31.87	5,270.33	6,957.00	221.00	2,104.00	307.00	14,859.33
14. Transportation Margins[i]	3,669.14	0.00	267.53	0.00	0.00	3,936.67	0.00	0.00	0.00	0.00	3,936.67
15. Operating Office Supplies[i]	4,723.72	357.45	1,450.36	294.13	0.00	6,825.67	0.00	0.00	0.00	0.00	6,825.67
16. Travel, Promotion and Advertising[i]	2,916.92	222.49	394.40	44.27	0.00	3,578.07	0.00	0.00	0.00	0.00	3,578.07
17. Public Administration and Defence	1,127.61	0.00	0.00	0.00	0.00	1,127.61	11,949.00	1,221.00	6,871.00	0.00	21,168.61
Total Industries:	77,868.14	1,926.40	13,787.56	1,205.26	174.02	94,979.38	58,682.00	3,016.00	24,727.00	7,858.00	189,262.39

[a,b] Commodity indirect taxes consisting mainly of federal excise tax, provincial sales tax, import duties, and gasoline tax accruing to the demand of industries for intermediate products.

[c] Other indirect taxes consisting mainly of motor vehicle licences, capital and place of business taxes paid by industries minus government subsidies received by industries.

[d] Sum of columns 1 to 5 equals intermediate cost of production by industry.

[e] Total contributions to unemployment insurance, Canada and Quebec pension plans and workmen's compensation (* includes contribution to public service pensions).

[f] Corporate and property taxes.

[g] Sum of columns 6 to 10 equals total costs of production by industry.

[h] This negative figure results from the choice of year (small profits and large inventory valuation adjustment). Negative factor use is inconsistent with a general equilibrium. Averaging over a number of years might remove this.

[i] These consist of dummy industries for which there is no value added in the Input-Output tables (total supply equals total use).

TABLE 6

DEMAND-SUPPLY ACCOUNT FOR DOMESTIC GOODS AND SERVICES, CANADA, 1972

(Millions of Dollars)

Commodity	Total Supply of Domestic Products	Intermediate Demand for Domestic Products	Total Final Demand for Domestic Products				Total Demand for Domestic Products[b]
			Consumer Demand for Domestic Products	Government Demand for Domestic Products	Investment Demand for Domestic Products	Export of Domestic Products[a]	
1. Grains	1,148.44	215.89	0.00	0.00	0.00	932.57	1,148.46
2. Other Agricultural Products	4,218.30	3,119.90	739.27	7.34	11.25	340.55	4,218.31
3. Forestry Products	1,582.50	1,523.61	29.70	0.00	0.00	29.22	1,582.52
4. Fishing and Trapping Products	250.80	154.37	10.44	0.00	0.00	86.08	250.88
5. Metallic Ores and Concentrates	2,275.70	1,318.65	0.00	2.70	0.00	954.49	2,275.84
6. Mineral Fuels	2,256.60	955.72	48.98	0.00	13.86	1,238.05	2,256.60
7. Non-Metallic Minerals	534.80	232.63	10.36	21.41	6.92	263.49	534.81
8. Services Incidental to Mining	511.70	409.98	0.00	0.00	99.52	2.04	511.55
9. Meat, Fish and Dairy Products	5,259.40	1,629.02	3,065.52	0.00	33.25	531.62	5,259.41
10. Fruit, Vegetables, Misc. Food Products	3,920.00	1,492.75	2,142.18	0.00	26.63	258.60	3,920.15
11. Beverages	1,331.20	120.55	994.73	0.00	12.07	203.88	1,331.24
12. Tobacco and Tobacco Products	578.40	122.09	398.24	0.00	0.00	58.14	578.47
13. Rubber, Leather, Plastic Fab.	1,581.40	969.95	489.24	1.15	23.43	97.78	1,581.55
14. Textile Products	2,005.10	1,372.87	477.18	18.63	35.97	100.48	2,005.14
15. Knitted Products and Clothing	2,043.00	206.72	1,709.46	7.87	36.22	82.74	2,043.01
16. Lumber, Sawmill, Wood Products	3,067.30	1,643.29	55.52	0.00	0.00	1,368.63	3,067.45
17. Furniture and Fixtures	936.50	158.91	589.10	35.53	104.60	48.44	936.59
18. Paper and Paper Products	4,461.50	2,138.53	237.77	0.00	0.00	2,085.36	4,461.67
19. Printing and Publishing	1,843.60	1,277.59	446.75	64.55	6.60	47.99	1,843.48
20. Primary Metal Products	5,195.40	3,065.93	2.19	0.00	0.00	2,127.39	5,195.51
21. Metal Fabricated Products	3,722.40	3,132.58	161.58	35.35	67.87	325.04	3,722.41
22. Machinery and Equipment	2,251.60	1,197.88	7.93	7.89	171.95	866.15	2,251.80

23. Autos, Trucks and Transport Equipment	7,939.20	1,855.23	706.98	75.29	305.94	4,995.87	7,939.31
24. Electrical and Communications Products	3,457.90	1,700.57	742.33	31.11	442.12	541.80	3,457.93
25. Non-Metallic Mineral Products	1,652.60	1,424.54	74.13	0.10	8.45	145.41	1,652.64
26. Petroleum and Coal Products	2,543.20	1,348.35	885.81	106.04	6.72	196.15	2,543.08
27. Chemicals and Chemical Products	3,159.30	1,903.74	580.73	90.61	16.05	568.30	3,159.43
28. Misc. Manufacturing Products	1,307.80	517.39	401.41	61.09	56.59	271.37	1,307.86
29. Residential Construction	5,148.10	2,094.62	0.00	17.06	2,973.99	62.32	5,147.99
30. Non-residential Construction	9,478.00	3,438.75	0.00	2,506.45	3,443.17	89.59	9,477.96
31. Repair Construction	3,022.50	2,380.87	38.72	602.77	0.00	0.00	3,022.37
32. Transportation and Storage	8,713.00	6,146.87	1,240.40	200.75	0.00	1,124.98	8,713.00
33. Communication Services	2,974.90	1,630.80	1,099.01	210.01	0.00	34.92	2,974.75
34. Other Utilities	2,684.30	1,268.19	1,351.41	0.00	0.00	64.84	2,684.45
35. Wholesale Margins	7,545.50	4,003.27	2,148.77	104.58	436.38	852.63	7,545.62
36. Retail Margins	7,691.10	787.73	6,770.16	26.18	104.54	2.59	7,691.21
37. Imputed Rent, Owner-Occupied Housing	5,943.30	26.74	5,916.53	0.00	0.00	0.00	5,943.27
38. Other Finance, Insurance Real Estate	11,987.80	5,275.44	6,166.56	73.73	362.86	100.06	11,978.65
39. Business Services	3,130.00	1,870.64	203.54	304.22	0.00	751.46	3,129.85
40. Personal and Misc. Services	14,407.20	3,278.46	9,282.15	980.95	0.00	865.52	14,407.09
41. Transportation Margins	3,936.50	2,052.09	645.28	44.03	92.74	1,102.47	3,936.62
42. Operating, Office Lab., & Food	6,825.60	5,328.75	234.34	1,262.39	0.00	0.00	6,825.48
43. Travel, Promotion, Advtg.	3,577.90	3,093.70	111.00	373.21	0.00	0.00	3,577.91
44. Public Administration and Defence	21,168.50	0.00	1,036.00	20,132.50	0.00	0.00	21,168.50
Total	189,260.84	77,886.15	51,251.41	27,405.52	8,899.71	23,819.00	189,261.79

[a] Exports of merchandise and services consist basically of Input-Output exports + re-exports with a few adjustments: 1) unallocated exports are allocated to commodities, 2) the column is scaled equal to the Balance of Payments total merchandise exports and service receipts for 1972 (net of investment income), 3) non-financial capital acquisition of non-residents is added.

[b] Intermediate demand plus total final demand for domestic products equal total demand for domestic products.

TABLE 7

DEMAND-SUPPLY ACCOUNT FOR IMPORTED GOODS AND SERVICES, CANADA, 1972

(Millions of Dollars)

Commodity	Total Supply of Imports[a]	Intermediate Demand for Imported Products	Consumer Demand for Imported Products	Government Imported Products	Investment Demand for Imported Products
1. Grains	26.47	26.57	0.00	0.00	0.00
2. Other Agricultural Products	835.73	670.93	160.82	1.60	2.44
3. Forestry Products	50.39	49.55	0.93	0.00	0.00
4. Fishing and Trapping Products	65.09	60.99	4.13	0.00	0.00
5. Metallic Ores and Concentrates	229.28	228.88	0.00	0.47	0.00
6. Mineral Fuels	1,098.96	1,029.72	54.03	0.00	15.22
7. Non-Metallic Minerals	112.90	96.38	4.45	9.20	2.96
8. Services Incidental to Mining	0.00	0.00	0.00	0.00	0.00
9. Meat, Fish and Dairy Products	290.20	98.20	189.96	0.00	2.05
10. Fruit, Vegetables, Misc. Food Products	487.69	195.83	288.39	0.00	3.57
11. Beverages	146.33	13.88	130.89	0.00	1.58
12. Tobacco and Tobacco Products	12.19	2.93	9.29	0.00	0.00
13. Rubber, Leather, Plastic Fab.	525.68	339.70	177.17	0.42	8.45
14. Textile Products	780.77	557.25	200.68	7.84	15.06
15. Knitted Products and Clothing	310.40	27.06	276.36	1.27	5.83
16. Lumber, Sawmill, Wood Products	195.66	189.44	6.31	0.00	0.00
17. Furniture and Fixtures	83.74	6.51	62.58	3.77	11.06
18. Paper and Paper Products	250.66	225.60	25.06	0.00	0.00
19. Printing and Publishing	303.09	214.79	76.02	10.98	1.12
20. Primary Metal Products	845.92	845.35	0.58	0.00	0.00

21. Metal Fabricated Products	798.03	734.40	38.91	8.51	16.27
22. Machinery and Equipment	2,700.50	1,454.36	52.83	52.60	1,140.75
23. Autos, Trucks and Transport Equipment	5,143.60	2,494.39	1,723.39	183.53	742.43
24. Electrical and Communications Products	1,478.05	722.29	462.33	19.38	274.11
25. Non-Metallic Mineral Products	265.42	250.74	13.19	0.02	1.50
26. Petroleum and Coal Products	230.27	131.45	87.54	10.48	0.66
27. Chemicals and Chemical Products	989.91	724.25	224.50	35.03	6.18
28. Misc. Manufacturing Products	1,119.19	484.90	490.77	74.69	68.88
29. Residential Construction	0.00	0.00	0.00	0.00	0.00
30. Non-Residential Construction	0.00	0.00	0.00	0.00	0.00
31. Repair Construction	0.00	0.00	0.00	0.00	0.00
32. Transportation and Storage	592.35	479.18	97.29	15.75	0.00
33. Communication Services	38.13	20.91	14.32	2.74	0.00
34. Other Utilities	6.32	3.06	3.27	0.00	0.00
35. Wholesale Margins	126.92	73.21	43.01	2.09	8.70
36. Retail Margins	0.00	0.00	0.00	0.00	0.00
37. Imputed Rent, Owner-Occupied Housing	0.00	0.00	0.00	0.00	0.00
38. Other Finance, Insurance, Real Estate	350.36	150.26	186.84	2.23	10.94
39. Business Services	1,189.93	934.27	102.44	153.10	0.00
40. Personal and Misc. Services	1,049.86	250.33	723.05	76.41	0.00
41. Transportation Margins	0.00	0.00	0.00	0.00	0.00
42. Operating, Office, Lab., and Food	0.00	0.00	0.00	0.00	0.00
43. Travel, Promotion, Advertising	0.00	0.00	0.00	0.00	0.00
44. Public Administration and Defence	0.00	0.00	0.00	00.00	0.00
Total Commodities	22,730.00	13,787.56	5,931.32	672.11	2,339.74

[a] Imports of merchandise and services consist basically of Input-Output imports with a few adjustments: 1) customs import duties by commodity are deducted from the value of imports, 2) non-competing and unallocated imports are allocated to commodities, 3) the column is scaled equal to the Balance of Payments total merchandise imports and service payments for 1972 (net of investment income). The trade imbalance with exports (Table 2) is accommodated through financial transactions and an overall trade balance condition held (Table 4). Export and Imports are valued on an F.O.B. basis.

TABLE 8
Summary Income and Outlay Accounts by Sector, Canada, 1972
(Millions of Dollars)

Personal		Government		Investment		External	
Total Final Demand	$57,182	Total Final Demand	$28,078	Total Final Demand	$11,239	Canadian Exports	$23,819
Investment Income Paid Abroad	1,970	Investment Income Paid Abroad	551	Transfers Paid to Persons	172	Investment Income Paid to	
Total Transfers Paid Abroad[a]	344	Total Transfers Paid	10,448	Total Taxes Paid	694	Canada	943
Interest on Consumer Debt	699	Special Drawing Rights	336			Total Transfers Paid to Canada[a]	907
Total Taxes Paid[b]	17,388	Total Taxes Paid	165	Outlay	$12,105	Net Official Monetary	
						Movements	117
Outlay	$77,583	Outlay[c]	$39,579	Capital Assistance Received	199	Financial Investment in Canada	2,589
Labour Income (Net of Tax)	58,682	Capital Income (Net of Tax)	7,159	Income	$199	Outlay	$28,375
Capital Income (Net of Tax)	17,568	Investment Income from		Net Financial Savings			
Investment Income from		Abroad	34	$199 − 12,105 = −11,906		Canadian Imports	22,730
Abroad	909	Transfers Received from				Investment Income from	
Total Transfers Received[a]	10,756	Abroad	287			Canada	2,521
Interest on Consumer Debt	699	Net Official Monetary				Total Transfers Received from	
		Movements	117			Canada	629
Income	$88,614	Total Direct and Indirect Taxes				Special Drawing Rights	336
Net Financial Savings		Received	32,427			Financial Investment from	
88,614 − 77,583 = 11,031						Canada	2,159
		Income[c]	$40,024				
		Net Financial Savings				Income	$28,375
		$40,024 − 39,579 = 445				Net Financial Savings	
						$2.589 − 2,159 = 430	

[a] Includes inheritances and immigrants (emigrants) tund.
[b] Includes personal income tax, succession duties and sales taxes.
[c] Net of interest on public debt and subsidies.

TABLE 9

SUMMARY OF EXPENDITURE OF HOUSEHOLDS BY COMMODITY AND BY INCOME CLASS,[a] CANADA, 1972

(aggregate data in millions of dollars/per household data ($ per year) in parentheses)

Income Range (% of households in parentheses)

Expenditure Category	Under $3,546 (16.6)	$3,546– $4,727 (7.1)	$4,728– $5,909 (6.9)	$5,910– $7,091 (8.0)	$7,092– $8,273 (8.9)	$8,274– $9,455 (8.6)	$9,456– $10,637 (8.5)	$10,638– $11,819 (7.3)	$11,820– $13,001 (5.6)	$13,002– $14,183 (4.6)	$14,184– $17,729 (9.3)	$17,730 over (8.6)	All Classes (100)
1. Food	1,326	695	730	874	1,101	1,095	1,122	990	804	740	1,424	1,666	12,567
per capita	(1,355)	(1,666)	(1,808)	(1,864)	(2,114)	(2,150)	(2,249)	(2,297)	(2,428)	(2,730)	(2,613)	(3,300)	(2,137)
2. Housing and Operation	1,486	713	719	881	1,137	1,200	1,245	1,165	984	869	1,768	2,432	14,599
per capita	(1,518)	(1,710)	(1,780)	(1,879)	(2,183)	(2,357)	(2,496)	(2,702)	(2,972)	(3,207)	(3,244)	(4,816)	(2,482)
3. Furniture and Equipment	269	181	200	261	353	359	407	370	350	311	649	890	4,600
per capita	(275)	(434)	(495)	(556)	(678)	(705)	(815)	(859)	(1,056)	(1,147)	(1,191)	(1,762)	(782)
4. Clothing	289	211	235	300	381	393	426	390	341	339	692	917	4,914
per capita	(296)	(506)	(581)	(640)	(731)	(772)	(853)	(905)	(1,029)	(1,253)	(1,270)	(1,815)	(835)
5. Personal Care and Health	453	229	221	274	331	330	333	296	244	218	431	500	3,860
per capita[b]	(463)	(550)	(547)	(584)	(635)	(649)	(668)	(687)	(738)	(806)	(792)	(989)	(656)
6. Transportation	392	308	406	500	705	697	749	636	586	539	1,111	1,417	8,046
per capita	(400)	(739)	(1,005)	(1,066)	(1,353)	(1,369)	(1,501)	(1,475)	(1,772)	(1,989)	(2,038)	(2,806)	(1,368)
7. Tobacco and Alcoholic Beverages	281	190	203	284	356	336	354	325	261	259	494	586	3,929
per capita	(287)	(457)	(502)	(605)	(684)	(660)	(710)	(754)	(789)	(957)	(906)	(1,160)	(668)
8. Personal Services	364	228	253	335	409	457	554	515	464	426	911	1,469	6,385
per capita	(372)	(548)	(627)	(715)	(785)	(897)	(1,111)	(1,195)	(1,401)	(1,572)	(1,671)	(2,909)	(1,086)
9. Financial and Misc.	230	130	152	210	349	340	349	344	266	272	579	832	4,053
per capita	(235)	(312)	(376)	(449)	(670)	(669)	(700)	(799)	(804)	(1,002)	(1,062)	(1,648)	(689)
10. Savings (Net)	−759	−126	−158	−49	−49	253	325	553	580	483	1,946	8,031	11,030
per capita	(−776)	(−302)	(−390)	(−104)	(−95)	(497)	(652)	(1,283)	(1,752)	(1,782)	(3,571)	(15,903)	(1,875)
All Expenditures[c]	4,331	2,759	2,961	3,870	5,073	5,460	5,864	5,584	4,880	4,456	10,005	18,740	73,983
	(4,425)	(6,620)	(7,331)	(8,254)	(9,738)	(10,725)	(11,755)	(12,956)	(14,741)	(16,445)	(18,358)	(37,108)	(12,578)

[a] The income classes reported correspond to the 1969 family expenditure survey and income, assets and indebtedness survey income classification scaled to 1972 dollars. Household expenditure and income are for the main part disaggregated by income class using distributive series from these sources although the definition of income we adopt involves a broader concept than the one used to define this classification. (See text for definition of capital income.)

[b] Includes medical insurance premiums and motor vehicle licences and permits.

[c] Total expenditure of households gross of indirect taxes and savings.

TABLE 10

SUMMARY OF INCOMES OF HOUSEHOLDS BY SOURCE AND BY INCOME CLASS,[a] CANADA, 1972

(aggregate data in millions of dollars/per household data ($ per year) in parentheses)

Income Range (% of households in parentheses)

Income Sources	Under $3,546 (16.6)	$3,546– $4,727 (7.1)	$4,728– $5,909 (6.9)	$5,910– $7,091 (8.0)	$7,092– $8,273 (8.9)	$8,274– $9,455 (8.6)	$9,456– $10,637 (8.5)	$10,638– $11,819 (7.3)	$11,820– $13,001 (5.6)	$13,002– $14,183 (4.6)	$14,184– $17,729 (9.3)	$17,730– over (8.6)	All Classes (100)
Labour Income	587	1,174	1,760	3,051	4,225	4,871	5,516	5,399	4,519	4,166	9,741	13,673	58,682
per capita	(599)	(2,814)	(4,358)	(6,506)	(8,110)	(9,569)	(11,054)	(12,526)	(13,651)	(15,374)	(17,874)	(27,075)	(9,977)
Capital Income	564	499	473	485	760	693	730	677	879	757	1,758	8,232	16,507
per capita[b]	(576)	(1,196)	(1,171)	(1,033)	(1,460)	(1,362)	(1,463)	(1,571)	(2,656)	(2,793)	(3,225)	(16,302)	(2,806)
Transfers	3,251	1,219	955	748	712	672	546	479	368	324	564	574	10,412
per capita[c]	(3,321)	(2,924)	(2,365)	(1,595)	(1,367)	(1,320)	(1,095)	(1,112)	(1,113)	(1,194)	(1,035)	(1,134)	(1,770)
Income Tax	71	132	227	413	624	776	926	971	887	790	2,058	3,739	11,614
per capita	(73)	(315)	(562)	(881)	(1,198)	(1,525)	(1,857)	(2,254)	(2,679)	(2,916)	(3,776)	(7,403)	(1,974)
Disposable Income L+K+TR−IT	4,331	2,760	2,961	3,871	5,073	5,460	5,866	5,584	4,879	4,457	10,005	18,740	73,987
per capita	(4,423)	(6,619)	(7,332)	(8,253)	(9,739)	(10,726)	(11,755)	(12,955)	(14,741)	(16,445)	(18,358)	(37,108)	(12,579)

PERSONAL INCOME TAX DATA ($ per household) BY INCOME CLASS, CANADA, 1972

Gross Income (L+K+TR)	4,496	6,935	7,893	9,135	10,936	12,251	13,612	15,209	17,420	19,361	22,133	44,511	
Estimated Assessed Income	4,305	6,659	7,579	8,756	10,457	11,629	12,876	14,373	16,375	18,266	20,706	39,136	
Estimated Taxable Income	1,544	3,764	4,585	5,572	6,913	7,936	8,984	10,252	11,914	13,365	15,517	32,127	
Income Tax Paid	73	315	562	881	1,198	1,525	1,857	2,254	2,679	2,916	3,776	7,403	
Average Tax Rate[e]	1.6	4.5	7.1	9.6	11.0	12.4	13.6	14.8	15.4	15.1	17.1	16.6	
Marginal Tax Rate on Labour Income	24.6	27.2	27.2	29.8	29.8	32.4	35.0	35.0	40.2	40.2	45.4	53.1	
Marginal Tax Rate on Capital Income (inflation = 0)	13.6	18.6	17.6	16.4	18.4	15.9	15.5	14.4	22.9	22.7	23.1	29.7	

[a] See Footnote 1, Table 9.

[b] Gross of investment income from abroad and net of investment income paid abroad.

[c] Net of transfer income paid abroad; includes capital assistance and inheritance and immigrants' (emigrants') fund.

[d] See Footnote 1, p. 14.

[e] As percentage of gross income.

In practice, the number of households who dissave (where, on average, dissaving occurs) will typically be smaller than the number of households in such cells since some positive savers occur in such cells (although some dissavers occur in cells where positive savings occur on average).

3. An especially high savings rate occurs for the group in the top income range; this group owns substantial amounts of equity and in addition has large pension holdings. While this group contains an open interval, it is nonetheless remarkable that this group has a savings rate of (approximately) 40 percent out of disposable income. This group comprises 8.6 percent of households but accounts for over 70 percent of all household savings.

On the income side of our household accounts we make significant additions to the measure of capital income of households appearing in the household survey income and expenditure data. When reported totals for rent, interest, and dividends received are projected onto a population-wide basis underreporting in the survey relative to National Accounts totals is suggested. We include as additional items retained and sheltered earnings consistent with our measure of capital return in value added. An interesting feature of the data is that on a per household basis the capital to labour ratio in income is highest for the lowest income group, reflecting the large number of retired individuals in this income range. A "U-shaped" distribution of capital to labour income by income range is indicated by Table 10.

In the lower portion of Table 10 we report estimates of income tax characteristics of households. We begin with gross household incomes and calculate estimated assessed income making allowance for sheltered and imputed capital income. Estimated taxable income incorporates data on allowances and deductions. Data on average and marginal tax rates reflect a weighted average over provincial tax rates using population data. The marginal tax rate on labour income is the marginal rate from tax schedules; the marginal tax rate on capital income[6] includes an allowance for sheltered and retained earnings and preferential tax treatment of capital gains. The indications are that the income tax is mildly redistributive along the lines revealed in the Gillespie [1976] data.

In Table 11 we report intersectoral financial transactions which have been obtained from a consolidation of flow of funds accounts for 1972. This is a consistent part of the whole data set in the sense that savings by any sector equal nonfinancial capital acquisition plus net financial savings. The sum of net financial savings across sectors equals zero.

V. SUMMARY TAX RATES AND THE PUBLIC SECTOR AS TREATED IN THE DATA SET

The Canadian micro consistent data set we have constructed for 1972 not only portrays a benchmark equilibrium which can be used to calibrate a general

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[6]These tax rates are calculated assuming a zero rate of inflation. Given the taxation of nominal rather than real capital gains, the rate of inflation changes marginal tax rates on capital income. Indications are that higher marginal and average rates result, along with more redistribution across income ranges.

TABLE 11

INTERSECTORAL FINANCIAL TRANSACTIONS, CANADA, 1972

(Millions of Dollars)

Savings	Private	Public	External	Total
Non-Financial Capital Acquisition	10,488	2,797	260	13,545[a]
Net Financial Savings	-874	444	430	0
Total Savings	9,614	3,241	690	13,545

| | | Assets Acquired by: | | |
	Private	Public	External	
Private	23,107	3,478	1,529	28,114
Assets Issued by Public	3,632	3,284	158	7,074
External	501	756	1,271	2,528
	27,240	7,518	2,958	

Net Financial Savings (Lending or Borrowing) by Sector = Total Assets Acquired − Total Assets Issued by Sector:
1. Private sector net savings = 27,240 − 28,114 = −874
2. Public sector net savings = 7,518 − 7,074 = 444
3. External sector net savings in Canada = 2,958 − 2,528 = 430

[a]This estimate of total non-financial capital acquisition consists of the Input-Output structure estimate of total capital expenditure after real depreciation and corresponding indirect taxes have been deducted.

The same procedure applied to National Accounts estimate has a similar result:

Total gross fixed capital formation	23,051	(Table 11, p. 17)
Real depreciation	−8,878	(model)
Corresponding indirect taxes	−598	(I–O final demand matrix)
Net Non-Financial Capital Acquisition (as per National Accounts)	13,575	

equilibrium model specified in equation form, it also provides an overview of the Canadian tax system and we illustrate this in this section.

In Table 12 we report some estimates obtained after consolidating *ad valorem* factor, output, and income tax rates obtained after consolidating legal taxes into "subsystems" and consolidating certain expenditure and industry categories. In the factor tax system we include the corporate and property taxes as taxes on capital income by industry, labour taxes include Canada and Quebec Pension Plans. Output taxes include manufacturers' sales tax, provincial retail sales taxes and selective excises (including profits of liquor commissions). The distortions in the factor tax system can be seen to be concentrated within the capital tax system with heavy taxation of capital use in manufacturing. The heavy taxation of alcohol and tobacco in the output tax system is also apparent.

We also report income tax characteristics across aggregated classifications within the household sector. The average tax rate on low income households of (approx.) 5 percent rises to (approx.) 16 percent for high income households. We report marginal rates on components of income with capital income tax rates below those on labour income. The tax free portion of savings falls from over 80 percent to around 20 percent as we move into the top income range; the

imputed rent as a percentage of capital income falls from 14 percent to around 4 percent as we move from low to high income groups.

A representation of the tax system in *ad valorem* form enables a general equilibrium model incorporating the data compiled here to be used in the counterfactual equilibrium analysis. The benchmark equilibrium would be assumed to hold in the presence of 1972 policies (as represented by Table 12). A counterfactual analysis would involve some hypothetical policy change (such as an income tax reform) for which a new equilibrium would be computed. Welfare analysis of the policy option would then involve a comparison between the two equilibria. Such analyses would typically involve more detail than represented here, but the main distorting features of the tax system which might be analyzed are nonetheless evident from Table 12.

VI. EXTENSIONS TO THE DATA SET

Updating the Data Set

It is possible to apply updating procedures to this data set for crude extrapolations to later years. The motivation for such a discussion is either the unavailability of complete data for later years or the desire to avoid the amount of work involved in complete construction of data for a later year. We envisage a situation in which the national income and expenditure accounts for a year more recent than 1972 are to be used as a basis for updating the entire data set while maintaining all consistency conditions satisfied by the data. Along with the national income and expenditure accounts we assume that the balance of payments accounts are also part of the more recent data. This situation of using more recent years' national accounts to update a larger data set is comparable to that of updating input-output tables.

The updating procedure would involve initially constructing the income and outlay account for the external sector as in the present data set using the balance of payments accounts, and revised value-added data using national income and expenditure accounts. From these data revised income and outlay accounts for all domestic sectors could be constructed taking into account new tax and government expenditure data in formulating the income and outlay account for the public sector.

Total indirect taxes net of property taxes and net of subsidies could be allocated between intermediate and final uses of domestic and intermediate products. Final demands for domestic products and savings would be estimated taking the residual income and expenditure for each sector and allocating it using the proportions found in the original data. Adjustments would be made if the sum of net savings of all sectors were not equal to zero.

Consumer expenditure data from National Accounts on a consumer good classification could be scaled for consistency with the total value of final demands of the household sector appearing in the revised income and outlay accounts. Data on income sources by component would also come from the revised income and outlay accounts.

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TABLE 12

AGGREGATED SUMMARY OF MODEL EQUIVALENT TAX RATES, CANADA, 1972

Industry[a]	FACTOR TAX SYSTEM Percentage Tax Rates on Net of Tax Factor Rewards		PRODUCER OUTPUT TAX SYSTEM Percentage Tax Rates on Net of Tax	
			Intermediate Expenditure	Total Production Expenditure
	Labour Taxes[b]	Capital Taxes[c]	Commodity Indirect Taxes[d]	Other Indirect Taxes[e]
1. Mines, Quarries and Oil Wells	6.7	30.5	0.6	0.5
2. Agricultural and Other Resources	2.5	26.7	1.0	−2.6
3. Manufacturing and Construction	4.3	67.7	3.1	0.1
4. Transportation, Communication, Utilities	3.9	32.4	5.7	−1.8
5. Trade	3.4	60.8	3.2	0.0
6. Finance, Insurance and Real Estate	3.3	44.0	0.5	3.2
7. Business and Miscellaneous Services	3.2	14.6	5.4	0.1

CONSUMER OUTPUT TAX SYSTEM
Percentage Tax Rates on Net of Tax Consumer Expenditure

Commodity Category	Consumer Indirect Taxes[f]
1. Food	2.1
2. Housing and Operation	2.0
3. Furniture and Equipment	12.1
4. Clothing	14.4
5. Personal Care and Health*	5.6
6. Transportation	18.2
7. Tobacco and Alcoholic Beverages	126.5
8. Personal Services	7.0
9. Financial and Miscellaneous	0.2

*Does not include medical insurance.

INCOME TAX SYSTEM

Income Classes[g]	Labour Income	Capital Income	Transfer Income	Gross Income	Average Income Tax Rate (% of Gross Income)	Marginal Tax Rate[h] on Labour Income	Marginal Tax Rate On Capital Income Inflation = 0%	Tax Deductible Savings as a Percentage of Net Savings[i]	Imputed Rents as a Percentage of Capital Income
Under $6,000	2,590	981	2,870	6,441	4.9	25.8	15.7	—[j]	14.2
$6,000–$12,000	9,553	1,378	1,298	12,229	12.6	32.4	16.2	83.1	11.2
$12,000 and over	18,494	6,244	1,119	25,857	16.2	45.9	25.0	21.8	4.4

[a] These are aggregated over the categories appearing in Table 5.

[b] Social security taxes.

[c] Corporate and property taxes.

[d] Federal excise tax, provincial sales taxes, import duties, gasoline tax and miscellaneous indirect taxes.

[e] Motor vehicle licence, capital and place of business taxes minus subsidies received.

[f] Commodity and other indirect taxes paid by consumers.

[g] These are aggregated over the income classes appearing in Table 9.

[h] The marginal tax rates presented here represent the weighted average of the marginal rates appearing in Table 10 (using % households by income range as weights).

[i] Private pensions and registered pension plans as tax deductible portion of net savings.

[j] This income class shows negative savings; tax deductible savings for this group amount to $68 million in aggregate or an average $50 per capita.

This procedure would provide a new set of marginal constraints for the matrices to which the RAS consistency procedure is currently applied. Unlike the updating of input-output tables by such a method, additional demand side matrices are also involved which must be made consistent with the production side data through interlocking marginal constraints.

Further Commodity and Industrial Detail

The main sources for further detail on commodities and industries are the input-output data on the production side and household expenditure data on the demand side. We have used the small level of aggregation of the Canadian input-output tables covering 43 producer commodities and 16 industries. The middle level of aggregation involves 89 producer commodities and 43 industries and the large level 595 producer commodities and 191 industries. Since National Accounts value-added data are not available on such a detailed classification the input-output value-added data would probably need to be used. Foreign trade data from these tables could be used to disaggregate items into domestic and foreign products as in our data set. We feel that for a broad evaluation of the tax system using general equilibrium techniques, such additional detail is not especially valuable, but for other purposes this may not be the case.

On the demand side the 18 consumer goods and services which provide consumer expenditure categories could be further disaggregated to the 40 goods and services used to report personal expenditure data in national accounts.

Further Detail by Household Type

We have limited ourselves in our classification of households simply to differentiation by household income, but further characteristics can be used as identified in the family expenditure survey data. Detailed analyses on these classifications are not all published but are, in principle, obtainable from the basic data source. Stratifications exist by family type (size), age of head of household, urbanization, region, province, class of tenure (housing), occupation of head, education of head, country of origin of head, year of arrival of head in Canada, and number of full-time earners in the family. As with additional commodity detail, we do not feel that for our eventual purposes with the data set that much of this additional potential stratification is of special interest but for other purposes this may not be the case.

Regional Data

Because of the interest in Canada in regional issues, and in particular the regional impacts of the tax system, it is natural to raise the issue of potential regional disaggregation in the data set. Our initial guess was that such disaggregation whether by individual province or by the five regions used by Statistics Canada would be impossible.

There are however two recent developments which cause us to be less pessimistic while still having serious doubts as to the feasibility of the exercise. A first complete set of input-output provincial accounts will soon be made

available by the Structural Analysis Division of Statistics Canada which will be similar to the economy-wide accounts. These accounts incorporate data on interprovincial trade flows and provide a starting point for a regional disaggregation.

In addition, an experimental set of provincial product accounts have been recently published by Statistics Canada for the period 1962–1977. There are numerous methodological problems with these data not the least being the location of corporate activity when tax return corporate profit data are used covering conglomerate activity. Financial transactions data are not available and so a set of provincial income accounts is not easy to construct from these data.

Other data sources which can complement these two data sources are the household expenditure survey data where households by region are identified, and income and corporate tax statistics where regional characteristics appear in the data. While a daunting task, regional disaggregation may thus not be insuperable.

VII. CONCLUSION

In this paper we have presented the methodology for and a summary of a micro consistent data set we have constructed for Canada for 1972 for eventual use in counterfactual general equilibrium analysis of Canadian tax policy. We provide documentation of data sources and adjustments in appendices available on request.

With our approach we stress the necessity of constructing a data set in which all the equilibrium conditions of Walrasian general equilibrium are satisfied if the data are to be used to determine parameters in equations for a general equilibrium model. While input-output accounts go a substantial distance in this direction the absence of an integrated set of household accounts with income sources and expenditures by household is a major difficulty for tax incidence analysis. In addition, input-output accounts do not contain clearly defined sectoral income and outlay accounts.

We stress the methodological differences in our approach from current National Accounting, provide a summary of main features of our data set, and give indications as to how the data set may be extended in its detail.

BIBLIOGRAPHY

Bacharach, M., (1971), *Bi-proportional Matrices and Input-Output Change* (Cambridge, England: Cambridge University Press).
Fullerton, Don, Henderson, Yolanda K., and Shoven, John B., (forthcoming), A Comparison of Methodologies in Empirical General Equilibrium Models of Taxation in *Applied General Equilibrium Analysis*, eds. H. E. Scarf and J. B. Shoven (Chicago: University of Chicago Press).
Fullerton, D., King, T. A., Shoven, J. B., and Whalley, J., (1981), Corporate Tax Integration in the United States, *American Economic Review* 71, 677–691.
Gillespie, I., (1976), On the Redistribution of Income in Canada, *Canadian Tax Journal* 24, 419–450.
Harberger, A. C., (1962), The Incidence of the Corporation Income Tax, *Journal of Political Economy* 70, 215–240.
Harberger, A. C., (1974), *Taxation and Welfare*, (Boston: Little, Brown and Co.).
Mansur, Ahsan and Whalley, J., (forthcoming), Numerical Specification of Applied General Equilibrium Models: Estimation, Calibration, and Data, in *Applied General Equilibrium Models of Taxation*, eds. H. E. Scarf and J. B. Shoven (Chicago: University of Chicago Press).

Shoven, John B. and Whalley, J., (forthcoming), Applied General Equilibrium Analysis, *Journal* (*Economic Literature*.

Dominion Bureau of Statistics, *The Input-Output Structure of the Canadian Economy, 1961, Vol.* Catalogue 15-501 Occasional, Ottawa, 1969.

Revenue Canada Taxation, *Taxation Statistics 1974 Edition*, Ottawa, 1974.

Statistics Canada, *The Canadian Balance of International Payments 1973-74*, Catalogue 67-20: Ottawa, 1977.

Statistics Canada, *Corporation Taxation Statistics, 1972*, Catalogue 61-208, Ottawa.

Statistics Canada, *Corporation Financial Statistics, 1972*, Catalogue 61-207, Ottawa.

Statistics Canada, *Employment, Earnings and Hours*, 1972, Catalogue 72-206, Ottawa.

Statistics Canada, *Family Expenditure in Canada, Volume I, All Canada: Urban and Rural*, 196! Catalogue 62-535, Ottawa, 1973.

Statistics Canada, *Financial Flow Accounts, 1973 (IX)*, Catalogue 13-002, Quarterly, Ottawa.

Statistics Canada, *Fixed Capital Flows and Stocks 1973-77,* Catalogue 13-211, Ottawa, 1977.

Statistics Canada, *The Input-Output Structure of the Canadian Economy 1961-71*, catalogue 15-506 Occasional, Ottawa, 1977.

Statistics Canada, *The Input-Output Structure of the Canadian Economy, 1972*, unpublished dat provided by the Input-Output Division, Ottawa.

Statistics Canada, *National Income and Expenditure Accounts, Vol. 3, Definitions, Concepts, Source Methods*, Catalogue 13-549E Occasional, Ottawa, 1975.

Statistics Canada, *National Income and Expenditure Accounts 1962-76*, Catalogue 13-201, Ottaw: 1977.

Statistics Canada, *Pension Plans in Canada, 1974*, Catalogue 74-401, Ottawa.

Statistics Canada, *Principal Taxes and Rates: Federal, Provincial and Selected Municipal Government 1972*, Catalogue 68-201, Ottawa.

U.S. Department of Commerce, *Survey of Current Business*, Volume 54, No. 2, February 1974.