Queen's Economics Department Working Paper No. 81

A SURVEY OF RECENT CANADIAN MACRO-ECONOMETRIC MODELS AND USEFULNESS OF CANADIAN DATA FOR MACRO-AND MICRO-ECONOMETRIC MODEL BUILDING COMPARED WITH U.S. AND JAPANESE DATA

Hiroki Tsurumi
Queen's University

Department of Economics
Queen's University
94 University Avenue
Kingston, Ontario, Canada
K7L 3N6

5-1972

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Discussion Paper No. 81

May 1972

I. Introduction

Since Timbergen's pioneering study [22] published in 1939, various econometric models[(1)] have been built in many countries in the world. The rate of production of econometric models has been increasing particularly over the last decade. This trend is a product of the following developments: (i) statistical data on various levels of economic activities are more and more readily available; (ii) training in econometric techniques has been widely diffused and improved in undergraduate and graduate economics programs, and (iii) computer facilities are readily accessible and many econometric estimation methods are now available as canned programs.

Econometric model building started with macro models to explain some entries of national income accounts. These models are of a basically Keynesian nature with much emphasis on explanation of final demand components in real terms (i.e. deflated by price indexes). In some models price indexes and wage levels were explained as endogenous variables; their roles, however, were quite 'passive' in the sense that they were used mainly to

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(1) What exactly is meant by an econometric model is by no means clear. An 'econometric model' ranges from a one equation model to analyze a particular institutional, technical or behavioral activity of an economic agent (say, a group of consumers, a firm, or an industry) to a set of simultaneous equations to analyze certain economic activities of economic agent(s) emphasizing the mutual dependency of these economic activities. It is in the latter context that the term 'econometric model' is used in this paper. One common feature of econometric models is that most or all of the parameters in each equation are assumed to be time-invariant. Based on this assumption as well as on the assumption that either the disturbance terms are time-wise independent or that they observe very special stationary stochastic processes, these parameters are estimated from observed data. The observed data are assumed to have the minimum property that the averages of their products and cross products follow the weak law of large numbers. If one is certain that an economic system one is analyzing violates any or all of the above assumptions, one may begin to construct an econometric model which is different from the conventional understanding of the econometric model. The recent upsurge in application of optimum system control and Baysian estimation to economic problems may move econometric model building into a new era. However, if one recognizes that an economic system is always subject to noises and to sudden and unforeseen changes and that the true foundation of economics lies in the economist's metaphysical and ideological perception of economic problems, one can be a skeptic about this new movement in econometrics as well as about the intuitive approaches in specification of an equation and in estimation. An interested reader on intuitive or ad hoc specification of an equation should read Nerlove [18]. An optimal control approaches to econometrics is illustrated in [28].

convert real terms into nominal value terms rather than as a directly influential factor in the consumer or investment behavior.(2) Gradually macro-econometric models began to incorporate more actively the wage and price sector, production and employment functions, income distributions and monetary sector. Hence the Keynesian nature was more and more modified by neoclassical supply and production considerations. The supply mechanism, however, still plays a secondary role in current econometric models, giving the primary role to final demand factors.(3) The final demand factors themselves have been increasingly disaggregated; for example, rather than consumer expenditure being specified by a single consumption function, consumption is often divided into several categories.

A more recent notable trend is to disaggregate production, wages and prices, employment and capital formation into some broad industrial sectors.(4) While macro-econometric models began to show more disaggregation in final demand categories and in industrial sectors, new research has been directed to econometric models at the industrial as well as the firm levels. At the industrial level certain macro variables may be treated as exogenous variables, and at the firm level in turn certain industrial and macro variables may be treated as exogenous variables. Hence there is a hierachical linkage between macro, industrial and firm models.(5)

The current trend towards disaggregated macro models, industry models, and firm models has several advantages: (i) Disaggregation of a macro model

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(2) A simple but comprehensive survey of macro-econometric models of various countries over the period 1939 to 1964 is made by Nerlove [17]. This survey clearly indicates the gradual evolution of macro models to more disaggregation in terms of final demand categories and industrial sectors.

(3) There have been no macro models built which have an active interaction of supply and demand factors in the sense that supply and demand decisions are made independent of each other. If one believes that the market is imperfect such that either demand or supply factors always play the primary role in determining price and quantity, then the practice of making a model either demand or supply determined may be justifiable.

(4) One of the earliest disaggregated macro models is done by Ueno [29], and large scale models such as Brookings-SSRC model [8] inevitably disaggregate national economy into broad industrial sectors.

(5) Examples of industrial models are [30,31,32], and those of firm models are [23,24,16]. The linkage between macro model, industry, and firm models is demonstrated in [30, 23].

into industrial sectors would describe more accurately the behaviors of heterogenous decision makers. (ii) Since in the medium to long run, industrial development indicates the growing, stable, or declining patterns of various industries, industrial disaggregation of a macro model would conveniently catch these structural changes in the production, employment, and wage shares of an economy. (iii) Disaggregated macro models, industry models and firm models may assist policy makers of governments and corporations to set up short, medium or long term planning.(6)

In this paper we take the position that the trend towards disaggregated macro models, industry models and firm models is a useful phenomenon and will help us understand economic activities in a more systematic and logical way.(7) Based on this viewpoint we survey the current state of Canadian macro-econometric models in Section II, and in Section III we examine the usefulness of Canadian data for disaggregated macro models in comparison to U.S. and Japanese data. Also in this section we briefly examine the data necessary for building an industry or firm model. Section IV presents some suggestions for data publications useful for econometric model builders.

II. The Current State of Canadian Macro-Econometric Models

Since late 1950's, there have been at least ten Canadian macro-econometric models [6,3,4,5,21,20,15,7,25,11]. Of these, the models which were built by Caves and Holton, Backony, Brown and Rhomberg between 1959 and 1964 were surveyed by Nerlove [17]. Hence, in this section we will focus our attention on more recent models giving particular attention to their disaggregation features. The models selected here are by Kuiper [15], University of Toronto [7], Tsurumi [25], and the Bank of Canada [11]. These recent models

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(6) Firm models are particularly promising for planning use. For example, a pharmaceutical company model [24] has been used in formulating the long-term planning of a firm by examining possible outcomes of sales, market shares, employment rate, costs and profits under different assumptions on exogenous variables such as a change in medicare prices of drugs or a slower growth of disposable income. A proper use of an econometric model presupposes necessary training within the firm in understanding the model and in knowing the limitations of the model.

(7) Since the inception of macro model building, there has been an on going controversy over the usefulness of the simple vs. the large-scale model.

are chosen partly on the basis of availability, and partly on personal preference and interest. Following Nerlove [17], these four models are tabulated in the following tables, and each table is divided into six sections: (i) types of data, time period used in estimation and methods of estimation, (ii) number of stochastic equations, technical relationships, number of endogenous equations, and number of exogenous variables.(8) (iii) main endogenous variables, (iv) main exogenous variables, (v) features of distributed lags, and (vi) features of disaggregation and other noteworthy features. In the section indicating the number of endogenous and exogenous variables, the variables are divided into four subcategories: private and income sector,(9) government sector, foreign trade sector, and financial sector. This is done to present a quick picture of which sector(s) are emphasized in each model. This survey does not discuss the theoretical foundation for each behavioral equation. Neither does it discuss the validity of estimation techniques, the reasonableness of estimated coefficients, or the accuracy of prediction. This discussion relates only to the general characteristics of each model as a basis for observing the trend in model building.

The tables below indicate that each model describes the Canadian economy from a different viewpoint. For example, the Kuiper model does not have a financial sector, and the major determinants of the model are such aggregate final demand variables as gross national product and government expenditures. The University of Toronto model disaggregates the private sector into non-agriculture and agriculture, and brings in neo-classical considerations of production, employment, wages and prices. The Tsurumi model divides the private sector into four industrial sectors and divides output, investment, wages and prices to conform to these sectors. The Bank of Canada model has detailed financial and government sectors while the private sector is divided into two broad sectors, i.e., construction, and all other sectors excluding government and agriculture. The section of the tables entitled

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(8) Technical relationships refer to identities and equations whose parameters are given a priori without being estimated. The term, "exogenous variables," is used in the narrow sense that they are assumed to be uncorrelated with any disturbance terms in the model. The number of exogenous variables does not include any lagged endogenous or exogenous variables.

(9) This sector includes consumption, investment, employment, labor force, population, prices, wages, income distributions and income determination.

"features of disaggregation and other noteworthy features" may indicate this point clearly.

Furthermore, differences are clearly discernible in three areas: (i) degrees of disaggregation; (ii) degree of recognition of the influence of the U.S. upon the Canadian economy,(10) and (iii) more or less elaborate estimation procedures and distributed lag structures.

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(10) This feature is abscent from the Kuiper model. The University of Toronto and Bank of Canada models explain it by the conventional market mechanism through international trade and financial market transactions. The Tsurumi model explains it through wage and price determination as well as by the above market transactions.

Department of Finance (Kuiper) Model XVI

(1) Types of data: period used in estimation	Annual data of 1927-1966 excluding 1942-1945. Only the postwar data, 1949-1966, were used to estimate 5 equations (demand for automobiles, price of automobiles, merchandise imports, unincorporated business income (nonfarm), and corporate profits).
Method of estimation	OLS
(2) Number of stochastic and technical relationships = total endogenous variables	26 + 49 = 75 private and income sector: 23 + 37 = 60 (80%) government sector: 1 + 5 = 6 (8%) foreign trade sector: 2 + 7 = 9 (12%)
Number of exogenous variables	66 (of which, government sector 34; foreign sector 5)
(3) Main endogenous variables	5 consumption functions: automobile, furniture and appliances, other durables, nondurables and services. 3 Investment equations: machinery and equipment, nonresidential construction, and nonfarm inventories. Output per manhour (private nonfarm), average hours worked per year (private nonfarm sector) and average wage rate (private nonfarm sector). 10 price equations for: the five consumer goods, machinery and equipment, nonresidential construction, residential construction, government expenditures on goods and services, and merchandise imports. One aggregate imports function for merchandise (excluding automobile and parts).
(4) Main exogenous variables	Household liquid assets, 3 capital consumption allowances (total, persons and unincoporated business, and corporation), gross domestic product of agriculture, residential construction, inventory valuation adjustment, civilian labor force, paid workers (agriculture), number of employees, own account and unpaid family workers, paid workers (government sector), and number unemployed. 5 foreign trade variables: dividends and interest received from nonresidents, merchandise exports, exports of services, and imports of automobiles and parts.

Number of exogenous variables	57 (of which government sector 15; financial sector 7; foreign sector 17)
(3) Main endogenous variables	Private and income sector: 3 consumption functions: durables, nondurables, and services. 3 business investment equations: residential construction, nonresidential construction, machinery and equipment, and change in non-farm business inventories. Real output per manhour in agriculture, potential real output per manhour in business nonagriculture, business nonagriculture wage rate, hours worked per week in business nonagriculture, manhour worked in agriculture, demand for labor by agriculture, demand for labor by business nonagriculture, civilian labor force, corporate profits. 3 aggregate price equations: price level of gross national expenditure, change in price of consumer goods and services, and change in price of nonresidential construction, machinery and equipment. Foreign trade sector: 6 export equations for: minerals and mineral products (3 equations, each for U.K., U.S., and the rest of the world), and paper and paper products (3 equations, each for U.K., U.S., and the rest of the world). 1 equation for total imports of goods and services. 1 foreign exchange rate equation. Government sector: 3 tax equations: personal income taxes, corporate income taxes, and total indirect taxes. Financial sector: 2 interest rate equations: treasury bill rate and long-term interest rate. 2 equations for: U.S. direct investment in Canada and net movement of long-term Canadian securities to the U.S.
(4) Main exogenous variables	Capital allowances, farm inventories, inventory value adjustment, capital stock in agriculture, capital stock in nonagricultural business, wages, salaries and supplementary labor income arising in government and personal sectors (nonmilitary).

	34 government sector variables including such variables as government expenditures, transfers, indirect taxes, personal and corporate income taxes.
(5) Features of distributed lags	Discrete lag of one period, and hence it can be interpreted as the transformed Koyck lags.
(6) Features of disaggregations and other noteworthy features	A high proportion (65%) of the endogenous variables is determined by technical relationships. The model is entirely demand determined; the most important variables in the model are gross national product and and its price deflator. All price equations are determined by the one-period lagged endogenous variable and a change in the price index of gross national product. No industrial disaggregation. Absence of a financial sector. Government sector variables are the most important exogenous variables in the model. Also exports and residential construction are exogenous variables. Absence of the influence of the U.S. economy upon the Canadian economy.

OLS = ordinary least squares.

University of Toronto Model

(1) Types of data: period used in estimation	Annual data of 1928-1966, excluding 1941-1946 are the basis of data. Only the postwar data (1947-1966) were used for the balance of payment, monetary and tax equations.
Methods of estimation	2SLS-PC and OLS
(2) Number of stochastic and technical relationships = total endogenous variables	33 + 65 = 98 private and income sector: 19 + 45 = 64 (66%) government sector: 2 + 6 = 9 (9%) financial sector: 4 + 6 = 10 (10%) foreign trade sector: 8 + 7 = 15 (15%)

	Price indexes for personal expenditure on consumer durables, for nondurables, and for personal expenditure on services. Population in Canada 7 financial variables: average term to maturity of public debt, changes in the official gold and foreign exchange reserves, NHA approvals, U.S. treasury bill rate, U.S. government long-term bond interest rate, net long-term capital movement between Canada and the rest of the world, and total currency and money supply in Canadian chartered bank deposits. 15 government sector variables: government expenditure on goods and services, employment in the government sector, high corporate profit tax rate, low corporate profit tax rate, interest on public debt, military pay and allowances, price index of government expenditures on goods and services, other personal direct taxes, weighted average of personal income tax rate ($4,000-$4,500), employer and employee contributions to social insurance and government pension funds, subsidies, transfer payments, and withholding taxes. 17 foreign sector variables: 5 foreign exchange rates (sterling pound per U.S. dollars, Swedish Krona per U.S. dollars, Canadian dollar per sterling pounds, Canadian dollar per Swedish Krona, and Canadian dollar per U.S. dollars), price index of imports of goods and services, price of exports of newsprint from Sweden in Krona, price of paper and paper products in U.S., Canadian price of mineral exports, and Canadian price of wood and paper products.
(5) Features of distributed lags	Discrete lags of up to two periods.
(6) Features of disaggregations and other noteworthy features	A high proportion (66%) of the endogenous variables is determined by technical relationships. Private sectors are divided into agriculture and business nonagriculture. These two sectoral divisions are maintained only to describe output per manhour, wage rate, hours worked, and demand for labor. Cobb-Douglas production functions with constant returns to scale and time trend are used to obtain real output per manhour. For the determination of price and investment equations these sectoral divisions are not followed. Two export commodities (minerals and mineral products, and paper and paper products) are explained according

	to their three destinations: U.K., U.S., and the rest of the world. All other exports of goods and services are exogenous. In contrast to exports there is one aggregate import function. U.S. direct investment and net long-term Canadian securities sold to the U.S. are included as endogenous variables. For the period of flexible exchange rate, 1951-1961, the foreign exchange rate (Canadian dollar in terms of U.S. dollars) is made endogenous to the system. The U.S. influence on the Canadian economy is explained only through interest rate determination (by the interest rate differentials of the two countries), direct and security investment flows and two export functions.

2SLS-PC= two-stage least squares using principal components
OLS = ordinary least squares

Tsurumi's Four-Sector Model

(1) Types of data: period used in estimation	Annual data of 1947- 1969
Methods of estimation	NLLS, MS2SLS, 2SLS, HL-OLS
(2) Number of stochastic and technical relationships= total endogenous variables	54 + 41 = 95 private and income sector: 41 + 37 = 78 (82%) government sector: 4 + 0 = 4 (4%) financial sector: 4 + 0 = 4 (4%) foreign trade sector: 5 + 4 = 9 (10%)
Number of exogenous variables	29 (of which government sector 5; financial sector 5; foreign trade sector 5)
(3) Main endogenous variables	Private and income sector: 4 consumption functions: durables, semi-durables, non-durables, and services. The following equations are divided into four sectors (agriculture, fishing and forestry; mining and manufacturing; construction, and services): investment functions for plant and equipment, wage rates, prices, production functions, domestic products, capacity production, available labor, capital stock and utilized capital stock.

	Residential construction, housing starts, change in non-farm inventories. Exports functions are divided into two: agricultural products and manufacturing goods. Import functions consist of three: manufacturing goods, services, and interest payments. 11 price equations: four sectoral prices, consumer durables, semi-durables, nondurables, services, housing, capital, and government goods and services. Labor force, birth rate and net immigration rates, and total population. 4 financial variables: short-term and long-term interest rates, net direct and portfolio investment. 4 government sector equations: personal taxes, corporate taxes, indirect taxes and transfers. Capital allowances, interest on the public debt, accrued net income of farm, accrued net income of nonfarm unincorporated business, dividend paid to nonresidents, gross national product.
(4) Main exogenous variables	U.S. wage rate in mining and manufacturing, U.S. wage rate in construction, U.S. price index of mining and manufacturing, U.S. price index of services, U.S. business investment, and U.S. disposable income. Inventory value adjustment, interest and miscellaneous investment income, and change in farm inventories. Government expenditure on goods and services, government fixed capital formation, military payment and allowances The bank rate, U.S. short-term interest rate, U.S. long-term interest rate. The weighted national income of U.S., U.K., and Japan, price of imports of manufacturing goods, price of imports of services, and the price of world's manufacturing goods.
(5) Features of distributed lags	Extensive use of gamma distributed lags [27]. The maximum lag of six years.
(6) Features of disaggregation and other noteworthy features	Industries are divided into four sectors: (1) agriculture, fishing, and forestry, (2) mining and manufacturing, (3) construction, and (4) services. Output, labor, investment, wages and prices are explained for each sector.

	Production functions in Cobb-Douglas form are used to derive labor requirements. Also the production functions are used to compute capacity output for each sector, following Klein-Preston [14]. The basis of all price equations lies in the four sectoral prices which are explained by the mark-up on the unit labor cost, and capacity utilization. The price equations for mining and manufacturing, and for services include U.S. price levels as explanatory variables. These sectoral prices in turn explain the other endogenous prices in the model. The dependence of the Canadian economy upon the U.S. is explained through the wage and price determination as well as through such conventional channels as interest rates, foreign capital flows, and trade, on the contention that pricing and wage policies are directly influenced by the U.S. due to the high degree of American ownership in Canada. The government sector and financial sector are not developed well compared to the private sector. Modified Sargan's two-stage least squares [2] and Hildreth-Lu procedure [12] are used to account for the first order autocorrelation.

NLLS = Nonlinear least squares
MS2SLS= Modified Sargan's two-stage least squares
2SLS= two-stage least squares
HL-OLS= Hildreth-Lu ordinary least squares.

The Bank of Canada RDX 2

(1) Types of data; period used in estimation	Quarterly data (seasonally unadjusted); end point of the sample period is the 4th quarter of 1968; starting point varies according to each equation from as early as the 1st quarter of 1952 to as late as 1st quarter of 1961. Majority of equations have some quarters in 1957 or 1958 as the starting points.*
Methods of estimation	OLS, HL-OLS, OLS(constrained)
(2) Number of stochastic equations and technical relationships = equal total endogenous variables	142 + 116 = 258 private and income sector: 35 + 35 = 70 (27%) government sector: 38 + 41 = 79 (31%) financial sector: 41 + 31 = 72 (28%) foreign trade sector: 28 + 9 = 37 (14%)

Number of exogenous variables	322 (of which population variables 10; price indexes 27; government sector variables 78; financial sector variables 64; U.S. variables excluding those in financial and price variables 24; dummies 59)
(3) Main endogenous variables	Private and income sector: 4 consumption functions: nondurables and semi-durables, services including imputed services from stock of consumer durables, motor vehicles and parts, and durables excluding motor vehicles and parts. 5 residential construction equations: business investment in residential construction, housing starts (single-detached), housing starts (multiples), stock of single-detached dwellings, and stock of multiple dwellings. 3 business investment and inventory equations: machinery and equipment, nonresidential construction, and change in nonfarm business inventories. 13 technical relationships for business investment and output: they range from stock of three forms of investment above, desired capital-output ratios for machinery and equipment and for nonresidential construction, imputed rental prices for machinery and equipment and for nonresidential construction, preferred output of machinery and equipment, and of nonresidential construction, gross private business product, desired business* output, and aggregate business supply. 7 business employment, hours, labor force and population equations: paid employees in business*, paid employees in construction, average weekly hours worked in business*, average weekly hours worked in construction, labor force, immigrants, and emigrants. 2 private sector wage equations: wage rate in business*, and wage rate in construction 20 price equations: consumer nondurables and semi-durables, consumer services, consumer motor vehicles, other durables, business investment in machinery and equipment, private investment in residential construction, business investment in nonresidential construction, nonfarm business inventory stock, residential construction materials, nonresidential construction meterials, exports of goods to the U.S., exports of goods to other countries, imports of food and beverage from the U.S., imports of crude materials from the U.S., imports of energy fuels from the U.S., imports of manufacturers from the U.S., government current nonwage expenditure, government investment in nonresidential construction, government investment in machinery and equipment, and consumer price index.

Foreign trade sector:

22 foreign trade equations: imports of food and beverages from the U.S., imports of energy fuels from the U.S., imports of crude materials from the U.S., imports of manufacturers from the U.S., imports of motor vehicles and parts from the U.S., imports of goods from other countries, exports of motor vehicles and parts to the U.S.,exports of goods (excluding uranium, aircraft and parts, motor vehicles and parts) to the U.S., exports of goods (excluding wheat, uranium, aircraft and parts) to other countries, interest and dividend receipts from the U.S., travel receipts from the U.S., freight and shipping receipts from the U.S., interest and dividend receipts from other countries, travel receipts from other countries, freight and shipping receipts from other countries, interest payments to the U.S., dividend payments to the U.S., travel payments to the U.S., freight and shipping payments to the U.S., interest and dividend payments to other countries, travel payments to other countries, freight and shipping payments to other countries.

Government sector:

3 personal income tax equations: personal income tax collections withheld at source, personal income tax collections not withheld at source, and provincial personal income tax collections.

26 technical relationships for personal income taxes: here personal tax returns are divided into four income classes ($0-3,000, $3,000-5,000, $5,000-10,000, and $10,000 and over), and also assessed wage incomes are divided into these four income classes.

2 equations for transfers from persons to provincial-municipal governments: hospital and medical care insurance premiums, and motor vehicle licenses and permits.

3 corporate income taxes: corporate income tax accruals, taxable corporate profits, and federal corporation income tax accruals.

7 indirect taxes and other government revenue: manufacturers sales tax, customs duties, excise taxes and duties, retail sales tax, gasoline tax, motor vehicle licences and permits, nonresident witholding tax.

5 equations for transfers to persons: unemployment insurance fund revenue, unemployment insurance benefits, enrollment

in the unemployment insurance fund, claimants on the unemployment insurance fund, and interest on the federal public debts.

4 equations for federal current and capital expenditures on goods and services: federal employment in public administration and defence, wage rate in dederal public administration and defence, federal current nonwage expenditure, and federal investment in nonresidential construction.

6 equations for provincial-municipal current and capital expenditure on goods and services: provincial-municipal employment in public administration, wage rate in provincial-municipal public administration, employment in elementary and secondary schools under municipal control, provincial-municipal current nonwage expenditure, provincial-municipal investment in construction (excluding schools), and municipal investment in school construction.

5 equations for government asset and liability changes: federal corporation income tax collections, ratio of market value to book value of government of Canada direct market issues, an equation each for maturity class 1,2,3, and 4.

Financial sector:

8 demand for liquid assets by nonfinancial sector: currency outside chartered banks held by nonfinancial public, personal savings and checking accounts in chartered banks, checkable and noncheckable demand and savings deposits in trust and loan companies, end-of-quarter stock of Canada saving bonds, demand deposits in chartered banks, swapped deposits in chartered banks, nonpersonal term and notice deposits in chartered banks, and receipts and guaranteed investment certificates deposited in trust and loan companies.

6 equations for chartered bank assets: statutory deposits in chartered banks, Bank of Canada notes held by chartered banks, Bank of Canada notes held by chartered banks on a statutory basis, chartered bank personal loans, and chartered bank business and miscellaneous general loans.

10 equations for interest rates and mortgage approvals: average yield on government of Canada bonds (4 equations each for maturities of 1-3 years, 3-5 years, 5-10 years, and 10 years and over), rate on nonpersonal term and notice deposits in chartered banks, rate on one-year deposits in trust companies, rate on swapped deposits in charted banks, conventional mortgage rate, trust and loan company mortgage approvals, life insurance company, and mortgage approvals.

	13 equations for long-term capital flow: covering such items as direct investment in Canada, provincial and municipal bonds sold in U.S., corporate bonds sold in U.S., U.S. bonds and shares purchased by Canadians, and Canadian corporate retained earnings accruing to U.S. shareholders. 3 equations for the foreign exchange market and short-term capital flows: official excess demand for spot exchange, private excess demand for spot exchange, and 90-day forward exchange rate.
(4) Main exogenous variables	10 population variables: births, deaths, total population of 14 years of age and over attending school, students enrolled in elementary and secondary schools, old age pension recipients, paid workers in non-commercial institutions (excluding schools), number of families in Canada, unpaid and paid farm workers, the proportion of total population in the labor force population. Wage rate in farming, wage rate in noncommercial institutions (excluding schools), labor efficiency factor, employment residuals. Change in farm inventories, and value of physical change in government inventories, investment expenditure by hospitals, and current expenditures on goods and services by hospitals. Farm cash income, accrued farm income, hospital investment income, inventory valuation adjustment, miscellaneous personal nonwage and investment incomes, and supplementary labor income of private sector. 27 price indexes (11 of which are U.S. price indexes): price deflator for hospital investment, implicit price deflators for U.S. gross national product, U.S. consumption expenditures, U.S. expenditures on producer durables, and U.S. nonfarm business product and household output. 10 import prices and 6 export prices. 8 exports covering such items as exports of uranium, and aircrafts and parts to the U.S., and to other countries, exports of other services to the U.S., and to other countries, world trade, inheritances and immigrants' funds from all countries, and transfer payments to Canadian residents from persons abroad. 5 capital consumption allowances for: corporations, federal government, hospitals, provincial and municipal governments. 78 variables related to government expenditures and taxes: Taxes: weighted average rate of federal income tax payable by taxpayers (each for four income classes divided by assessed incomes of $0 -3,000, $3,000-5,000, $5,000-

10,000, $10,000 and over), weighted average rate of basic tax payable by taxpayers (each for the four income classes), weighted average rate of provincial income tax payable by Quebec residents and that payable by all provinces except Quebec, weighted average rate of corporate income tax, corporate income taxes on government business enterprises, provincial mining and logging taxes, contributions to Canada Pension Plan, contributions to Quebec Pension Plan, rate of manufactures sales tax on production machinery and equipment, and one on construction materials and non-production machinery and equipment, weighted average of provincial retail sales tax, other federal indirect taxes, and other provincial-municipal indirect taxes.

Government expenditures: military pay and allowances, provincial medicare payments, federal and provincial capital assistances to industry, federal subsidies, provincial-municipal subsidies, federal transfers to provinces and municipalities, provincial and municipal wages, salaries and supplements paid to employees in non-commercial institutions (except schools), federal wage supplements paid to employees in public administration and defence, and municipal wage supplements paid to employees in elementary and secondary schools and in public adminstration.

64 financial variables:

Interest rates: weighted coupon rates for government of Canada direct market issues (each for the four maturity classes), weighted average coupon rate for Canada Savings Bond, U.S. corporate bond rate, U.S. treasury bill rate, U.S. certificate of deposit rate, rate of dividend tax credit, and interest rate ceiling on NHA mortgages.

Other financial variables: chartered bank holdings of provincial and municipal direct and guaranteed bonds, excess cash reserves held by chartered banks on a statutory basis, chartered bank mortgage loans, corporate securities held by chartered banks, assets of life insurance companies, life insurance company policy loans, retained earnings accruing to Canadian shareholders from U.S. corporations, and that from corporations in other countries, government of Canada demand deposits in chartered banks, required cash reserve ratio for chartered bank demand deposits, total liabilities of chartered banks net deposit liabilities, total time deposits in member banks of the U.S. federal reserve system.

24 U.S. variables excluding financial and price variables: U.S. GNP, U.S. consumer expenditure on durables, U.S. personal consumption expenditure, U.S. expenditure on producers durables, U.S. labor force including armed forces, U.S. unemployment, U.S. military prime contracts for defence goods, U.S. personal savings plus corporate

	retained earnings net of taxes, U.S. gross private domestic product, U.S. retained corporate profits, U.S. corporate dividends, and cash flow of U.S. corporation after taxes. 59 dummies including 9 seasonal dummies and 2 time trend dummies.
(5) Features of distributed lags	Extensive use of Almon distributed lags [1] constrained to have a zero value at the end of the distribution. Maximum degrees of polynomial are 4, but 74 percent of the lags use the second order degree polynomials. The maximum length of lags is 19 quarters (4.75 years) but most of lags are 4, 7, or 11 quarter lags.
(6) Features of disaggregations and other noteworthy features	Well developed financial and government sectors. 31 percent of endogenous variables are related to the government sector, while 28 percent relate to the financial sector. The government sector is broken down to two levels: federal and provincial-municipal governments. Fairly detailed personal income tax breakdown contrasts to the singular treatment of corporation taxes. Most of the government and financial sector variables do not feedback to the activities of the private sector such as consumption and investment. In contrast to the extensive financial and government sectors, private industry sectors are not well developed. Employment, hours of work, and wage rate equations are divided into two sectors: mining, manufacturing and other services (excluding institutions and government services), and construction. However, production function is not comformably disaggregated, for there is only one production function in Cobb-Douglas form for the private business product. The production function is used to calculate desired output and aggregate supply using Klein-Preston approach [14]. The production function also serves as the basis to explain demand for labor in mining, manufacturing and other business. Business investment is not explained by the sectoral breakdown comformable to the employment and wage equations. Rather, it is divided into the conventional national expenditure entries of business investment in machinery and equipment, nonresidential construction, and nonfarm business inventories. In contrast to business investment, there is a more detailed account of residential construction with five equations. The basis for price equations is the mark-up on the normal unit labor cost modified by the capacity utilization variable. Sales taxes are explicitely taken into consideration to explain consumer prices and prices for machinery and equipment.

	The financial sector constitutes almost a self-contained sub-block in the model. The demand for liquid assets by the nonfinancial sector explains eight categories of liquid asset holdings of the private domestic non-financial sector. The estimation of these equations is made by a constrained least squares method along the line of Zellner [33]. The theoretical ground for the specification of these equations is ambiguous, for the specification indicates that consumers make active saving portfolio decisions based on their incomes. In the consumption expenditure sections the consumers are assumed to make expenditure dicisions based on their incomes. Hence, in this model the consumers are making consumption expenditures and savings decisions simultaneously. Conventionally, the consumers are assumed to make expenditures dicision based on incomes and savings are then given as residuals. The departure from this conventional approach and the problem of how to maintain consistency of simultaneous decisions of expenditures and savings are left unexplained. The foreign trade sector explains in fair detail the current accounts of the balance of payments. Exports and imports are divided into several categories and trading partners are divided into the U.S. and other countries reflecting the Canada-U.S. trade relationships. The dependence of the Canadian economy upon the U.S. is explained by the conventional market mechanism through international trade and financial market transactions. Some Almon lag coefficients change sign giving a mixture of negative and positive distributed lag weights. It is difficult to justify the mixture of negative and positive lag weights on theoretical grounds. This mixture may be due to an estimation problem, since it is sometimes difficult to constrain polynomial fits to a positive space. If this happens, it may be better to use distributed lag patterns which a priori constrain lag parameters to a nonnegative space.

OLS = ordinary least squares
HL-OLS= Hildreth-Lu ordinary least squares [12]
OLS(constrained)= constrained ordinary least squares.

*business implies mining, manufacturing, and services excluding institutions and government services.

III. The Usefulness of Canadian Data for Macro- and Micro- Econometric Model Building: A Comparison with U.S. and Japanese Data

3.1 Data for Macro-econometric Model Building

In the preceding section we have observed that Canadian macro-econometric models have become more and more disaggregated into finer demand components and economic sectors. In building an econometric model one foten gets frustrated at the stage of data collection, although sometimes the so-called 'lack of data' is used as an excuse for sparing one's efforts. If the right kind of data are readily available, the burden of model building may be enormously relieved. Suppose that we are to build a macro-econometric model with a broad industrial classification and that we are to keep this model consistent with conventional income accounts.(11) Our task, then, is to explain various entries in these accounts by disaggregating them as much as possible into homogeneous behavioral groups which determine production, price, wage, demand for goods and services, or demand for production factors. There is no unique way of disaggregating these national income account entries.(12)

Here let us consider industrial disaggregation as well as disaggregation of foreign trade along the line of the industrial breakdown. We are particularly

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(11) The reason we may want to keep the model consistent with national income accounts is that entries in these accounts, particularly gross national product, are used as the measures of economic growth and of economic performance. Recently, the use of GNP as a measurement of economic performance has been criticized on the ground that it does not measure the welfare of a nation. See for example, Nordhaus and Tobin [19]. However, GNP serves as an indicator of production (if not of welfare), and in this sense GNP is being used by economic policy makers at various levels and sectors of economic activities. Therefore, there is a rationale for keeping an industry or firm model consistent with national income.

(12) As we have observed in the previous section the way the Canadian economy is explained varies from one model to another depending partly on the model builder's objectives of making a model, and partly on his metaphysical or ideological perception of the economy. Consequently, it is quite understandable that at one extreme some economists attempt to obtain quite detailed disaggregations (arbitrary as they may be) and that at another some economists advocate a simple model. Examples of detailed models are Brookings-SSRC [8], Osaka-ISER [13], and the CANDIE model project which is undertaken at the Economic Council of Canada. An example of simple model is Friend-Jones [10]. One has to be careful in determining the degree of disaggregation, for too detailed disaggregation makes a model quite suceptible to such changes

interested in explaining such activities as production, capital formation, wage bills and employment, and we shall examine the public availability and usefulness of data concerning these activities. To explain the process of how production, investment, employment and wage bills are determined, let us suppose that we have the following simultaneous system for industry i.

$$(3\text{-}1) \qquad V^d_{i,t} = V^d(Z)$$

$$(3\text{-}2) \qquad I_{i,t} = I(V^d_{i,t}, \frac{w_{i,t}}{p_{k,t}}, CP_{i,t}, K_{i,t-1})$$

$$(3\text{-}3) \qquad K_{i,t} = I_{i,t} + (1 - \delta_i)K_{i,t-1}$$

$$(3\text{-}4) \qquad V^s_{i,t} = V^s(L_{i,t}, K_{i,t-1})$$

$$(3\text{-}5) \qquad w_{i,t} = w(\frac{V_{i,t}}{L_{i,t}}, CPI_t, un_t)$$

$$(3\text{-}6) \qquad V^d_{i,t} = V^s_{i,t} = V_{i,t}$$

where $V^d_{i,t}$ = demand for commodity i at time t

Z = a vector of variables which determine $V^d_{i,t}$ (for example, consumer income)

$I_{i,t}$ = gross investment of industry i at time t

$K_{i,t}$ = net capital stock of industry i at time t

$V^s_{i,t}$ = supply of commodity i at time t

$w_{i,t}$ = average wage rate per employee at time t

$CP_{i,t}$ = capacity utilization rate at time t

$p_{k,t}$ = price of capital goods at time t

CPI_t = consumer price index at time t

un_t = unemployment rate at time t

δ_i = depreciation rate of capital stock.

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as tax structures, institutional arrangements, and statistical reclassifications.

Equations (3-1) is the demand function. Investment and employment are determined by equations (3-2) and (3-4) respectively.[13] The wage rate is given by equation (3-5). Once the system for industry i is specified we require the following accounting identities to conform to national income accounts:

$$(3\text{-}7) \qquad GDP_t = \sum_{i=1}^{m} V_{i,t}$$

$$(3\text{-}8) \qquad I_t = \sum_{i=1}^{m} I_{i,t}$$

$$(3\text{-}9) \qquad W_t = \sum_{i=1}^{m} w_{i,t} L_{i,t}$$

$$(3\text{-}10) \qquad L_t = \sum_{i=1}^{m} L_{i,t}$$

$$(3\text{-}11) \qquad U_t = L_t^s - L_t$$

where GDP_t = gross domestic product at time t

I_t = business gross fixed capital formation excluding residential construction at time t

W_t = wages, salaries and supplementary labor income in the GNP account at time t

L_t = total employment at time t

U_t = unemployment at time t

L_t^s = total labor force at time t.

Let us survey whether or not data which satisfy the identities (3-7)-(3-11) are readily available on annual as well as a quarterly basis from published data sources. The following tables compare whether gross domestic product, business fixed capital formation, wages, and employment data are available on

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(13) We have specified the model basically as a demand-determined type. The production function (3-4) is used not to compute supply but to determine employment. This is one of the current practices widely used in macro-econometric model building [9,25, 11]. An exact specification of explanatory variables and the mathematical form of each equation should be determined as much as possible from the institutional and behavioral theory of an economic agent. In the above model we included those variables which are frequently used in macro models.

some industrial disaggregation basis. The comparison is made for Canada, U.S. and Japan.

Table 3.1 Domestic Product Data by Industry

	Annual Data	Quarterly Data
Canada	Available in current dollars for 15 classifications for old national income accounts (a)	Available in volume indexes for 23 classifications (b)
U.S.	Available in current dollars as "National Income by Industry," for 80 classifications (c)	Available in current dollars as "National Income by Industry" for 13 classifications (d)
Japan	Available in current yen for net domestic product, gross domestic product, and domestic output for 13 general classifications and 13 manufacturing classifications (e)	Not published in National Income Statistics (f)

(a) Statistics Canada (Dominion Bureau of Statistics) National Accounts Income and Expenditure (13-201)

(b) Statistics Canada (DBS) Indexes of Real Domestic Product by Industry 1961 Base (61-005). Indexes of real domestic product are not entirely comparable with the current dollar Gross Domestic Product (GDP) at factor cost in National Accounts, Income and Expenditure publications. The reason for this is that the national accounts' current dollar data are a mixture of company and establishment data: a company with several establishments of different SIC is classified in total to the industry in which its major activity occurs for the purposes of the industrial distribution of the National Accounts. In the indexes of real domestic product this company would be broken down into its establishments and each of these would be classified according to major activity. See DBS Indexes of Real Domestic Product by Industry of Origin 1935-61, May, 1963, p.13.

(c) U.S. Department of Commerce, The National Income and Product Accounts of the United States, 1929-1965 Statistical Tables, August 1966, and Survey of Current Business.

(d) U.S. Department of Commerce, Survey of Current Business

(e) Economic Planning Agency, Annual Report on National Income Statistics, Tokyo, Japan

(f) Although quarterly data for domestic product by industry are not published in the annual and quarterly publications of National Income Statistics, it is possible to obtain them from the EPA.

As shown in Table 3.1 above, Canadian data on domestic product by industry are quite respectable except that it would be more advantageous to a model builder if quarterly data were publicly available in value figures rather than in indexes.(14) The system specified in equations (3-1)-(3-11) should be estimated using value or quantity figures rather than indexes. This is so because indexes tend to give the following difficulties. (i) The identities (3-7)-(3-11) do not hold in index for, and thus to save these identities in index models we have to use appropriate weights.(15) (ii) Behavioral or technical equations (3-1)-(3-5) hold in value or quantity terms and not in index form. (iii) The structure of a disturbance term of an index form equation usually has a more intractable distribution than that of an equation specified for value or quantity terms. (iv) Decision makers would prefer to make their decisions on production, investment, and employment based on actual figures rather than on indexes. Publication of data in index form have an advantage in that the reader can quickly see the increase or decrease in a data series by index points, if the reader is trained to read data in indexes. However, if gross domestic product by industry is available in actual dollar figures, then it would be easier for this data series to become "an integral part of the national accounting system," and to "be used in conjunction with other aggregative studies such as inter-industry flow tables and labor income and productivity," as Statistics Canada says it wants this data series to be of service.(16)

Table 3.2 Business Gross Fixed Capital Formation by Industry

	Annual Data	Quarterly Data
Canada	Available in current dollars for 13 classifications for old national income accounts (a)	Not available

(14) Laspeyers formula is the basic method of computing indexes of real domestic product. See DBS Indexes of Real Domestic Product by Industry of Origin 1935-61, May, 1963 Part IV. Methods Used in Preparing the Industry Indexes.

(15) These weights are specified in the statistical publications for gross domestic products.

(16) The sentences in quotation marks are taken from DBS, Indexes of Real Domestic Product by Industry of Origin 1935-61, May, 1963, p.14

(Table. 3.2 continued)

U.S.	Available in current dollars for 40 classifications (b)	Available in current dollars for 31 classifications (b)
Japan	Available in current yen for 16 classifications (c)	Not published in National Income Statistics (d)

(a) DBS National Accounts Income and Expenditure (13-201)
(b) U.S. Department of Commerce, Survey of Current Business, January and February 1970, and capital stock estimates are available in Survey of Current Business April, 1970, "Alternative Estimates of Fixed Business Capital in the U.S. 1925-1968." This series does not agree with national income and product accounts, but its movements coincide. Hence, one has to make the necessary adjustments to ensure that the new plant and equipment expenditures series becomes consistent with national income accounts.
(c) Economic Planning Agency, Annual Report on National Income Statistics, Tokyo, Japan
(d) Although not published, it is possible to obtain them from EPA.

For Canada business gross fixed capital formation data by industry are publicly available on an annual basis but not on a quarterly basis. Hence, one will encounter difficulty in trying to establish investment function (3-2) by industry. As for capital stock data, estimates are available on an annual basis for manufacturing industries, and thus for these industries it is possible to construct a capital stock series consistent with national income data.(17)

Table 3.3 Wages, Salaries and Supplementary Labor Income by Industry

	Annual Data	Quarterly Data
Canada	Available for 15 classifications (a)	Available for 15 classifications (a)

(17) DBS Fixed Capital Flows and Stocks Manufacturing Canada 1926-1960 (13-523) August 1966. I understand that quarterly data on capital stock are available for the manufacturing industries for the post-war period at Statistics Canada. Hence, for the manufacturing industries one may construct investment and capital stock series using Statistics Canada's estimates as a bench mark.

When capital stock series are not available, one may construct a proxy for capital stock from past data on gross capital formation of industry i with this formula:

$$(*) \quad K_{i,t} = \sum_{i=0}^{n} (1-\delta_i)^k I_{i,t-k}$$

where δ_i is the depreciation rate, and $I_{i,t}$ is measured in constant dollars. One needs an estimate of the depreciation rate, and the number of summation n should be sufficiently large. This formula suffers from measurement errors, but all available data on capital stock share the same problem since capital

(Table 3.3 continued)

U.S.	Available for 82 classifications (b)	Available for 51 classifications (c)
Japan	Available (d)	Available (d)

(a) DBS National Accounts and Expenditures (13-201) for annual data. Quarterly data can be calculated from monthly data, Statistics Canada, Estimates of Labour Income (72-005).
(b) U.S. Department of Commerce, The National Income and Product Accounts of the U.S., 1929-1965, Statistical Tables, August 1966, and Survey of Current Business.
(c) U.S. Department of Commerce, Survey of Current Business reports weekly hours and weekly and hourly earnings by industry and based on them labour income can be constructed.
(d) They are not published in National Income Statistics but figures are available from EPA. Quarterly data are estimated for industries excluding agriculture, forestry and fishing.

Table 3.4 Employment by Industry

	Annual Data	Quarterly Data
Canada	Available for 11 classifications (a)	Available for 11 classifications (a)
U.S.	Available for 32 classifications (b)	Available for 32 classifications (b)
Japan	Available for 10 classifications (c)	Available for 10 classifications (c)

(a) DBS The Labor Force (71-001)
(b) U.S. Department of Commerce, Survey of Current Business
(c) Prime Minister's Office, Labor Force Survey (Monthly), Tokyo, Japan

Wage and employment data which are consistent with national income accounts and with unemployment rate figures are relatively well developed in all of the three countries. In Canada, some wage and employment figures are available in more detail than reported in (a) above.[18] However, these data are based on

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stock are constructed from book values rather than physical units of capital. The formula (*) is often used in macro-econometric models. [9,25].

(18) Statistics Canada (DBS) Employment and Average Weekly Wages and Salaries, (72-002), and Estimates of Employees by Province and Industry (72-008)

surveys of establishments employeeing 20 or more people and thus they are not necessarily consistent with the labor force survey data. Recently the unemployment figures have become (rightly or wrongly) one of the most important indicators for economic policy makers and their critics. Thus, there is good reason to argue that an employment series incorporated in a macro-econometric model should be consistent with the labor force survey data from which unemployment figures are reported. More detailed industrial breakdown in the labor force survey may provide useful information for econometric model builders.

From the point of view of industrially disaggregated models, exports and imports should be divided into finer categories than are currently available in the national income publications. This is true for all of the three countries compared above. In the Canadian National Accounts Income and Expenditure, exports and imports of goods and services are divided into merchandise, interest and dividends from and to nonresidents, other receipts (payments).[19] If merchandise exports were available on the same breakdown as the gross domestic product by industry, then we could separate equation (3-1) into two components: domestic demand and foreign demand.

$$V^{d}_{i,t} = V^{dd}_{i,t} + V^{dx}_{i,t}$$

where $V^{dd}_{i,t}$ = domestic demand for commodity i at time t

$V^{dx}_{i,t}$ = foreign demand for commodity i at time t.

Then domestic and foreign demand functions could be explained separately.[20] Merchandise imports can be divided in a similar manner. At present one can construct merchandise imports and exports by industry and by countries from Trade of Canada Exports (65-004) and Imports (65-007). However, these data do not necessarily agree with national income accounts.

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(19) Statistics Canada (DBS) National Accounts Income and Expenditure (13-201). A table entitled "Exports and Imports of Goods and Services, Reconciliation Statement."

(20) One may further wish that as well as the breakdown of merchandise exports by industry, breakdown by major countries and areas were available. If one were to put some priority over these two types of disaggregation, one might choose merchandise exports by industry on the grounds that once this is available it is easier to find who is the major trading partner(s) for these commodities.

3.2 Data for Micro-econometric Model Building

In building an industry or firm model, one wants to explain such activities as demand for products (or market shares), investment, employment, cost of production, administrative and sales expenditures, other costs, profits, taxes, dividend payments, retained earnings and external finance. If one is building a model from inside industry or a firm, one will have the advantage of getting hold of classified data, although one finds often that classified data are not too useful as they are and that one has to spend quite some time trying to build a consistent data series from these data. Here let us assume that we want to build an industry or firm model from publicly available data to explain various activities of an industry or a firm. For this purpose one needs such data as production, sales and costs by product lines, sales and promotion expenditures, other expenditures, employment by job categories, capital formation, wages, and profits. To obtain these data one has to rely on various sources ranging from federal or provincial governments and industrial associations to labor unions and companies. Sometimes one finds that an industrial association and/or labor union have good data on particular activities. For example, some labor unions keep wages, productivity, and employment data.(21)

One of the most important data sources in building an industry and firm model is the income statement and balance sheets as given in the annual reports of the firm or more preferably in the Security and Exchange reports which it is obligated to file after each accounting period. (This is in U.S. and Japan.) The role of income statements in a micro model is quite similar to that of GNE or GNP accounts in a macro model. Since items in income statements (and some entries in balance sheets) have been used by corporate management and business analysts to examine the performance of a firm and to make decisions on future planning, it is important to explain these items in an econometric model of a firm or of an industry.

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(21) For example, if one is interested in building an industry model in Canada, Statistics Canada publications such as General Review of Manufacturing Industries of Canada (31-201), Manufacturing Industries of Canada (31-203) and their related series by regions may be quite useful. For example, Manufacturing Industries of Canada covers by detailed industrial breakdown such items as administrative and office employees, production workers, total employees, total salaries and wages, cost of fuel and electricity, cost of plant of materials used, value added by manufacture, and selling value of factory shipment. If one is interested in the degree of foreign ownership and international trade unionism in order to understand the

The present writer has built form models in U.S., Canada and Japan [23, 16, 24], and from his experience it seems that the Japanese Security and Exchange reports to the Finance Minister provide quite a rich data source for firm or industry econometric models, compared to their counterparts in the U.S. The Japanese Security and Exchange reports contain not only detailed income statements but also costs of production, external borrowings (short and long term debts), production plans for the next accounting period, number of production machines, number of employees by plants and by sales branches, and average wages and salaries.

In the U.S. a firm is not obligated to report to the S.E.C. on detailed external borrowings, production plans, number of employees, number of production machines, or wages. Occasionally, some companies report wages and employment in their annual reports, but in some years they do not report these data.(22)

IV. Conclustions

At the outset of this paper we took the position that the current trend towards disaggregated macro models, industry models, and firm models is a useful phenomenon to advance our understanding of economic activities in a more systematic and logical way. To build industrially disaggregated macro models within the framework of national income accounts, we have examined in Section III what kinds of data are needed. Canadian national income accounts and related accounts are fairly comparable with those of the U.S. and Japan. However, from the point of vies of a user of statistical data who is interested in building a disaggregated macro or industry model, the following types of data would be quite useful if they were published along with national income accounts.

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general trend of industrial and labor organization in Canada, then Corporations and Labour Unions Returns Act Part I (Corporations), Part II (Labour Unions) may provide some useful information.

(22) The SEC reports in the U.S. give accounting aspects of the operation of a firm, but they do not cover the physical and planning activities such as the purchase of plants and equipment, employment, wages, mergers, and future production planning. This is understandable if one knows the historical reason why the SEC reports were instituted. Furthermore accounting data have been conventionally more available and well developed than other types of data. However, to analyze the activity of a firm one really needs not

(1) Domestic Product (or National Income) data by industry (quarterly data in value terms, not in indexes)

(2) Business gross fixed capital formation estimates by industry (quarterly data)

(3) More detailed industrial classification of the Labor Force survey data than currently available

(4) Merchandise exports and imports classified by industry of origin in the reconciliation statement of exports and imports of goods and services.

If these data are readily available in such publications as the national income accounts or the Canadian Statistical Review as an integral part of reporting national income accounts, econometric model builders may be greatly relieved in their effort to 'dig out' and 'construct' necessary data. Then, quantitative studies on such items as production, investment, employment, productivity, labor income, corporate dividends and profits may become an integral part of the study of national and industrial income determination. To obtain the data necessary for a firm model, we have to suggest some drastic changes in the SEC reporting system as to what types of data should be made available to the public, and this suggestion seems to go far beyond the possible scope of this paper, and hence no specific suggestions are given here.

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only the accounting but also physical data such as investment, employment, and wages. A comprehensive financial analysis of any firm cannot be complete without an analysis of those physical aspects of the operation of a firm which give rise to financial expenditures.

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