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THE 1993 INTERNATIONAL SYSTEM OF NATIONAL ACCOUNTS

and

THE CANADIAN INPUT-OUTPUT TABLES

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Abstract: In this paper, the Input-Output tables are situated within the Canadian System of National Accounts (CSNA). The rectangular format of the accounting framework of the Canadian Input-Output tables and the integration rules established by the CSNA management are examined for their role in helping to integrate the various components of the CSNA. Lastly, a critical evaluation is made of the recommendations presented in the 1993 International System of National Accounts in its chapter on Supply and Use Tables and Input-Output from the perspective of the Canadian Input-Output tables. Reasons are stated in cases where we may not be able to implement the 1993 SNA recommendations.

The framework of the Canadian System of National Accounts (CSNA) bears a close relationship to the one described both in the 1968 UN SNA manual and the 1993 International System of National Accounts (1993 SNA) manual. The CSNA, like the 1993 SNA, is both a comprehensive and an integrated system, in the sense that all aspects of the economy are included and all of its components are interrelated. The CSNA comprises production accounts, income and outlay accounts, capital finance accounts, and financial flow and balance sheet accounts. The balancing item in the production accounts, value added, is the starting point of the income and outlay accounts; that of the income and outlay accounts, saving, is the take-off point for the capital finance accounts; and the balancing item of the capital finance accounts, net lending, is the point of departure for the financial flow accounts. Through these linkages, the CSNA is integrated both conceptually and statistically.

The CSNA corresponds to the 1993 SNA in the important sense that input-output tables form an integral part of the production accounts. Statistics Canada has produced annually, starting with the reference year 1961, product by industry input-output tables (also referred to as make and use matrices) in both current and

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[1] An earlier draft of this paper was presented at the Tenth International Conference on Input-Output Techniques, Seville, Spain, March 29 to April 3, 1993. This paper complements our other paper, The 1993 International System of National Accounts vis-à-vis The Canadian System of National Accounts.

constant prices. Such tables are produced with a lag of two and half years to the reference year. The latest input-output tables for the year 1990 were published in the fall of 1993. These tables provide benchmarks to current price, quarterly and annual, income and expenditure based gross domestic product (GDP) accounts, constant price monthly real gross domestic product by industry, and current and constant price annual provincial GDP by industry. The Canadian input-output tables successfully form an integral part of the production accounts because of two very significant factors. One is the accounting framework of the tables and the other is the integration rules established by the CSNA management. Both of these are elaborated below; in addition, the series which are integrated in the CSNA are noted. The last section of this paper comments on the recommendations and guidelines presented in the 1993 SNA in its Chapter XV Supply and use tables and input-output. These guidelines are examined from the perspective of the Canadian input-output tables.

A. The accounting framework

The Canadian input-output tables are very similar to the ones described in the 1968 UN SNA. The outputs (make matrix) and inputs (use matrix) of industries are presented in separate tables; both intermediate inputs and outputs are classified by commodity (product). Commodities are clearly distinguished from industries, the number of commodities exceeding the number of industries: thus the Canadian input-output tables are rectangular rather than square. There are important advantages to the rectangular format over the square (or symmetric) format. As noted by Anne Carter and Wassily Leontief in their article "Goals for the Input-Output Data System in the Seventies", published in the US Department of Commerce Survey of Current Business, July 1971, page 31: rectangular tables permit as much detail as is available in the basic census or survey records, and the meaning of each entry is straightforward because observed transactions are not combined with fictitious transfers (a feature of symmetric tables). Canada has played a pioneering role in both the theoretical and empirical development of rectangular input-output tables, in Statistics Canada and other Canadian institutions.

The input-output tables for Canada contain two sets of interrelated accounts: the commodity accounts and the industry accounts. The former details the supply and disposition of individual commodities (goods and services), the latter the commodity composition of the output of industries and their complete costs of production (including surplus). These accounts are described below in the schematic chart of the accounting framework of the Canadian input-output tables. While the industry and commodity accounts also treat primary inputs and final demand, these entries are described in a separate section.

1. Commodity accounts

As noted, the commodity accounts display the supply and disposition of each commodity. Matrix V (in the schematic chart) shows the value of production of each commodity produced by each industry. The disposition of commodities by the various classes of transactors are shown in matrices U and F. Matrix U contains the use, on current account, by each industry of each commodity as an intermediate input in the production of other commodities.

Matrix F contains the demand for each commodity by final demand category: personal expenditure, fixed capital formation, additions to (the value of physical change in) inventories, gross government expenditure on goods and services, and exports. The three other columns in matrix F are imports, withdrawals from (the value of physical change in) inventories and government revenue from the sale of goods and services. These three categories supplement the supply of goods and services produced by Canadian industries in the period of account. It should be noted, however, that small amounts of goods and services are produced within the government sector and the production costs of these goods and services are already included in gross government expenditure. Matrices U and F include the use of commodities originating either as imports, withdrawals from inventories, or government-produced goods and services. Three adjustments are thus required to effect equality with the output of domestic industries. They concern imports, because they are extraneous to the production of Canadian industries, withdrawals from inventories, because these were produced in an earlier period, and government revenues from sales of goods and services, because the costs have already been fully accounted for in government gross expenditure.

2. Industry accounts

The total output of each industry, classified by commodity, is shown in the industry's row of matrix V. The inputs of each industry are shown in the industry's column, which covers both matrix U for intermediate inputs and matrix YI for primary inputs. Matrices U and V were discussed above in the context of the commodity accounts. The primary inputs in matrix YI consist of net indirect taxes (commodity indirect taxes, plus other indirect taxes, less subsidies) and GDP at factor cost (wages and salaries, supplementary labour income, net income of unincorporated business and other operating surplus).

For each industry total output equals total input, intermediate and primary.

A schematic chart of the accounting framework of the Canadian input-output tables

	Commodities	Industries	Final Demand Categories									Total
			PE	FCF	VPCW	VPCA	GGCE	X_D	X_R	Less M	GR	
Commodities		U					F					q
Industries	V											g
Commodity indirect taxes Other indirect taxes Less subsidies Wages and salaries Supplementary labour income Net income of Unincorporated business Other operating surplus		Y1					YF					n
Total	q'	g'					e'					

Final Demand Categories

PE - Personal expenditure on goods and services
FCF - Fixed capital formation, business and government
VPCW - Value of physical change in inventories, withdrawals
VPCA - Value of physical change in inventories, additions
GGCE - Gross government current expenditure on goods and services
XD - Domestic exports of goods and services
XR - Re-exports of goods and services
M - Imports of goods and services
GR - Government revenue from sales of goods and services

Notation

V: is a matrix of the values of outputs
U: is a matrix of the values of intermediate inputs
F: is a matrix of the values of commodity inputs of final demand categories
YI: is a matrix of the values of primary inputs of industries
YF: is a matrix of the values of primary inputs of final demand categories
q: is a vector of the values of total commodity outputs
g: is a vector of the values of total industry outputs
e: is a vector of the values of total inputs (commodities plus primary) of final demand categories
n: is a vector of the values of total primary inputs (industries plus final demand categories)

3. Primary inputs and final demand

There is one matrix not yet described, YF. It contains primary inputs purchased directly by final demand categories. Labour income in matrix YF represents the wages, salaries and supplementary labour income paid to persons employed in the personal and government sectors. This includes the employees of non-profit institutions, such as universities and labour unions, and the income of domestic servants and baby sitters in the personal sector, and all public servants in the government sector. Surplus in matrix YF reflects the consumption of fixed capital in the government sector and the non-profit institutions classified to the personal sector. Assets which are charged to fixed capital formation in these sectors are depreciated, such as buildings, roads, equipment, etc. All residential housing, even when owner-occupied, is classified to business, and thus depreciation on housing is part of the surplus of the appropriate industry in matrix YI, not YF.

4. Economic identities

The following identities emerge from the above matrices:

i) The total outputs of industries equal the total intermediate inputs of industries plus their total primary inputs.

ii) The total outputs of commodities of industries equal the total intermediate inputs plus the total commodity inputs into the final demand categories.

iii) Intermediate inputs being common, primary inputs of industries equal commodity inputs of final demand categories. Adding primary inputs of final demand categories to both sides, we get:

(a) primary inputs of industries and final demand categories equal to,

(b) commodity inputs of final demand categories plus primary inputs of final demand categories.

(a) is called gross domestic product at market prices and (b) is called expenditure on gross domestic product at market prices.

This is true for both current price and constant price tables.

Finally, gross domestic product (GDP) at factor cost (wages and salaries, supplementary labour income, net income of unincorporated business and other operating surplus) equals GDP at market prices less net indirect taxes (commodity indirect taxes plus other indirect taxes less subsidies). The CSNA term of commodity indirect taxes and other indirect taxes are called taxes on products and taxes on production respectively in the 1993 SNA.

B. Integration rules

Integration and reconciliation of the System's components require the resolution of several important issues such as valuation, a common set of classification and aggregation rules, as well as consistent revision practices to be used for all the underlying statistical series in the CSNA. An equally important consideration is the documentation of data sources and methods and the establishment of links between the various components. But integration should not be equated with forcing or producing a single set of numbers. If two independent methodologies produce two sets, let them both stand. Suppressing one set will serve integration poorly. We will deal below with various integration issues that have been faced in Statistics Canada in integrating the SNA series. Within the CSNA management, there are three separate divisions, each headed by a Director, which produces some parts of the production accounts. The Input-Output Division produces input-output tables and annual productivity measures; the Industry Measures and Analysis Division produces monthly real gross domestic product by industry and annual provincial GDP by industry; and the National Accounts and Environment Division produces quarterly and annual income and expenditure accounts.

5. Valuation

Input-output tables in current prices are initially balanced in purchasers' prices, which are then converted into approximate basic prices, to have a consistent valuation for all users. Consistent valuation is crucial for relating use to supply of each commodity and more particularly, for calculating constant price GDP through double deflation. In the income and expenditure accounts, all expenditure series are valued in purchasers' prices because source data record only such prices. Deflation is done for the expenditure categories using such deflators as the CPI (consumer price index). Valuation is even more important for imports. In the input-output tables, imports are valued at c.i.f. (cost of insurance and freight) plus import duties to make them consistent with the domestic producers' values. In the income and expenditure accounts, values of individual import commodities do not include duties and indeed are at f.o.b. (free on board) values; however, these differences are clearly delineated. It is important that all the subsystems of the CSNA delineate the various values in order to reconcile series using different valuation practices. The series in the input-output tables are delineated such that one can move from one valuation to another without difficulty.

6. Classification

Fundamental to integration and reconciliation initiatives is a consistent classification of transactions and transactors. Before the 1986 CSNA historical revisions, the input-output component and its derivatives used an inconsistent sector classification and aggregation of industries. The sector classification - there are three domestic sectors in the economy: business, government, and persons or households - used by the

input-output tables and the income and expenditure accounts was identical. However, such was not the case between the input-output and productivity measures or between the input-output and monthly GDP measures. For example, the industry "education" was allocated to all three sectors - business, government, and persons - in the input-output and income and expenditure accounts, but for productivity measures and monthly GDP it was entirely allocated to the non-business (government and persons) sectors. The income and expenditure accounts used major SIC (standard industrial classification) divisions as aggregates, whereas input-output aggregated three - and four-digit SIC industries into 191 industry classes. The Industry Measures and Analysis Division used still another aggregation for the monthly measures. The aggregation rules adopted by the components of the CSNA were not hierarchically related. One result was that monthly measures of GDP were not serving their very important role as forerunners of annual GDP estimates by industry derived from the input-output tables.

Moreover, the various components of the CSNA were not treating transactions consistently. For example, contributions by the government to, say, the urban transit system were considered operating subsidies in one component and grants in other components, with the result that estimates of GDP at factor cost were dramatically different for this industry amongst the various components. This type of inconsistent treatment has now ceased.

With the 1986 historical revisions, common SNA industry codes have been developed and implemented for all CSNA integrated industry statistics series, be they national, provincial or sub-annual. A common set of codes, both for detailed classes and aggregates, is now used. This is an exceedingly important tool of integration.

7. Revision practices

Before the 1986 CSNA historical revisions, the three divisions of the CSNA which compile production accounts had their own specific revision practices. The National Accounts and Environment Division would typically revise data each June for the last four years whereas the Input-Output and Industry Measures and Analysis Divisions often would revise data for longer time spans. The result was that, at any given time, the finality of the series was never consistent amongst the various components.

The following rules and procedures have been put in place starting with the 1987 CSNA revision cycle, with an example from the revision cycle in 1992:

a) Annual benchmark estimates at current purchasers' prices:

The final annual estimates for the year 1988 and almost final annual estimates for the year 1989 at current purchasers' prices, produced through the input-output accounting framework, were produced in May 1992 for use by the national income and expenditure accounts annual revision in June 1992. Note that final annual estimates have a specific meaning in our context; such estimates will not be reexamined till the next historical revisions, usually conducted after every five or ten years.

b) Income and expenditure accounts estimates

The National Accounts and Environment Division released the results of the annual revision with the first quarter estimates in June, 1992. In the second, third and fourth quarter releases, only estimates for the current year are subject to revision; i.e. at the time of the second quarter estimates, the first quarter could be revised; at the time of the third quarter estimates, the first and second quarters could be revised etc. The number of years for an annual revision is normally four years.

c) Annual benchmark estimates at constant producers' prices:

The Input-Output Division converted the current purchasers' price estimates into current producers' price and, then, constant price valuation by the end of July, 1992. As noted, the Input-Output Division produced current purchaser price annual estimates in May 1992. Between May and early June, some fine-tuning of the input-output estimates was done in concert with the National Accounts and Environment Division. By the first week of June, the two divisions finalized the estimates for the two years 1988 and 1989, such that total GDP at market prices and all components (except value of physical change in inventories and operating surplus) of GDP were identical in the two sub-systems. These estimates were converted, in July 1992, into producers' prices and, then, constant prices. The term producer prices in the CSNA input output tables is similar to approximate basic prices in the 1968 UN SNA or basic prices in the 1993 SNA.

d) Monthly Real GDP at factor cost:

Constant price final estimates for the years 1988 and almost final estimates for the year 1989 became the annual benchmark estimates for monthly real gross domestic product by industry. The Industry Measures and Analysis Division released, at the end of August, 1992, benchmarked monthly estimates for the years 1988 and 1989, and projected estimates for 1990 and 1991, as well as for the first six months of 1992.

In the monthly releases for July 1992 to May 1993, estimates for 1991 or earlier years are not subject to

revision.

e) Provincial GDP by industry

We do not have, as of May 1994, a full coverage for the provincial GDP by industry program. About 90% of GDP by industry is covered at present and, by October 1994, we are hoping to have a full coverage. In any case, these estimates are fully consistent with those produced by national input-output tables and real GDP produced through the monthly program.

f) Productivity measures:

The revision practices for productivity measures are now completely consistent with the annual constant price GDP by industry produced through the input-output program and the current period's estimate of the real annual GDP produced through the monthly program.

g) Revision practices in the feeder system

There are no comprehensive rules, procedures or policies affecting in a consistent manner the revision practices for the series produced in the feeder system (the supplying divisions to the SNA). Some series (for example, consumer price indexes) are never revised; some (for example, census of manufacturers) remain open for revision for one year; others have varying practices. In the process of compilation of the national accounts, certain (sometimes major) imbalances arise which are resolved by adjusting the basic sources and/or by macro adjustments. This resolution is quite often not incorporated into the series of the feeder system. Thus the link between the SNA revisions and the underlying series produced and published in the feeder system is not maintained.

8. CSNA documentation

The absence of full documentation of sources and methods, classification systems, valuation rules, revision practices and other judgements made in the preparation of any large scale and interlocking statistical data base - such as the CSNA - is always an impediment to integration and reconciliation initiatives. As mentioned in the introductory paragraph, the final output of one CSNA component becomes the starting point of the next component and the final output of the second component locks into the third one.

It is planned to prepare several documents over the next while. Some documents have already been published. The first, and perhaps the most important one, entitled A User Guide to the Canadian System of

National Accounts was published in 1989. This document is a guide to the various components of the CSNA, describing frameworks, major concepts, definitions and purpose of each component. It draws attention to accepted national accounting conventions and to the links between the components of the System, and it explains how each component provides a statement about an important aspect of the Canadian economy. The central theme of the report is the integrated nature of the overall System, not only conceptually but also statistically. This is a reflection of the high priority attached by Statistics Canada to improving the linkage between the System's components.

9. Statistical integration, present situation

a) Current prices

The statistical estimates in current prices in the following series are now identical, both in total and in detail:

Income side

1) wages and salaries,
2) supplementary labour income,
3) net income of unincorporated business,
4) indirect taxes,
5) subsidies.

Expenditure side

6) consumer expenditures,
7) government current expenditures,
8) fixed capital formation,
9) exports,
10) imports.

In addition, total GDP at market prices is now identical for every year from 1980 onwards.

What is not identical on the income side of GDP is the operating surplus in the input-output accounts and the equivalent concept of the total of profits, investment income, inventory valuation adjustment and capital consumption allowances in the income and expenditure accounts. Value of physical changes (VPC) in inventories, part of the expenditure side of the accounts, is not identical in the two subsystems. It is important to emphasize, however, that these two series - surplus and VPC - are closely monitored and analyzed by the concerned divisions before the estimates are finalized.

b) Constant prices

As noted above, we have identical totals for all series except operating surplus, profits, investment income etc, VPC and error of estimate in current prices. However, we do not produce the same results in constant prices. It is our policy not to force an identical constant price total, even if current price total is identical, for the simple reason that there is no definitive way of estimating "volume" or "quantum" except with reference to time and weights. The input-output tables express values in producers' prices whereas income and expenditure accounts express values, say for consumer expenditures, in purchasers' prices. There is no guarantee that deflating detailed expenditures in producers' prices for commodities and margins separately will give the same results as deflating composite commodities (including margins as in retail trade). The two series are usually not very different but they are rarely identical. There is another constraint in the income and expenditure accounts namely, that the current quarterly and annual series do not have the same data base and data sources as the annual input-output tables. The annual input-output tables are produced with a lag of two and a half years to the reference year and use detailed annual census/surveys not yet available for the current period.

C. The 1993 SNA

The 1993 International System of National Accounts (1993 SNA) includes a chapter (Chapter XV) on Supply and use tables and input-output. Our comments in this section are made with reference to this chapter.

"The System includes an integrated set of supply and use tables, or matrices, as well as symmetric input-output tables, or matrices. They provide a detailed analysis of the process of production and the use of goods and services (products) and the income generated in that production. The concepts and definitions in the input-output tables of the SNA are the same as in the rest of the System" (paragraph 15.1). As in the 1968 UN SNA, "the integration of the input-output in the overall system of national accounts is an important feature of the SNA" (paragraph 15.2). We fully agree with the importance attached to the input-output tables in the 1993 SNA.

10. Basic and purchaser's prices

The 1993 SNA recognizes the following four components of the price paid by the purchaser of a product (paragraph 15.26):

Basic price of the product as output;

Taxes on the product;

Less subsidies on the product;

Trade and transport margins in delivering the product to the purchaser.

The 1993 SNA defines the purchaser's price as "... the amount paid by the purchaser, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place" (paragraph 15.28a).

The basic price is defined as "... the amount receivable by the producer from the purchaser for a unit of a good or service produced as output, minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer" (paragraph 15.28.c).

In the Canadian input-output tables, values in total at purchaser's price contain all the elements defined in the 1993 SNA. However, two elements - i) transport charges paid separately by the purchaser and ii) non-deductible taxes on products levied at the final stage of sale - are separately identified, such that the purchaser's price of any individual item in the CSNA input-output tables is lower by the value of these elements, compared with the 1993 SNA definition.

In the CSNA input-output tables, subsidies on products have not been articulated, such that the basic price and the purchaser's price are identical for products with no tax or trade and transport margins. Let us assume that a purchaser pays for a unit of a product $103 and that this value includes a product tax of $5 and a subsidy of $2. The basic price per the 1993 SNA is $100. Suppose that the tax of $5 is eliminated; the purchaser price will be $98 but the basic is still $100 per the 1993 SNA. However, in the CSNA, both the basic price and the purchaser's price is $100. This will need to be changed to conform to the 1993 SNA. GDP at purchasers' price (also called GDP at market prices) will not change but valuation at basic prices will change.

11. Valuation of product flows

We fully agree with the 1993 SNA that "the preferred method of valuation is at basic prices" (paragraph 15.33) for product flows in the input-output tables. The preference for basic prices is further justified in the same paragraph:

a) Basic prices provide the most homogenous valuation for all the users.

b) Basic prices are found most useful when a system of VAT or similar deductible tax is in operation.

c) Basic prices record the amounts available to the producer.

"For exports and imports, the System adopts analogous price concepts: the free on board (f.o.b.) for exports and total imports and the cost insurance and freight (c.i.f.) price for detailed imports" (paragraph 15.35, emphasis mine). Note that the f.o.b. price is at the customs frontier of the exporting country both for exports and imports. Further, the 1993 SNA states: "The f.o.b. price is considered to be a special purchaser's price applied to flows of exports. ...The c.i.f. price is considered to be a basic price applied to flows of imports, equivalent to the basic price of a good or service produced by resident producers" (paragraph 15.36). This is a change from the 1968 UN SNA where "the protective duties form part of the basic value of imports" (paragraph 2.16 of the 1968 UN SNA). In contrast, in the CSNA input-output tables, the basic price of imports includes all import duties. The valuation of imports in the CSNA input-output tables will need to be changed to conform to the 1993 SNA. This will not change GDP at purchasers' prices, but the valuation of individual imported products will exclude import duties. Also, there will be no need to list total import duties with the opposite sign at the intersection of the column vector of imports and the row vector of taxes on products; instead, the import duties will be articulated in the basic price use tables (both of intermediate consumptions and final users), under each user of imports.

To remain consistent with the f.o.b. valuation of exports and imports of goods and services in the balance of payments statistics, several adjustments are needed to present these series at basic prices in the input-output tables.

a) Exports

The f.o.b. price for exports, as noted above, is considered to be a special purchasers' price and includes basic price plus any net taxes (taxes less subsidies on products) and trade and transport margins from the producing establishment to the customs frontier of the exporting country. The trade and transport margins can be supplied both by resident and non-resident producers of such services. All components of f.o.b. price have to be fully delineated in product detail to balance the commodity flows in basic prices. The delineation of the value of exports at f.o.b. price in the balance of payments statistics with their value in the input-output tables at basic prices will require close attention, if non-resident transporters play a role in delivering exports from the producing establishment to the customs frontier of the exporting country. Such charges will have to be noted simultaneously as exports and imports of transport services in the input-output tables valued at basic prices, unless this has already been done in the export flows in the balance of payments statistics. Valuation at basic prices brings into sharp focus the need to impute an equal amount for export and import of transport services provided by non-resident transporters of exports.

b) Imports

Data on detailed flows of imports from foreign trade statistics are most usually valued at c.i.f. prices. The c.i.f. price for detailed imports includes f.o.b. price for imports (valued at the customs frontier of the exporting country) plus the cost of insurance and freight between the frontier of the exporting country and the frontier of the importing country. Again, these services can be provided by both resident and non-resident producers of such services. In the balance of payments statistics, the System adopts f.o.b. price for valuation. One will need to add insurance and freight charges provided by both non-resident producers and resident producers to bring this valuation at c.i.f. price into the input-output tables at basic prices. The part charged by the non-resident producers should be removed from the total for services, as it is part of the c.i.f. price of imports of goods, such that the two together (goods and services) remain the same. But the insurance and freight charged by resident producers of the importing country to bring imports of goods from the frontier of the exporting country to the frontier of the importing country need to be properly delineated. In the CSNA input-output tables, the valuation of imports at c.i.f. prices ignores this component. The implementation of the newly recommended c.i.f. valuation will raise the total level of imports of goods by the amount of insurance and freight supplied by Canadian carriers and, at the same time, it will require an imputation to raise the level of exports of services by an equal amount to balance the System. There will be no change in the net external balance in the exports and imports of goods and services, but the gross valuation will be higher at basic prices compared with the f.o.b. valuation in the balance of payments.

The 1993 SNA provides an alternative presentation which obviates the need to increase the gross flows of goods and services in the input-output tables at basic prices. Rather than imputing an addition to exports of insurance and freight services provided by resident carriers, the 1993 SNA recommends creating a new c.i.f./f.o.b. global adjustment on imports (see paragraph 15.69 and Table 15.1). This alternative presentation records imports and global adjustment as follows:

a) Imports of goods detailed by products are valued c.i.f.;
b) All transport and insurance services on imports, provided by both resident and non-resident producers, which are included in the c.i.f. value of imports by products, are globally deducted. Thus, the total of imports of goods in the System is always recorded f.o.b. in the table;
c) Those transport and insurance services on imports that are provided by non-resident producers, are recorded under imports of services.

Whether the provision of transport and insurance services to bring imports from the frontier of the exporting country to the frontier of the importing country by the resident producers is shown as an addition to exports of services or as a c.i.f./f.o.b. adjustment to imports, it requires additional information not at present collected

in the CSNA.

12. Gross value added at factor cost

In the 1993 SNA, gross value added at factor cost "... is not recommended as a measure of value added in the System, since there are no observable prices such that output minus intermediate consumption equals gross value added directly ..." (paragraph 15.39). The measure recommended throughout the System is gross value added at basic prices, which is defined as "... output valued at basic prices less intermediate consumption valued at purchasers' prices" (paragraph 15.37a). It is noted, however, that gross value added at factor cost "... could be derived from gross value added at basic prices by subtracting other taxes less subsidies on production" (paragraph 15.39). It is further asserted: "Other taxes less subsidies on production, by definition, are in fact taxes or subsidies that cannot be eliminated from the prices of outputs and inputs. Therefore, gross value added at factor cost is essentially a measure of income and not output" (paragraph 15.39).

Information on other taxes less subsidies is no more difficult to obtain from industry records than information on intermediate consumption. Other taxes less subsidies cannot be eliminated from the prices of outputs and inputs but neither can compensation of employees, surplus or capital consumption. Gross value added at factor cost has been and remains a standard measure of output for analysis of productivity by industry. We do not see any logic in calling gross value added at basic prices an output measure, and gross value added at factor cost an income measure. Both are output measures, as GDP at purchasers' prices is an output measure in the System. Statistics Canada has been producing and publishing GDP by Industry at factor cost for decades at both annual and monthly frequencies. In the CSNA input-output tables, the contribution of each industry to the aggregate gross domestic product at purchasers' prices is fully delineated in terms of the three prices - factor cost, basic prices and purchasers' prices. The flexibility of presentation in the CSNA may be emulated by other national statistical organizations.

13. Presentation of non-market producers

In the 1993 SNA, output of non-market producers (such as establishments belonging to general government or non-profit institutions) forms part of the supply tables and, similarly, their inputs form part of the Use tables (see paragraphs 15.62-67). In the CSNA input-output tables, non-market producers do not form part of either supply or use tables but, rather, their detailed inputs are directly allocated to final consumption (see the schematic chart, presented earlier). This is merely a presentational issue; however, the 1993 SNA's presentation is better and the CSNA will need to conform to it. When implemented, an additional benefit will occur, as there will be no need to have a separate column of revenues from the sale of goods and services in the final demand categories, and the value for government final consumption will be equal to the value

noted in other parts of the CSNA.

14. Gross fixed capital formation, stocks of fixed assets and labour inputs

The 1993 SNA suggests that at least three rows be appended, as supplementary information, to the value added quadrant of the use tables, one each for gross fixed capital, stocks of fixed assets and labour inputs, classified by the same industry detail as the use tables (see paragraphs 15.96-105). Such a presentation will facilitate productivity analysis and provide useful additional information to a broad range of users.

15. Cross-classification of value added by sectors and industries

The 1993 SNA recommends that value added by industry in the use tables be cross-classified by institutional sectors so that production can be related to income and consumption (see paragraphs 15.106-110). This is a laudable recommendation but it cannot be implemented by most statistical organizations. The approach requires a well functioning business register linking establishments to enterprises and sectors. Such information needs to be current, so that one can relate the current profile of establishment-based input-output industry statistics to the institutional-based structure of the economy. It also demands a highly articulated micro database which can be readily added to provide aggregates for the SNA. These conditions are rigorous. Given that the approach is costly to implement and of limited usefulness to relate production with income and consumption, an alternative presentation is to by-pass the production account and the generation of income account by institutional sector and to go direct to primary allocation of income account by institutional sector.

16. Conversion of the supply and use tables into symmetric tables

Supply and use tables are typically rectangular in the sense that the number of products (commodities) is greater than the number of industries. "In the supply and use table, when the number of rows of products and columns of industries happens to be equal, we shall refer to a square (not symmetric) supply and use table" (paragraph 15.2). Symmetric tables are tables which have an identical number of rows and columns for either industries or products and which use "... the same classifications or units ... in both rows and columns" (paragraph 15.2). Symmetric tables are always product by product or industry by industry, but not industry by product. There are important advantages to the rectangular format over the symmetric format (see section A, The accounting framework).

In the 1993 SNA, several procedures are listed (see paragraphs 15.137-143) to convert the rectangular supply and use tables into symmetric input-output tables. One procedure suggested for producing symmetric tables is transferring secondary products from the activities in which they are produced to the activities for which they

are principal products, such that all "off-diagonal" entries in the supply table are eliminated. Transferring the corresponding inputs within the industries in the use table is properly noted as being more complicated, as the basic data on inputs relate to industries and not to particular products produced in those industries. To overcome this difficulty, it is suggested that supplementary information be used. In the CSNA input-output tables, only construction activity is transferred from industries where it is produced as a secondary product to the construction activity. All other secondary products remain as they are reported. One would need to aggregate products produced or used to the same number as the total number of activities to have symmetric tables. Failing the use of supplementary information to generate symmetric tables, the 1993 SNA recommends using a mechanical approach by adding certain analytical assumptions (see paragraphs 15.144-149). It notes that the mathematical methods used when transferring outputs and associated inputs hinge on two types of technology assumptions (paragraph 15.144):

a) industry (producer) technology, assuming that all products produced by an industry are produced with the same input structure;
b) Product (commodity) technology, assuming that a product has the same input structure in whichever industry it is produced.

The 1993 SNA opts for the product technology assumption. We have serious reservations about this recommendation. The product technology assumption may be valid if one can develop a vector of inputs for each of the twenty thousand or so products identified in the market. It is, however, completely unrealistic to seek to achieve such a data base. Aggregating twenty thousand products into a manageable set of 200-300, or even 500-1000, product groups can hardly be called a replication of the commodity technology. At this level of aggregation of products or industries, there is hardly any difference between the two sets. Furthermore, it is evident that at least some important expenditures such as R&D, management skills and management style, which are industry specific or even firm specific, affect similarly all the products produced within an industry. The commodity technology assumption is partly a hangover from the perception that one needs the same physical things to produce a given product, no matter who produces it.

Another reason why we do not support the commodity technology assumption is that for model building purposes, the algebraic manipulation is easier using the industry technology assumption. The industry technology assumption does not require artificially transforming the basic rectangular supply and use tables into square tables. On the other hand, the commodity technology assumption can only work with a square table (see also the 1968 UN SNA paragraph 3.84 where it is stated: "... The assumption of a commodity technology can only be used if the number of industries is equal to the number of commodities".

17. Double deflation

We agree with the 1993 SNA that "... the supply and use tables are the most complete consistent framework for constant price estimation and provide: a) Interdependent measures of prices and volumes; b) An important check on the numerical consistency and reliability of the entire set of such measures, interlinking values at constant and current prices, value and volume indexes and deflators" (paragraph 15.161). "Constant price measures for gross value added are possible in the input-output framework by using the double deflation method, as the difference between: a) The value of output deflated by a price index of output; b) The value of intermediate consumption deflated by a price index for these inputs" (paragraph 15.162).

The double deflation method in the context of inputs and outputs at basic prices is a very efficient technique. A similar recommendation was made earlier in the UN Manual on National Accounts at Constant Prices, Series M, No. 64, New York, 1979 (in short, UN Constant Price Manual). The Canadian practice conforms to the recommendation in the UN Constant Price Manual , which states: "In an ideal world real product by kind of activity would always be derived from an input-output table by double deflation" (p. 55). In Canada, the input-output tables form the core of the production accounts. Input-output tables in full detail are produced annually both in current and constant prices. Real output by industry is produced using the preferred double deflation approach.

In the double deflation approach, one deflates commodity outputs at basic prices of an industry, its intermediate uses of commodity inputs at basic prices as well as taxes on products and other taxes on production, net of subsidies. The difference between the deflated value of outputs and the total deflated value of commodity inputs and net taxes on products and production equals GDP at factor cost at constant prices. The double deflation approach satisfies the requirement of an identity between GDP income and expenditure based estimates in constant prices. However, there are certain hazards in using double deflation for deriving the GDP of an industry whose value added represents a small proportion of total gross output.

For such an industry, GDP estimated by double deflation might be erratic, because small shifts in the relative prices of intermediate inputs and gross output could translate into big shifts in the resultant value added at constant prices. Here, the UN Constant Price Manual guidelines are not entirely satisfactory. They state: "The solution to this problem, however, may simply be to consolidate industries with very small ratios of value added to gross output with related industries at earlier or later stages of production. In other words, the problem of instability may be solved by aggregation into larger units whose values added are large enough in relation to gross output not to be too sensitive to the effects of changes in prices or technology" (p. 53). In one year, value added in one industry may be erratic but in the next, a different industry might suffer. Ad hoc aggregation into large units would disturb the continuity of time series. Thus, one needs additional guidelines.

In the CSNA, we have solved this problem as follows: Values added are combined as suggested by the UN Constant Price Manual. The combined value added is then redistributed using gross output or any other indicator as a proxy, but the combined value added for a given sub-aggregate remains unchanged. Without this constraint, the above noted GDP identity requirement will not be satisfied. These comments on the UN Constant Price Manual apply equally to the 1993 SNA recommendation on double deflation.

Concluding remarks

The rectangular accounting framework of the input-output tables is one of the most important factors for enabling them to play an integrating role in the production accounts in the SNA. Integration requires a strong and long term commitment by senior management and, a dedication to developing and implementing a common set of classification and aggregation rules, valuation principles as well as consistent revision practices used for all underlying statistical series. Furthermore, integration requires documentation of the above as well as of links between the components of the production accounts. The 1993 SNA supports the rectangular format in the supply and use tables. It further recommends manipulating the supply and use tables into symmetric input-output tables using a commodity technology assumption: it is this recommendation about which we have serious reservations. The commodity technology assumption is partly a hangover from the perception that one needs the same physical things to produce a given product, no matter who produces it. Also, the commodity technology assumption needs square tables, which, in our judgement, are not as useful for integration purposes.