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A Guide to Deflating the Input-Output Accounts: Sources and methods

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A Guide to Deflating the Input–Output Accounts: Sources and Methods

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Symbols

The following standard symbol is used in Statistics Canada publications:

- - amount too small to be expressed.

x confidential to meet secrecy requirements of the Statistics Act.

.. figures not available.

... figures not appropriate or not applicable.

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The System of National Accounts

In Canada, the National Accounts have been developed since the close of the Second World War in a series of publications relating to their constituent parts. These have now reached a stage of evolution where they can be termed a "System of National Accounts". For purposes of identification, all publications (containing tables of statistics, descriptions of conceptual frameworks and descriptions of sources and methods) which make up this System carry the term "System of National Accounts" as a general title.

The System of National Accounts in Canada consists of several parts. The annual and quarterly Income and Expenditure Accounts (included with Catalogue Nos. carrying the prefix 13) were, historically speaking, the first set of statistics to be referred to with the title "National Accounts" (National Accounts, Income and Expenditure). The Balance of International Payments data (Catalogue Nos. with prefix 67) are also part of the System of National Accounts and they, in fact, pre-date the Income and Expenditure Accounts.

Greatly expanded structural detail on industries and on goods and services is portrayed in the Input-Output Tables of the System (Catalogue Nos. with prefix 15). The Catalogue Nos. carrying the prefix 15 also provide measures of the contribution of each industry to total Gross Domestic Product at factor cost as well as Productivity Measures.

Both the Input-Output tables and the estimates of Gross Domestic Product by Industry use the establishment as the primary unit of industrial production. Measures of financial transactions are provided by the Financial Flow Accounts (Catalogue Nos. with prefix 13). Types of lenders and financial instruments are the primary detail in these statistics and the legal entity is the main unit of classification of transactors. Balance sheets of outstanding assets and liabilities are published annually.

The System of National Accounts provides an overall conceptually integrated framework in which the various parts can be considered as interrelated sub-systems. At present, direct comparisons amongst those parts which use the establishment as the basic unit and those which use the legal entity can be carried out only at highly aggregated levels of data. However, Statistics Canada is continuing research on enterprise company establishment relationships; it may eventually be feasible to reclassify the data which are on one basis (say the establishment basis) to correspond to the units employed on another (the company or the enterprise basis).

In its broad outline, the Canadian System of National Accounts bears a close relationship to the international standard as described in *System of National Accounts, 1993*, a joint publication of the Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank.

INTRODUCTION

This publication documents the data sources and methods used to compile national input–output tables at constant prices. It is the first to be issued since the publication in 1993 of the revised International System of National Accounts.[1] An earlier discussion of methods used in deflation appeared in *The Input–Output Structure of the Canadian Economy in Constant Prices, 1961–1981.*[2] Documentation on the updating of the input–output accounts at current prices will be issued later.

Measuring anything 'at constant prices' implies the use of complex rules and assumptions, which analysts need to know explicitly in order to interpret precisely what is conveyed by the data. This report will help readers better understand the potential usefulness of input–output tables.

Although input–output tables at constant prices have many uses, they are most often used to provide consistent time series on gross output and gross domestic product (GDP) by industry. Other uses include providing consistent time series for the structure of final demand, industry market shares, and input–output coefficients, as well as providing more flexibility to some forms of structural analysis, including the extension of productivity measurement from the more conventional labour productivity to multifactor productivity. Although nominal GDP may be described simply as the value of all goods and services produced within the economy's boundary, real GDP by industry is an analytical construct formulated by economists and statisticians to provide a quantitative answer to a very specific set of questions. Frequently, using the data effectively requires a good familiarity with the questions they answer. For instance, properly interpreting movements in real GDP by industry may depend on adequate knowledge of the treatment of taxes on products and other taxes on production paid by the industry, and the treatment of subsidies in measuring real GDP.

Input–output tables have been published for 35 years. Naturally, both methods and sources have evolved over this period, reflecting better source data, new estimation techniques and lower computation costs. This report is largely based on recent methodology and notes changes only when a major shift in either the technique or the data source has occurred.

Time series for input–output tables begin in 1961. Since 1961, the base years for constant prices have changed as follows:

- data for 1961 to 1971 are in 1961 prices;
- data for 1971 to 1981 are in 1971 prices;
- data for 1981 to 1986 are in 1981 prices;
- data for 1986 to 1992 are in 1986 prices; and
- data for 1992 to date are in 1992 prices.

The introduction of new base years improves intertemporal comparisons. However, to obtain a single long series, the five segments must be linked by expressing data in four of the segments in the relative prices of a fifth segment—say the 1992 prices. When series are linked, it is a convention of the Canadian System of National Accounts to preserve the rates of growth of each data segment. This leads to the problem that the first four segments, whose relative prices have been altered, no longer add up to their previous totals. However, this allows the growth rates of all five segments to remain the same after they have been linked, which is consistent with the intention of observing the behaviour of the series over the entire period.

The first two chapters of this report show, respectively, the basic framework of the Canadian accounts and an overview of methods and data sources, including how real GDP by industry is derived within this integrated system. Chapter 3 discusses in more detail the techniques and data sources for groups of goods (such as manufactured goods), and Chapter 4 discusses those for services (such as financial services). Chapter 5 is dedicated to the non-business sector, where deflation techniques differ significantly from those in the business sector. Chapter 6 outlines each instance where specific pricing is used for deflation of a commodity. This is necessary where significant heterogeneity of a commodity (in either sources of supply or of disposition) calls for application of different price deflators in different parts of the input–output system. Finally, Chapter 7 discusses some of the challenges with which we are faced and new developments with which we are occupied at the present time.

[1]Commission of European Communitie *et al.*, 1993*, System of National Accounts*.
[2]Statistics Canada, 1987*, The Input–Output Structure of the Canadian Economy in Constant Prices, 1961–1981 (Revised Data).*

CHAPTER 1 THE ACCOUNTING FRAMEWORK

Input–output tables present a detailed industry and commodity breakdown of the Canadian economy. Using these tables properly depends on understanding their structure and knowing the accounting conventions used to create them. Figure 1.1 presents a schematic accounting framework of the Canadian input–output tables, which consists of five matrices depicting the production and consumption of goods and services and the use of primary inputs in the Canadian economy. These matrices are repeated in Figure 1.2, where Matrix V shows some detail of the industries and the commodities they produce, as well as in Figure 1.3, where matrices U and F provide information on the goods and services purchased for intermediate use and final demand, respectively. Details of the primary inputs used by industries (Matrix YI) and purchased by final demand categories (Matrix YF) are also given in Figure 1.3. As Figure 1.1 shows, at the present time the tables contain 243 industries, 671 commodities, 162 categories of final demand and 8 primary inputs.

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 non-factor services). The latter details the commodity composition of the output of industries and the complete costs of production (including earnings of the primary factors of production) of industries.

Commodity accounts

Commodity accounts reveal the supply and disposition of each commodity. Commodities are goods or services and include items normally intended for sale on the market at a price designed to cover production costs, as well as non-market services delivered by institutions such as hospitals and schools. Matrix V of figures 1.1 and 1.2 shows the commodities produced by business (market) and non-business (non-market) industries. While commodities produced by business sector industries are valued at market prices, the value of non-business commodities is measured by the sum of their costs of production. Where a non-business industry produces market commodities as secondary output, the value of the non-business commodity is obtained residually as the difference between the industry's total input and its market output.

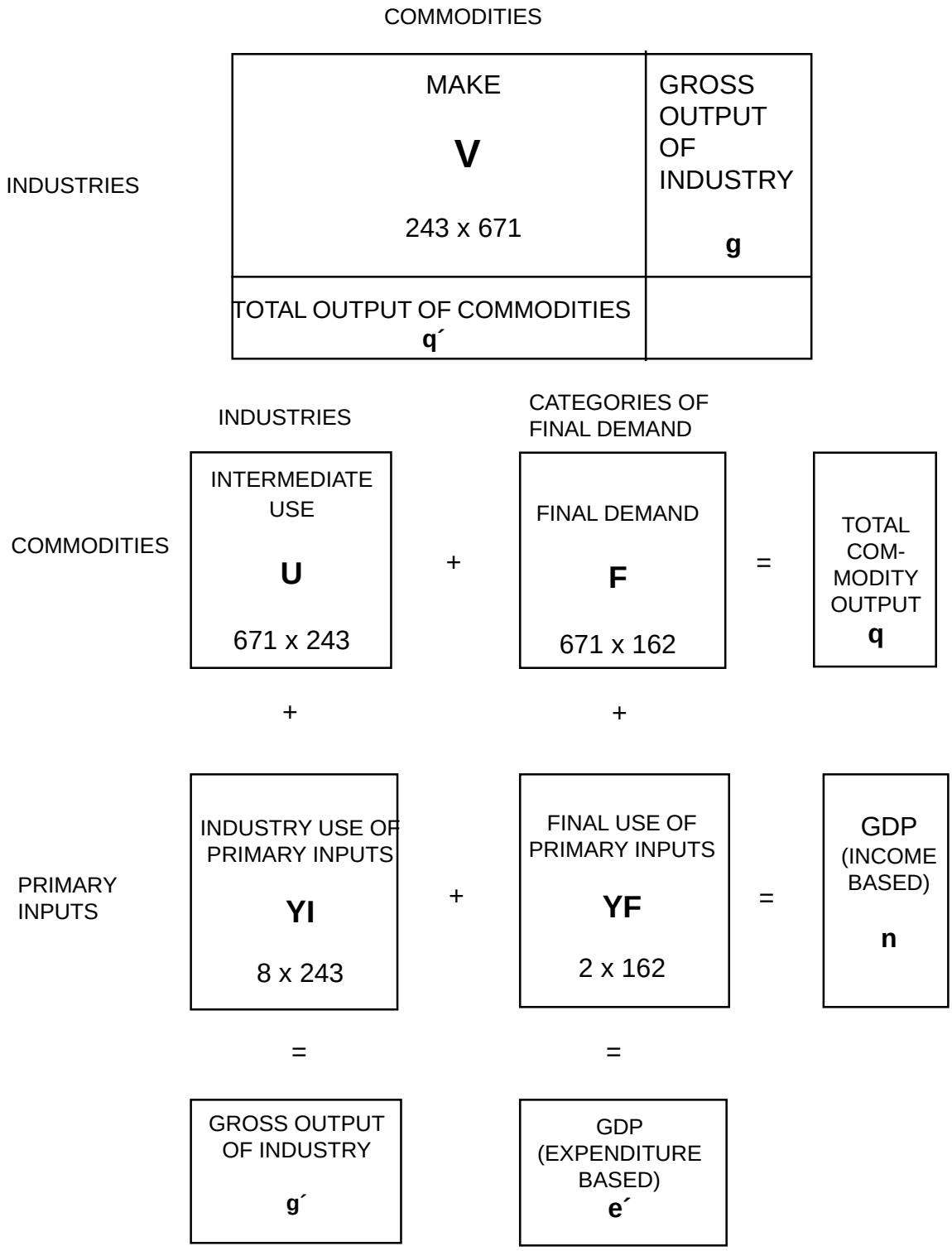
The disposition of commodities by industry and final demand category is shown in matrices U and F of figures 1.1 and 1.3. Matrix U shows the use of commodities by industries as intermediate inputs for the production of other commodities. Matrix F contains the demand for each commodity by final demand category. Figure 1.3 shows the final demand categories. They include personal expenditure, gross fixed capital formation, additions to (the value of physical change in) inventories, government expenditure on goods and services, and exports. Two other columns in Matrix F refer to imports and to withdrawals from (the value of physical change in) inventories. These two categories are recorded to supplement the supply of goods and services produced by Canadian industries. Since matrices U and F include the use of commodities originating either as imports or as withdrawals from inventories, negative adjustments for these items are required to achieve equality with the output of domestic industries. Adjustments for imports are required because they are extraneous to the production of Canadian industries. Withdrawals from inventories are required because these were produced in an earlier period.

Industry accounts

Industries are groups of operating units (establishments) engaged in the same or similar kinds of economic activity, whether they produce market, own account or non-market output. Currently, the accounting framework treats the establishments belonging to the business and non-business sectors quite differently. Business sector establishments are grouped according to the Standard Industrial Classification (SIC) with a significant amount of detail. These establishments will soon be regrouped to conform to the North American Industry Classification System (NAICS). On the other hand, establishments of non-profit institutions serving households and government are not classified by SIC at present.

The industry accounts are contained in matrices V and U and YI (in figures 1.1, 1.2 and 1.3). Each row of Matrix V details the commodity composition of each industry's output. The output of business sector industries is produced either for sale or disposal on the market (e.g., department stores, clothing factories and restaurants) or for own final use (e.g., owner-occupants of housing and subsistence farming). Production for the market is sold at prices that are economically significant, in the sense that they have a significant influence on the amounts producers are willing to supply or buyers are willing to purchase. Items for own use are valued at the prices of similar products sold on the market. Production of non-business industries is measured by the sum of the costs of production: that is, as the sum of intermediate consumption, compensation of employees, consumption of fixed capital, and taxes less subsidies on production.

FIGURE 1.1: Accounting Framework of Canadian Input–Output Tables



Matrices U and YI show, respectively, the intermediate commodities and primary inputs used by each industry in production.

For the business sector, the primary inputs consist of the following:

- taxes on products;
- other taxes on production;
- subsidies on products;
- other subsidies on production; and
- gross domestic product at factor cost.

It should be noted that the primary inputs found in input–output tables at current prices include the following, in addition to the first four above:

- wages and salaries;
- supplementary labour income;
- mixed income of unincorporated business enterprises; and
- other operating surplus.

At constant prices, however, GDP at factor cost (for all business sector industries) is calculated as a residual—that is, the difference between the gross output of industries and the total of intermediate inputs and taxes less subsidies on production (net taxes on production). This residual includes the constant price equivalent of the sum of wages and salaries, supplementary labour income, mixed income of unincorporated business and other operating surplus. These components of income include all personal income and corporate income taxes. Including net taxes on production in the residual would produce a measure of gross domestic product at market prices.

The primary inputs for non-business industries in Matrix YI also consist of net taxes (taxes less subsidies) on production, labour income and other operating surplus. Labour income consists of wages and salaries and supplementary labour income paid to persons employed in non-profit institutions serving households and the government sector. The surplus of non-business industries reflects the depreciation on assets owned in the government sector and by non-profit institutions serving households. Assets that are charged to fixed capital formation are depreciated, such as buildings, roads, equipment, etc. All residential housing, even when owner-occupied, is classified to the business sector, and thus depreciation on housing is part of the surplus of the appropriate industry in that sector.

Primary inputs are also recorded in Matrix YF (figures 1.1 and 1.3). These include taxes on products bought by final demand categories, and other taxes on production associated with those categories. The latter includes licences for motor vehicles, cellular telephones, fishing and hunting as well as land and deed transfer taxes. Taxes on products make up the difference between the price paid by the purchasers and the price received by the producers.

Gross domestic product by industry

Gross domestic product by industry is an integral part of the input–output accounts. This measure represents the contribution of each industry to the total value of production in the economy; it is the value added by the industry's labour and capital to the intermediate inputs used in production. For the business sector, GDP at constant prices cannot be broken down meaningfully into its labour and capital components. GDP by industry is measured at factor cost (rather than at market price, which would also include net taxes on production). At the aggregated level, GDP at market prices, or the sum of all elements of primary inputs in matrices YI and YF, is equal to final demand expenditures on gross domestic product, or the **sum** of all elements of matrices F and YF (see Figure 1.3). This is true both at current and constant prices.

The industry distribution of GDP at factor cost for the business sector is shown in Matrix YI on an SIC basis. The primary inputs of the non-business industries in the Matrix YI are not shown by SIC. However, they may be reallocated to the same classification as that of the business sector so that GDP may be presented for a total SIC industry or separately for the business and non-business components of an industry. Tables 1a to 1c in *The Input–Output Structure of the Canadian Economy, 1961–1992, Historically Revised Data* show current dollar GDP on this basis.

Basic accounting identities

By describing all the matrices, the basic identities of this accounting framework become apparent. The basic identities include the following:

- **Industry accounts basic identity**: The total output of any industry (**g** in Figure 1.1) equals its total intermediate inputs plus its total primary inputs (**g**´).

- **Commodity accounts basic identity**: The total output of any commodity (**q**´) equals its total use as an intermediate input and for final demand (**q**).

- **Primary inputs and final demand identities**. In terms of Figure 1.1, the output of all commodities (i**q**´) equals the gross output of all industries (**g**i´). Intermediate inputs (U) being common to both outputs (of industries and of commodities), primary inputs of all industries together (YI) equal commodity

inputs of all final demand categories (F). Hence, the **sum** of all elements of YI equals those of F. And total gross domestic product at market prices (income based)—YI plus YF—equals total gross domestic product at market prices (expenditure based), F plus YF.

All of these identities hold for both current price and constant price tables.

In summary, for a system with k commodities, l industries, m primary inputs and n final demand categories:

$g_j = \Sigma u_{ij} + \Sigma yi_{hj}$

That is, the total output of the jth industry (g_j) equals the sum of its intermediate (u_{ij}) and primary inputs (yi_{hj}).

$q_i = \Sigma u_{ij} + \Sigma f_{ik}$

That is, the total output of the ith commodity (q_i) equals the sum of purchases of this commodity for intermediate use (u_{ij}) and final demand (f_{ik}).

$\Sigma g_j = \Sigma\Sigma u_{ij} + \Sigma\Sigma yi_{hj}$

$\Sigma q_i = \Sigma\Sigma u_{ij} + \Sigma\Sigma f_{ik}$

Since $\Sigma g_j = \Sigma q_i$

$\Sigma\Sigma yi_{hj} = \Sigma\Sigma f_{ik}$

$\Sigma\Sigma yi_{hj} + \Sigma\Sigma yf_{hk} = \Sigma\Sigma f_{ik} + \Sigma\Sigma yf_{hk}$

or in matrix notation:

$i'YIi + i'YFi = i'Fi + i'YFi$

The tables of data contained in the annual catalogues are similar to the matrices found in Figure 1.1. The Make Matrix tables contain matrices V, g and q; the Use Matrix tables contain matrices U, YI and g; the Final Demand Matrix tables contain matrices F, YF and e. All these tables contain cross-sectional data, one set per year. Finally, the Gross Domestic Product by Industry Table, a table of time series, is constructed from Matrix YI.

[3]See Commission of European Communities *et al.,* 1993, *System of National Accounts.*

FIGURE 1.2: Make (Output) Matrix

	COMMODITIES									TOTAL
	BUSINESS						NON-BUSINESS		Other including fictive	
INDUSTRIES	Primary	Manu-facturing	Con-struction	Communi-cation and utilities	Transport and trade	Other services	Non-profit	Government		
BUSINESS Primary Manufacturing Construction Communication and utilities Transport and trade Other services NON-BUSINESS Non-profit Government Fictive	**V**									**g**
TOTAL	**q'**									

FIGURE 1.3: Industry and Final Use Matrices

	INDUSTRIES	FINAL DEMAND								TOTAL
		PE	GFCF	VPCA	LESS VPCW	GCE	X_D	X_R	LESS M	
COMMODITIES Primary Manufacturing Construction Communication and utilities Transport and trade Other service Non-profit Government Other including fictive **TOTAL**	**U**	**F**								**q**
PRIMARY INPUTS Taxes on products Other taxes on production Less subsidies Labour income Mixed income Other operating surplus GDP at factor cost **TOTAL** (GDP at market prices)	**YI**	**YF**								**n**
TOTAL USE	**g´**	**e´**								

Industry detail is identical to that of figure 1.2

Final demand categories:

PE—Personal expenditure on goods and services
GFCF—Gross fixed capital formation, business, government and non-profit institutions serving households
VPCW—Value of physical change in inventories, withdrawals
VPCA—Value of physical change in inventories, additions
GCE—Government current expenditure on goods and services
X_D—Domestic exports of goods and services
X_R—Re-exports of goods and services
M—Imports of goods and services

Notation:

V—a matrix of the values of outputs
U—a matrix of the values of intermediate inputs
F—a matrix of the values of commodity inputs of final demand categories
YI—a matrix of the values of primary inputs of industries
YF—a matrix of the values of taxes on products or other production of final demand categories
q—a vector of the values of total commodity outputs
g—a vector of the values of total industry outputs
e—a vector of the values of total inputs (commodities plus primary) of final demand categories
n—a vector of the values of total primary inputs (industries plus final demand categories)

Glossary

Matrices

V—a matrix of the values of commodity outputs. In it, each row shows the distribution by commodity of the output of an industry. Each column shows the distribution by industry of the output of a commodity. The data relate to domestic output only. The output of an industry is the aggregate value of goods and services produced and work done by the industry. It is equal to the value of the industry's sales plus any increase (less any decrease) in the value of physical change in stocks of finished products and work in progress.

U—a matrix of the values of intermediate commodity inputs. Each row shows the distribution by industry of the input of a commodity. Each column shows the distribution by commodity of the input of an industry.

F—a matrix of the values of commodity inputs of final demand categories. The categories include the following: personal expenditure on consumer goods and services; gross fixed capital formation of business, government and non-profit institutions serving households; value of physical change in inventories, withdrawals and additions; gross government current expenditure on goods and services; exports; imports; and government revenue from the sales of goods and services.

YI—a matrix of the values of primary inputs of industries. Primary inputs are those inputs which are not current outputs of other industries. Primary inputs include taxes on production (taxes on products plus other taxes on production), also called indirect taxes; subsidies on production (subsidies on products plus other subsidies on production); wages and salaries, supplementary labour income, mixed income of unincorporated business and other operating surplus. (In this report, the terms 'other operating surplus' and 'surplus' are used interchangeably.)

YF—a matrix of the values of taxes on production (taxes on products plus other taxes on production) associated with final demand categories.

Industry—a group of operating units (establishments) engaged in the same or similar kind(s) of economic activity, whether they produce market, own account or non-market output. Thus, the industries in the input–output tables include (1) domestic industries that primarily produce goods and services for sale at a price normally intended to cover the cost of production (e.g., coal mines, clothing factories, department stores, laundries); (2) entities, such as owner-occupants of housing and subsistence farming, that produce goods and services and use processes and resources similar to typical industries even though they do not produce for market; and (3) government and non-profit institutions that serve households and provide their products free or at prices that are not economically significant.

Commodity—a good or service, including items normally intended for sale on the market at a price designed to cover production costs, as well as non-market services delivered by institutions such as hospitals and schools.

Establishment—the smallest unit that is a separate operating entity capable of reporting all elements of basic industrial statistics—the main elements of input and output. It is typically a factory, mine, store, farm, airline, hotel or similar unit and in most cases it is a separate company.

Purchaser price—the cost of goods and services in the market to the point of delivery to the purchaser. The purchaser price can vary with circumstances (e.g., where the purchaser picks up the commodity at the producer's point of shipment rather than having it hauled by a common or contract carrier at the expense of the producer).

Modified basic prices—the selling price at the boundary of the producing establishment excluding sales and excise taxes levied after the final stage of processing. The modified basic price of a product equals the purchaser price less transport and trade margins in delivering the product to the purchaser and taxes on the product where applicable. The term 'basic' used in Canada is different from the 1993 SNA. The modified basic price in Canada is the subsidized price whereas in the 1993 SNA it is the actual price plus subsidy.

CHAPTER 2 SOURCES AND METHODS USED TO COMPILE INPUT–OUTPUT ACCOUNTS AT CONSTANT PRICES—AN OVERVIEW

In Canada, input–output accounts at constant prices are constructed annually. The methodology of these accounts is modeled largely on the revised International System of National Accounts (1993 SNA),[3] with adaptations that reflect Canadian institutional arrangements.

A time series of input–output tables expressed at current prices (that is, prices applicable in the actual years being measured) embodies two types of change—changes in the quantities (and quality) of commodities, and changes in the prices attached to the commodities. While economic time series at current prices serve a variety of purposes, there is an additional need for a set of accounts where the effect of changing prices on the measured flows is removed. This results in a measure of the volume of commodity flows (often referred to as real flows). This process, known as deflation, usually involves removing the effects of price changes from nominal values of transactions between a base period and the current (or reference) period.

A seemingly ideal approach to deflation would be direct measurement of quantity. However, such measures are not feasible when more than one commodity is involved. There is no meaningful way to combine tons of steel and dozens of oranges, for example. A workable solution would be to measure these quantities in terms of their price at a point in time, or the base year. Therefore, the dollar value of a quantity of oranges is additive with the dollar value of a quantity of steel. If all quantities are expressed in terms of their base-year prices, each commodity's constant price value will be proportional to its quantities in different years. However, commodities of diverse characteristics will remain additive, and a set of accounts at constant prices can be compiled to summarize or aggregate the individual commodity series. This constant price series is basically a Laspeyres quantity index. For any group of commodities, the sum of their constant price values in a given year, divided by their sum in the base year, is the Laspeyres index of quantity for the group. For instance, if an industry's 1993 revenue from producing three lines of products was $110 million (in 1992 prices) and only $100 million in 1992 (in the same 1992 prices), then the Laspeyres index of quantity for the 1993 aggregate is 110 (1992=100), or a growth rate of 10%. It is conventional to compute growth rates of economic aggregates from sums of constant price commodities.

This index, however, will yield meaningful measures of aggregate volume through time only as long as relative prices do not change. Indeed, since quantities are aggregated in terms of their values in a given base year, they are weighted in all other years by the relative prices of that base year. Consequently, the importance of the growth in the quantity of a certain element on an aggregate depends on the importance of its price relative to the prices of all other elements forming the aggregate. For instance, the importance of the growth in the quantity of petroleum imported on the total volume of imports is much larger if petroleum sells at $40 per cubic metre than if it sells at $1—all other import prices remaining the same. An important drawback of this type of aggregation, which corresponds to a Laspeyres quantity index, is that it requires frequent changes in the base year—especially in periods of large relative price changes. Initially, Statistics Canada rebased in the first year of each decade. All constant price accounts of the Canadian System of National Accounts (CSNA) have their aggregates built with 1961 relative prices (weights) for the 1960s, and 1971 prices for the 1970s. Since 1981, the base year has been changed every five years, except when 1992 was chosen as a base year instead of 1991.

The deflation process is essentially the construction of a model, or logical abstraction, of actual transactions. It serves two important purposes. First, by measuring values of all goods and services in base-year prices, deflation allows the comparisons of volume and price aggregates belonging to different time periods. Constant price input–output tables fully describe how economic relationships between various classes of transactors have evolved by measuring the real flow of goods and services between them, and show the real contribution of each class toward the economy's real gross domestic product. The extensive detail of the accounts allows the computation of economic aggregates using any of a number of means, including flexible functional forms, econometric estimation of parameters of aggregator functions, or simply Laspeyres quantity indexes. Constant price input–output tables also impart more flexibility to some forms of structural analysis, such as the analysis of industry production and cost functions. This facilitates, for example, the extension of productivity analysis from the more conventional assessment of labour productivity to multifactor productivity analysis.

Second, the deflation process incorporates changes in the quality of goods and services into the estimates of the quantities underlying constant price values. Changes in productive technology, along with changes in the demands and preferences of final users, accompany economic growth. Such changes can also stimulate changes in the quality of products and services. Separating the price component of the value of commodities often cannot be divorced from determining quality changes or measuring prices of goods for a 'constant quality.' Assessing quality change is a nec-

essary and integral part of the deflation process. Price and quantity indexes used in deflating input–output tables are often adjusted for quality change as recommended by the United Nations.[4] The conventional term for quantity measures that incorporate the impact of quality change is 'quantum.'

Constant price aggregates, or quantum aggregates, are constructed according to the Laspeyres quantity index number. Constant price series for any group of input–output commodities follow the base-year weighted or Laspeyres formula. Values at base-year prices, $\Sigma P_o Q_t$, are obtained from deflation of the current values, $\Sigma P_t Q_t$, by a price index. If this price index is of the Paasche type

$$P_{Paasche} = (\Sigma P_t Q_t / \Sigma P_o Q_t)$$

then the deflated value at constant prices is

$$\Sigma P_t Q_t \div (\Sigma P_t Q_t / \Sigma P_o Q_t) = \Sigma P_o Q_t$$

which is the Laspeyres quantity index for the group or when taken as a ratio of its actual value in the base year:

$$\Sigma P_o Q_t / \Sigma P_o Q_o = Q_{Laspeyres}.$$

The notations are P = price, Q = quantum, o = base year, t = observed year.

This would imply that the underlying price index for input–output commodities and their aggregates is the Paasche price index. However, the rigorous application of price and quantity index number formulae is often limited by statistical classification systems. The construction of price indexes for each commodity involves weighting together price relatives for a much larger number of commodity elements. Generally, the price indexes available are of the base-weighted or fixed-weighted types but, where applicable, these are aggregated to the input–output classification using current weights. Thus, while the index number formula suggests that the quantum measures are base-weighted, the reality is something of a mixture.

Methods used to deflate various parts of the input–output tables are outlined below, including deflation of goods and services, trade margins, taxes and subsidies. Deflation of gross domestic product and how it may differ from measures developed for other components of the CSNA are also examined. These methods and techniques are general principles grounded in economic theory, which are followed by deflating each element of the input–output tables.

[4]See United Nations, 1979, *Manual on National Accounts at Constant Prices,* Chapter 4.

Specific steps are sometimes taken based on alternative methods, which may diverge from these principles but will yield more sensible or congruous results.

Deflation of goods and services

Input–output flows can be recorded either in purchasers' prices or modified basic prices. The purchaser's price is the amount paid to take delivery of a good or service. It may include any transportation, tax and trade margins and storage, gas distribution and pipeline margins, which may be paid by the purchaser but not received by the producer. However, the purchaser's price can vary with circumstances—for example, where the purchaser picks up the commodity at the producer's point of shipment rather than having it hauled by a common or contract carrier at the expense of the producer. The modified basic price is the selling price at the boundary of the producing establishment excluding sales and excise taxes levied after the final stage of processing. It equals purchasers' prices less transport and trade margins and taxes on products where applicable. The term 'basic' used in Canada is different from the revised International System of National Accounts (1993 SNA). The modified basic price in Canada is the subsidized price whereas in the 1993 SNA it is the actual price plus subsidy.

In current price tables, purchasers' values are initially calculated and the appropriate margins are then allocated and the purchasers' values converted to 'basic' values. For the constant price tables, the deflation process starts with the current price tables at basic prices. The basic price concept implies a uniform basis of valuation through a commodity vector, and thus the same price index (for a given year) can be applied to every cell for a particular commodity. Alternatively, at purchasers' prices, each transaction represents a potentially unique amalgam of basic values and transport, trade and tax margins, and potentially, the number of deflators required can equal the number of cells in the input–output tables. Hence, except for personal expenditures in the Final Demand Matrix, the deflation of purchasers' values is limited because, apart from the computational complexity, such a wide array of price information does not exist. On the other hand, the commodity price information collected by the Prices Division to compile industry product price indexes can be used to construct deflators for values at basic prices.

These Industrial Product Price Indexes (IPPI), aggregated where necessary to the input–output classification, constitute the main source of deflators for manufactured commodities. The IPPIs cover commodities that are the output of domestic manufacturers. They include products made wholly or partly from Canadian labour and materials, and

cover all sales to Canadian businesses, individuals, and governments, as well as export sales. They do not cover manufactured goods that are imported except those that are imported and resold by Canadian manufacturers. Automobiles are the prime example. Items are priced free on board (f.o.b.) establishment and conform closely to the concept of a modified basic price.[5] Price indexes are available monthly and annual averages are estimated by taking an arithmetic mean of the 12 monthly indexes of the relevant year. Apart from being used for the deflation of output, they are the feeder indexes for the domestic portion of the machinery and equipment price indexes.

Unit value indexes are developed for commodities where there are no measured price indexes, but where quantity and value information is available. A unit value index is constructed by dividing the commodity into homogeneous subgroups and valuing the quantities of each subgroup at base-year prices. Alternatively, the base-year value of each subgroup is projected by its quantity index. An implicit price index for the commodity is then calculated by summing the revalued items and dividing the corresponding values at current prices by the result. Unit value indexes are widely used for primary commodities, such as agricultural products, mining commodities and fish landings, but are applicable to many other commodities where quantity information is available.

Subdividing the commodity into subgroups is essential, wherever possible, because cost and price conditions may differ between subgroups. Long-distance haulage by trucks may differ significantly from intracity trucking with respect to fuel consumption and frequency of loading and unloading and may result in variations in unit freight charges. Business class air travel may cost more per passenger than tourist class because of differences in the level of service provided. Such costs would be included on the input side of the account and should also be reflected in the output. A simple measurement of total tonne-miles or total passenger-miles would be adequate only if the pricing of the subgroups are similar or if there is little variation in their growth rates.

Little direct price information is available on services other than for those services purchased by households and a few price indexes recently developed by the Prices Division. Some service deflators are developed in the Income and Expenditure Accounts Division (IEAD), but several are constructed from information on a variety of related volume indicators and input costs, using various estimation techniques. The National Transportation Agency, Transport Canada, and the Transportation Division provided substantial statistical assistance and advice for compiling transportation-related commodities. Other price indexes are developed in the Input–Output Division—partly in response to gaps and deficiencies in existing prices, and partly in response to the particular needs of the input–output tables.

Specifying commodities for current price input–output tables does not always meet the needs of commodity specification for purposes of deflation. If there is reason to suspect that subsets of an input–output commodity class may display different price movements, then these subsets should be identified and deflated separately. Such procedures are limited by the significance of the problem, and by the availability of value and price information. However, such modifications have been found to be appropriate in a number of instances. For the pipeline transportation commodity, for example, it was observed that the pricing for pipelines carrying natural gas differed from the pricing for pipelines carrying petroleum products. This gave rise to two commodities for deflation. Also, prior to the latest commodity reclassification, different deflators were used for freight and passenger transportation by rail, although both were included in the same input–output commodity. The selected use of import price indexes to deflate merchandise imports is yet another example. Import price movements may be unlike those of domestic production—partly because the imported commodity's specifications may differ from those of the similarly classified domestic commodities.

Price indexes of imports are developed by the International Trade Division to compile price indexes and constant dollar values for broad commodity groupings of imports.[6] These data are made available to the Input–Output Division in considerably more detail than published, and are weighted to accord with the input–output commodity classification. This approach furnishes a significant portion of the import price indexes for many of the more important imported commodities.[7] Output deflators are used when specific import deflators are not available. Merchandise imports are adjusted for transport and tax margins. The price indexes from the International Trade Division are calculated on a merchandise trade basis. The deflators are used in a similar manner in input–output tables, with constant price margins (where applicable) added to merchandise imports deflated on a merchandise trade valuation.

Another case where a single price index is not applied uniformly across a commodity vector arises in the deflation of commodities that are used principally as investment in ma-

[5] Statistics Canada, 1986*, Industrial Product Price Indexes, 1981=100.*

[6] Statistics Canada, Various years, *Canadian International Merchandise Trade*, Table 1, 2 and 8.

[7] See section on imports in Chapter 3 for more detail.

chinery and equipment. These commodities are deflated mainly with the machinery and equipment price indexes developed by the Prices Division[8] and the price indexes are classified by input–output commodity and by industry of purchase. In this way, the deflation takes account of the heterogeneity of price movements of these commodities among industries. For example, industry-specific machinery purchased by the textile products industry may exhibit price movements quite different from that acquired by the food or beverage, or furniture and fixtures industries. The machinery and equipment price indexes are available for commodities produced domestically and for imports.

The import Machinery and Equipment Price Indexes (MEPI) are aggregated over industries to provide import price indexes for the commodities for which they are used. Prior to 1986, a similar procedure was followed with the domestic MEPI to derive output deflators, but this has been discontinued and IPPI are now used as output deflators for those commodities.

While it would seem necessary to deflate export values with export price indexes, exports originate with domestic industries whose selling price indexes are usually appropriate. Some cases have been detected where a commodity's export prices have moved differently from prices in the domestic market; in these instances, specific export prices are used.

Price indexes for fictive commodities, for trade (retail and wholesale) margins, and for taxes and subsidies on production are made for the particular needs of the input–output tables.

The input–output commodity classification includes seven fictive commodities, each corresponding to a fictive industry. Fictive commodities and fictive industries are a technique for routing groups of related commodities as inputs into industries when the precise commodity content is unknown. Some inputs, such as office supplies and advertising expenses, are reported in catch-all categories, which include many input–output commodities. These commodities are shown in detail as inputs into a corresponding fictive industry. The related fictive industry is shown as purchasing the related assortment of commodities and then selling the package to the purchasing industry. Since no primary factors are inputs into fictive industries, the quantum of output of a fictive industry is the sum of its commodity and tax inputs. The price index for a fictive commodity is the implicit price index of all the inputs of the corresponding fictive industry. The list of the fictive industries makes the nature of the technique obvious:

- Operating supplies
- Office supplies
- Cafeteria supplies
- Transportation margins
- Laboratory supplies
- Travel and entertainment
- Advertising and promotion

Each buyer of a fictive commodity is assumed to purchase the relevant group of commodities in the same proportion as the fictive industry 'producing' that fictive commodity purchases the commodities as inputs.

Deflation of transport and trade margins, taxes and subsidies

The value of a commodity assessed in constant purchaser prices reflects what the purchaser would effectively pay if base-year prices were in effect This would include the costs of trade, transport, storage and tax margins that are a wedge between what the purchaser paid and what the producer received. No direct information is available (or attainable) on price movements of each margin, for each commodity and industry.

Transport margins

Transport margins show the cost of transportation by commodity of goods going from producer to purchaser. The transport margin deflator is calculated as a weighted average of the deflators for modes of freight-carrying transportation (i.e., truck, rail, water, air and services incidental to air and water transport). The weights are the current price values of the gross output of each commodity.

Trade margins

Wholesale and retail trade margins are the largest cost elements separating purchaser values of commodities from basic values. They are principally produced by the wholesale and retail trade industries, although some trade margins are produced by other industries—notably industries trading in goods purchased for resale in addition to their principal activity. Trade margins are one of the elements between purchaser values and basic values, and they can be measured as the difference between the selling value of a commodity sold by a trader and the price of that commodity to the trader. The ideal solution in calculating constant price trade margins would be to take the difference between the constant price sales of commodities and the constant price cost of those commodities to the trader. In

[8]Statistics Canada, 1982, *Machinery and Equipment Price Indices by Industry of Purchase (1971=100*), *1971–1979.*

reality, the necessary array of price indexes, which would include the buying and selling price indexes for both wholesale and retail trade, by commodity, does not exist. It is also recognized that the quantities and qualities embedded in trade margins can vary over time and between commodities. Warranty provisions can change or the customer may have to perform more of the service himself (e.g., full service versus self-service outlets).

Consumer price indexes can be used to deflate the purchaser value of commodities sold for personal expenditure. Similarly, industry product price indexes are used to deflate the basic values of the same commodities. This has made it possible to calculate the trade margin for commodities bought for personal expenditure as a residual using both of these observed prices. The total trade margin at constant prices is calculated as the difference between the purchaser value, deflated with the appropriate Consumer Price Index (CPI),[9] and the sum of the basic value and the tax and transportation margins at constant prices. Since the commodity classification for the CPI is more aggregated than the worksheet classification, it has been necessary in some cases to assign the same index to all members of a group of worksheet commodities. However, this method yields results superior to those discussed in the next paragraph. The portion of the total trade margin to be assigned to wholesale or retail may then be determined on the basis of their shares in the estimates at current prices.

For other trade margins, a margin rate is applied to the value of the commodity at constant prices. This margin rate is the ratio of the value of the margin to the basic value of the commodity where the margin is applied, and it can be calculated for the current prices for any year including the base years. An average margin rate is calculated for each trade margin cell and for each year. The average margin rate is the average of the rate for the current year and the base year. The constant price margin is the average margin rate, defined above, applied to the constant price basic value of the commodity. The convention of using the average margin was adopted after testing a range of alternatives. Using only the base-year margin rate assumes no change in the quantum of services provided to the purchaser by the trader, and this introduces undesirable rigidities into the measure. Using current year margin rates alone exaggerates the effect of rapidly changing prices in times of higher inflation.

Synthetic price indexes calculated from basic prices plus margin prices, using the three alternatives, were compared with observed prices measured by the CPI. It was found that the average margin rate yielded results closer to the observed rates. Since services related to margins can be rendered at any point in the chain between the producer and the final purchaser of commodities, their actual point of incidence is not known. In practice, the wholesale margin rate is calculated on the basic valuation of the good. However, the retail margin rate is derived from the basic price of the good, plus its wholesale and transportation margins. Taxes on production are not included in the margin rate largely because most taxes fall after the retail level. This calculation was also used to determine the proportion of the total trade margins to be allocated to retail and wholesale for personal expenditure estimates.

[9]See Kitchen, 1996, "Direct Deflation of the Purchaser Price Data."

Taxes on production

Taxes, an element of cost in the production process, are not dictated by immediate technological needs. Taxes are the main source of funds for financing the social capital and social overhead necessary for the economy to function, but this cannot be earmarked to industries or establishments. Subsidies are the opposite of taxes in that they are payments—rather than charges—to producing industries by government.

Since taxes are a cost for which no specific and identifiable service is rendered, the deflation of taxes is not to be viewed in the same way as the deflation of commodities. The value of taxes cannot be factored into a measure of quantum and price. However, in market transactions, taxes on products usually form an identifiable element in the transaction price. Since the tax element is identifiable, an implicit transaction price excluding taxes can be determined. This process can be repeated for successive transactions over time and it can be extended to determine the constant price values of transactions, including or excluding taxes on production. The difference between the constant price, including and excluding taxes, is necessarily constant price taxes. It follows that constant price taxes can be calculated as the base-year tax rate, applied to the constant price value excluding tax of the commodity being taxed in other years.

Changes in tax rates for succeeding years have no effect when calculating constant price taxes. The deflation process establishes the quantum in succeeding years in terms of base-year prices, and the prices in the base year are determined by the tax rate in the base year.

The input–output tables show taxes on products and other taxes on production. All taxes on products are allocated to specific commodities and are paid by the transactor purchasing the commodity—either as intermediate input or in a final demand category. The constant price taxes on products are calculated in each cell in the Use and Final De-

mand matrices where taxes on products occur, and the taxes are summed over the appropriate Use and Final Demand vectors.

Input–output tables identify other taxes on production, of which property taxes are the dominant component. These taxes cannot be allocated to specific commodities, and are attributed to the paying industry. Their value at constant prices is computed as the product of the base-year tax payments and the growth rates of the gross output of the appropriate industries. Since property taxes are the major component, the total of other taxes on production at constant prices reflects the growth in the quantum of rental services rendered by the various relevant types of buildings.

Subsidies

Deflating subsidies presents difficulties, but subsidies are a relatively minor element in the operating account of the industries where they occur. The payment of a subsidy enables the receiving industry, for reasons of public policy, to sell a product at a price that is, in some sense, artificially low. Since the purpose of deflation is to express current quanta at base-year prices, the convention adopted for the deflation of subsidies is to calculate subsidies as a ratio of the industry's gross output in the base year, and to estimate constant price subsidies in succeeding years as the product of the base-year rate and the constant price gross output of the industry.

In summary, the following procedure is adopted in the deflation of the input–output tables. On the supply side, the commodity output of industries is deflated with output price indexes, and imports are deflated with import price indexes where possible. On the use side, domestic exports are deflated with output prices (with a few exceptions) and re-exports with import prices. Machinery and equipment purchased for fixed capital formation is deflated with special machinery and equipment price indexes available by commodity and industry of purchase for both domestic and imported machinery. Other categories in the Use and Final Demand matrices are deflated with an implicit price index based on the net supply available for domestic use, that is, for any commodity, an implicit price index of output plus imports minus domestic exports, re-exports and machinery and equipment where applicable. For a few commodities withdrawals from inventories are included in the equation. It is probable that, for particular commodities, the proportion between imports and domestic sources of the use of the commodities as intermediate inputs of industries or final demand categories is not the same in every case. But it is not possible to measure such market shares for individual uses of the commodity. Special procedures are discussed above for the deflation of fictive commodities, transport and trade margins, taxes and subsidies.

Gross domestic product

At current prices, gross domestic product (GDP) at factor cost by industry is defined as the sum of incomes accruing to labour and capital—the primary factors of production. In terms of the input–output classification of primary inputs, it is the sum of wages and salaries, supplementary labour income, mixed income of unincorporated business (a mixture of incomes accruing to labour and capital), and other operating surplus. Alternatively, since the gross output of an industry is equal to the sum of its intermediate and primary inputs, industry GDP or value added (or net output) can be computed as total industry gross output less total intermediate inputs. For input–output accounts at constant prices, real GDP at factor cost for business sector industries is constructed with the latter method as the difference between total gross output at constant prices and the sum of intermediate inputs and taxes less subsidies on production at constant prices. This method of obtaining GDP at constant prices, or 'double deflation,' is the difference between the quantum of gross output and the quantum of intermediate inputs and net taxes on production.

The double deflation method is appropriate because it is difficult to visualize how to factor some of the primary inputs into quantum and price. Under certain assumptions on the change of their quality, more specifically referred to as productivity, it is possible to conceive of price and quantum measures for labour income and for capital consumption allowances. The factor incomes of non-business industries where the output is not measured directly consist of just labour income and capital consumption allowances. These flows are deflated under the assumption of no productivity change. But the construction of price and quantum indexes for mixed income of unincorporated business and for the remaining parts of operating surplus, principally for profits, calls for even more heroic assumptions. Because of these problems, constant price gross domestic product for business industries has been calculated indirectly by the double deflation method.

Input–output tables lend themselves readily to double deflation, because the full detail of commodity output and input is specified for each industry. As the tables are at basic prices, a uniform basis of valuation applies to a commodity throughout the tables, and thus a given homogeneous commodity can be deflated more uniformly with the same price index.

Gross domestic product originating outside the business sector consists of labour income and capital consumption

allowances generated by the operations of government and non-profit institutions serving households. These expenditures are included as primary inputs of the non-business industries of the Use Matrix. The gross output of these sectors is not measured, and double deflation is not considered appropriate.[10] However, both components of income are directly deflated. Implicit price indexes derived from current and constant price estimates of capital stock are used for capital consumption allowances. On the assumption of a constant rate of labour productivity, labour income is deflated with price indexes based on employment or indexes of average weekly earnings. For the federal government administration the output at constant prices is calculated based on aggregating employees by group and level.

Gross domestic product may also be calculated at market prices. This is equivalent to gross domestic product at factor cost, plus taxes, less subsidies on production. At the aggregate gross domestic product at market prices (income based), obtained by summation over all industries plus taxes on production levied directly at purchases by final demand categories, is equal to the total final expenditure, that is, gross domestic product at market prices (expenditure based).

Tables 2.1 and 2.2 use the 1996 constant dollar accounts at 1992 prices to illustrate the interrelationships between various submatrices. The Make submatrix V, shown in Table 2.1, details the supply of commodities by business sector industries in billions of 1992 dollars. Total industry gross output at constant prices is given by the Vector g, showing $370 billion for manufacturing industries. Industries' purchases of intermediate goods and services are detailed by commodity in Matrix U (Table 2.2), showing $250 billion of expenditure by manufacturing industries.

Taxes, subsidies and real GDP of business and non-business industries are presented in the YI submatrix of Table 2.2. For manufacturing industries, these values yield a double-deflated GDP at factor cost of (370-250-{1+5-1}) =

[10] See, however, Chapter 7 where methods for measuring gross output of education, hospitals and residential care facilities are outlined.

Table 2.1
The Accounting Framework of the Canadian Input–Output Tables, 1996: Output Matrix

	COMMODITIES										
INDUSTRIES	Agriculture, fishing and forestry	Mining	Manufac-turing	Con-struction	Commun-ication and utilities	Transpor-tation and trade	Other services	Non-profit	Govern-ment	Other including fictive	TOTAL
	billions of 1992 dollars										
Agriculture, fishing and forestry	40	0	1	0	0	0	0	0	0	0	42
Mining	0	40	3	0	0	0	0	0	0	0	44
Manufacturing	0	2	352	0	0	11	5	0	0	0	370
Construction	0	0	0	87	0	0	1	0	0	0	88
Communication and utilities	0	0	0	0	58	0	4	0	0	0	63
Transportation and trade	0	0	3	0	0	155	19	0	0	0	177
Other services	0	0	7	0	0	5	328	0	0	0	340
Non-profit	0	0	0	0	0	0	4	10	0	0	14
Government	0	0	0	0	4	1	14	0	165	4	189
Fictive	0	0	0	0	0	0	0	0	0	92	92
TOTAL	40	43	367	87	62	172	375	10	165	96	1418

V

g

q'

Source: Statistics Canada, 1996, Input–Output Tables.

Table 2.2
The Accounting Framework of the Canadian Input–Output Tables, 1996 : Industry and Final Use Matrices

	INDUSTRIES										
	Agriculture, fishing, forestry	Mining	Manufac-turing	Con-struction	Communi-cation and utilities	Transpor-tation and trade	Other services	Non-profit	Govern-ment	Fictive	TOTAL INDUSTRY
	billions of 1992 dollars										
COMMODITIES											
Agriculture, fishing, forestry	9	0	21	0	0	0	0	0	1	0	31
Mining	0	2	22	4	1	0	0	0	0	0	31
Manufacturing	7	3	141	24	3	9	10	0	8	36	240
Construction	1	0	1	0	1	2	5	0	3	0	13
Communication and utilities	1	2	9	0	1	7	11	1	5	3	40
Transportation and trade	2	1	11	5	1	11	3	0	4	35	74
Other services	4	5	23	10	6	27	60	2	32	12	181
Non-profit										0	0
Government										0	0
Other including fictive	4	4	23	3	3	12	22	1	11	3	86
TOTAL	27	17	250	47	17	67	111	5	66	89	696
PRIMARY INPUTS											
Taxes on production	1	0	1	2	0	3	4	0	1	3	15
Other taxes on production	2	1	5	2	3	5	28	0	3	0	47
Less subsides	-5	0	-1	0	0	-3	-3	0	0	0	-12
GDP at factor cost	17	26	116	37	44	105	200	9	120	0	673
Total (GDP at market prices, income based)	15	27	121	41	47	109	228	9	123	3	723
TOTAL	42	44	370	88	63	177	340	14	189	92	1418

Source: Statistics Canada, 1996, Input–Output Tables.

$116 billion. Taxes less subsidies on production (5) are added to this value to obtain GDP at market prices of $121.0 billion. The table also shows that total GDP at market prices (income based) of $782 billion is equal to total final demand or total GDP at market prices (expenditure based).

The total domestic output of the manufacturing commodity is also displayed in the Make submatrix V. It is the sum of what is produced by manufacturing industries ($352 billion) and by other industries ($14 billion) or $367 billion. The third row of the Use submatrix and the Final Demand submatrix F (Table 2.2) show the disposition of this output as purchases by various business industries (totaling $240 billion) and final use as personal expenditure ($97 billion), fixed capital formation ($42 billion) and exports ($191 billion). It also shows additional supply of manufacturing commodities through inventory depletion ($1 billion), and imports ($202 billion). At constant prices, total supply from these sources and business industries is shown to equal disposition as intermediate inputs and final use by domestic and foreign transactors.

Table 2.2
continued

FINAL DEMAND CATEGORIES								
PE	FCF	VPC	GGCE	X	Less M	TOTAL FINAL DEMAND	TOTAL INDUSTRY AND FINAL DEMAND	
billions of 1992 dollars								
								COMMODITIES
5	0	0	0	7	-3	9	40	Agriculture, fishing, forestry
1	0	0	0	22	-11	12	43	Mining
97	42	-1	0	191	-202	127	367	Manufacturing
0	75	0	0	0	0	75	87	Construction
22	0	0	0	3	-2	23	62	Communication and utilities
77	9	0	0	18	-6	98	172	Transportation and trade
190	7	0	0	24	-26	195	375	Other services
10	0	0	0	0	0	10	10	Non-profit
0	0	0	165	0	0	165	165	Government
4	0	0	0	15	-9	10	96	Other including fictive
405	133	0	165	280	-260	723	1418	TOTAL
								PRIMARY INPUTS
46	5	0	0	0	5	56	71	Taxes on production
2	1	0	0	0	0	3	50	Other taxes on production
0	0	0	0	0	0	0	-12	Less subsides
0	0	0	0	0	0	0	673	GDP at factor cost
48	6	0	0	0	5	59	782	Total (GDP at market prices, income based)
453	139	0	165	280	-255	782		TOTAL

The 1992-based or other constant price measures of real GDP express the value of gross domestic product at prices of the base year. All such measures, however, correspond to the Laspeyres index with the inherent limitation that the relative price of each good or service is kept at its base-year level for the entire time series—regardless of how it may change over the five-year period. To alleviate this limitation and impart more flexibility to the real GDP measure, the 1993 SNA suggests that a chain index of GDP should be compiled and published to supplement the constant price measures now available.[11] Specifically, a Fisher ideal chain index is recommended as a potentially good candidate. This recommendation has been reviewed,[12] but has not been adopted in the Canadian input–output tables.[13] Fisher chain indexes are published in the quarterly income and expenditure accounts.

[11]Commission of the European Communities *et al.*, 1993, *System of National Accounts,* Chapter 16: "Price and Volume Measures."
[12]See, for example, Salem, 1994, "A Note on Superlative Chain-linked Measures of Industry GDP."
[13]See Statistics Canada, *National Income and Expenditure Accounts*, Quarterly Estimates. Table 4.

Analysis and reconciliation

The initial estimates for each industry are analysed for consistency and expected behavior, keeping in mind applicable theories of production and consumption as well as known autonomous influences. The analysis consists of summarizing the performance of each industry by examining certain selected aggregates and the relationships and trends based on these aggregates. It is a process of examination, verification and explanation. Each industry is reviewed in a time series format. Where results differ from expectation, methods and source data are reviewed at the highest level of detail to verify the data and determine if the methodology is adequate or if adjustments should be made. Explanations are sought for movements due to outside influences.

The aggregates used (shown in Table 2.3) include gross output, intermediate inputs, goods inputs, services inputs, energy inputs, taxes on production, and gross domestic product at factor cost. These are examined at current and constant prices together with implicit prices. Input–output data are supplemented with information on hours worked by industry to obtain labour productivity indicators. The behavior of input–output ratios and labour productivity indicators are also analysed. For instance, one expects a certain degree of stability in the goods-to-gross output ratio in manufacturing and in the GDP-to-gross output ratio in general. Where variation of these ratios is outside expected limits, the industry is re-examined in detail. On the output side, for instance, there may be shifts due to changes in the product mix of the industry, or a greater degree of wholesaling and less manufacturing operations than previously existed. On the input side, there may be changes in technology and different kinds of material used in the manufacturing process. Or it may be that adjustments are required because of modifications in methodology or source data.

The analyst can estimate the price performance of the outputs, intermediate inputs and subsets of inputs (goods, energy, services), and gross domestic product, and the movement of their implicit price indexes over time. The observed price movements may be examined for consistency with each other and can be compared with other available price indicators for verification. As well, unexpected movements can be investigated by re-examining source data. If the price of a particular input or output of an industry is sufficiently different from the average price used, an adjustment is made.

The final portion of the analytic documentation provides information on the year-to-year movements of the aggregates as well as year-to-year indicators of the labour productivity ratios. These year-to-year movements are examined simultaneously with the other indicators mentioned earlier in an attempt to get a complete picture. Business sector gross domestic product at factor cost is calculated as a residual, or the difference between deflated gross output and intermediate inputs at constant prices. Inappropriate inputs, outputs, prices or procedures may become apparent in the calculated residual and provide the signal for investigation. A particular problem can occur when the residual is a very small proportion of gross output or intermediate inputs, as it tends to be somewhat erratic in its movement. In such cases, the GDP of the industry may be adjusted to keep it in line with gross output. This procedure has, on occasion, been used to adjust the petroleum industries by redistributing gross domestic product between oil well activity and refining. It has also been used to adjust the motor vehicle assembly industry on the basis of indicators such as the number of vehicles assembled.

The benchmark measures of gross domestic product by industry calculated in the deflated input–output tables are produced well after current monthly estimates of gross domestic product by industry and quarterly estimates of expenditure-based gross domestic product. Much attention is given to examining and explaining the degree and source of variation between the input–output results and preliminary estimates. This is also convenient when comparing the methods and indicators used for the two types of estimates. A similar procedure is followed when comparing final demand with the expenditure-based Income and Expenditure Accounts (IEA).

The price base of input–output time series

Estimates of GDP by industry covering the years 1961 to 1996 are available from the electronic database (CANSIM) of Statistics Canada in a single series with 1992 as the base year. The input–output tables from which these tables are derived were deflated in five time segments. The period 1961 to 1971 was expressed in 1961 prices and 1971 to 1981, 1981 to 1986, and 1986 to 1992 were expressed in 1971, 1981 and 1986 prices, respectively. Finally, the years 1992 to 1996 are in 1992 prices. All segments have been rescaled to a 1992 time base, but estimates in the original base years at the M level aggregation can be obtained from the input–output tables directly. The rates of growth of the aggregates of the series are affected by the pattern of prices in the base year. All prices do not change by the same relative amounts over time. When the values for a single series are adjusted for price change, the rate of change will be independent of which period is selected as the base. How-

Table 2.3
Industry Analysis, Manufacturing Industries, 1992 to 1996: Modified Basic Price

	1992	1993	1994	1995	1996
Current	millions of current dollars				
Gross outputs	298,924	324,252	369,376	417,955	430,153
Intermediate inputs	199,146	217,309	246,657	279,672	288,010
Goods (including Energy)	162,577	178,245	203,952	231,845	235,366
Services	36,569	39,063	42,705	47,826	52,643
Energy	20,033	20,547	21,084	22,409	26,272
Net taxes on production	3,604	3,622	3,912	4,094	4,439
Labour income	68,414	69,788	72,975	77,094	78,546
GDP at factor cost	96,174	103,322	118,807	134,190	137,704
Constant	millions of constant dollars				
Gross outputs	298,924	316,726	342,289	362,068	370,397
Intermediate inputs	199,146	211,848	229,238	243,410	249,658
Goods (including Energy)	162,577	173,957	187,314	198,695	201,732
Services	36,569	37,891	41,924	44,716	47,925
Energy	20,033	20,423	21,045	21,340	21,997
Net taxes on production	3,604	3,785	4,199	4,427	4,569
GDP at factor cost	96,174	101,093	108,851	114,231	116,170
Implicit price indexes (1992=100.0)	index				
Gross outputs	100	102.4	107.9	115.4	116.1
Intermediate inputs	100	102.6	107.6	114.9	115.4
Goods (including Energy)	100	102.5	108.9	116.7	116.7
Services	100	103.1	101.9	107.0	109.8
Energy	100	100.6	100.2	105.0	119.4
GDP at factor cost	100	102.2	109.1	117.5	118.5
Labour inputs	millions of hours				
Paid hours worked	3,466	3,560	3,699	3,853	3,907
Total hours worked	3,542	3,646	3,791	3,947	4,009
	dollars				
Labour income/paid hours worked	19.74	19.61	19.73	20.01	20.10
GDP/total hours worked	27.15	27.72	28.72	28.94	28.98
Ratios	percent				
Goods/gross outputs	54.4	54.9	54.7	54.9	54.5
Services/gross outputs	12.2	12.0	12.2	12.4	12.9
Energy/gross outputs	6.7	6.4	6.1	5.9	5.9
GDP/gross outputs	32.2	31.9	31.8	31.5	31.4
C$ GDP/C$ gross outputs	32.2	31.9	32.2	32.1	32.0
Labour income/C$ GDP	71.1	67.5	61.4	57.5	57.0
Year-to-year change of K$	percent				
Gross outputs		6.0	8.1	5.8	2.3
Intermediate inputs		6.4	8.2	6.2	2.6
Goods (including Energy)		7.0	7.7	6.1	1.5
Services		3.6	10.6	6.7	7.2
GDP at factor cost		5.1	7.7	4.9	1.7
GDP/total hours worked		2.1	3.6	0.8	0.1
Gross outputs/total hours worked		2.9	4.0	1.6	0.7

C$—current dollars
K$—constant dollars
Sources: Statistics Canada, Input–Output Tables at current and constant prices, 1992 to 1996. See Statistics Canada, various years, *The Input-Output Structure of the Canadian Economy,* for data at current prices. The tables at constant prices are available from the Input–Output Division.

ever, when two or more series are summed, the same unique answer is no longer necessarily possible. For example, a basket of goods may include motor gasoline priced at $0.40 per litre in one period and $1.00 per litre in a second period. If the prices of other commodities have increased by smaller relative amounts, the change in the total basket will be influenced more heavily by changes in the quantum of gasoline if the second period is chosen as the base. Exactly the same problem is encountered when aggregating GDP series with different base years. For this reason, the measured rate of growth is not independent of the base year selected. To maintain the same rates of growth as in the original series, components of any aggregate are summed and then rescaled. In the published results, the rates of growth of the original constant price (1961, 1971, 1981 or 1986) series are maintained. However, individual series cannot be added together meaningfully. Thus, while they facilitate time series analysis, they should not be used to analyse the structure of the aggregate.

An additional problem in compiling the time series over this long period arises from the fact that the classifications on which the input–output tables are constructed change over time. In particular, annual tables covering the period 1961 to 1980 have been compiled on the basis of the 1970 SIC with 203 industries at the worksheet level, while those from 1981 onward are based on the 1980 SIC with 243 industries. To overcome the discontinuity in the time series and yet maintain as detailed a number of industries as possible, an aggregation link (L) level, which provides a continuous time series over the whole period, is published. This consists of 170 industries. Two useful aggregations at the medium (M) level (with 61 industries) and the small (S) level (with 22 industries) are also published, together with certain selected aggregates. It is possible to aggregate any combination of the published individual series and maintain the same rate of growth as if the aggregation were done with the 1961, 1971, 1981 or 1986 constant price series. The series to be aggregated should first be expressed in the prices of the original base year (1961, 1971, 1981 or 1986) by constructing indexes with that base year equal to 100, and multiplying them by the values at current prices for that base year. The results may then be added and the aggregate obtained converted back to 1992 prices using the same procedure (i.e., constructing an index with 1992 as its base and multiplying it by the value at current prices for 1992).

Sources of deflators

The main data source of deflators for manufactured goods is the Industrial Product Price Indexes (IPPI) produced by Statistics Canada's Prices Division. Prior to 1981, deflators were based on Industry Selling Price Indexes (ISPI). Unlike the IPPI, which represent commodities across all producing industries, the ISPI were constructed for representative commodities sold by specified industries. For selected machinery and equipment commodities, deflators are taken from Machinery and Equipment Price Indexes (MEPI) classified by commodity and industry of purchase, which is also produced by the Prices Division. For non-manufactured goods, such as agricultural and mining commodities, unit value deflators are derived from production volume data obtained through Statistics Canada surveys or censuses of the producing industries. Deflators for construction are developed in the Income and Expenditure Accounts Division from price information produced by the Prices Division. The Income and Expenditure Accounts Division carries out a quarterly deflation of over 400 expenditure categories of the Income and Expenditure Accounts in order to derive expenditure aggregates at constant prices. The Final Demand Matrix of the input–output accounts is identical in structure to the expenditure accounts of the Income and Expenditure Accounts. Indeed, the two sets of accounts are reconciled at the expenditure category level at current prices. There are some differences in the deflation of the two accounts. Deflation of the Income and Expenditure Accounts is carried out on data denominated in purchaser prices, and with less commodity detail than in the input–output accounts. Except for personal expenditure, which is deflated both at purchaser prices and basic prices, input–output commodities are deflated in basic prices. It is expected that when added to the deflated margins and aggregated over all items in an expenditure category, the input–output estimates should approximate the income and expenditure results for that category. Moreover, for construction and some service commodities, the income and expenditure deflators are identical to what is required for input–output commodities.

Deflators for imports are constructed mainly from price and other trade data obtained from the International Trade Division.

Primary inputs purchased by governments and non-profit institutions serving households, which are shown under non-business industries in the Use Matrix, consist of labour income and capital cost allowances. Labour income is deflated based on employment and labour costs from sources within Statistics Canada. Price indexes for capital cost allowances are constructed using data on fixed capital flows and stocks from the Investment and Capital Stock Division.

Deflators for services are obtained from a variety of sources. Deflators for services purchased directly by

households, many of which are developed by the Income and Expenditure Accounts Division, are largely based on the CPI. The Prices Division now publishes price indexes for the services of consulting engineers, long distance telephone services for business, and informatics professional services. This includes hardware and software consultative services, computer facilities management, and system maintenance services. In other cases, reliance is placed on volume, cost and price data from subject matter divisions, other divisions in the CSNA, other government departments and other sources.[14]

Differences between input–output tables and other components of the Canadian System of National Accounts

Unlike input–output tables at current prices, which are completely integrated with the Income and Expenditure Accounts (IEA) and parts of the Balance of International Payments, there are minor differences between the constant price tables and their counterparts in these two accounts. Values in the income and expenditure accounts are at purchaser prices, while the input–output tables express values at basic prices with separate margins for transportation, distribution and taxes. Deflation of commodities at basic prices and of margins do not yield the same result as deflation of the purchaser price estimates undertaken at a different level of detail and with different price indexes.[15] However, the deflation of the purchaser value of personal expenditure in the input–output tables with consumer price indexes[16] has brought the two estimates closer together. But the differences in commodity detail and the treatment of items not deflated with CPI deflators mean that some differences remain. The two accounts are not reconciled.

Table 2.4, which compares the estimates of total GDP at market prices at constant prices as well as the year-to-year percentage changes in the input–output accounts and the IEA, points to only minor differences in the results. Over the 35-year period, 78% of the differences range between zero and 0.3% with a modal difference of 0.1%. On the other hand, a difference of 1.0 % occurs twice. The average annual rates of growth over the long periods, are identical: 5.3% for 1961 to 1971, 4.7% for 1961 to 1981, 2.3% for 1981 to 1996 and 3.7% for 1961 to 1996.

Annual estimates of GDP by industry derived from the input–output tables at constant prices serve as annual benchmarks for the monthly estimates of real GDP at factor cost by industry produced by the Industry Measures and Analysis Division, as well as for the annual provincial estimates of real GDP.

Quality evaluation

It is difficult to assess the quality of estimates based on diverse data sources and methodologies. However, the quality of constant price data may be evaluated on the basis of an assessment of the current price data and on the quality of the deflators. Deflators may be classified as ranging from very high quality (level 1) to merely acceptable (level 3). The highest quality is assigned to deflators based on price indexes of commodities directly covered in a price survey, or if they are constructed from quantity and value data of homogeneous commodities from production surveys or other records in which the information is adequate in coverage and detail. A lower-quality rating is given where price indexes are built from partial information or are proxies, or where there are conceptual and definitional problems in the measurement of price or output.

Examples of deflators, which receive the highest rating, include many of the manufactured commodities, which are based on sample surveys of prices. High ratings are also given to a number of primary commodities, which are developed from quantities and values from production surveys. On the other hand, many of the service commodities are subject to data deficiencies, as well as conceptual and definitional problems in the measurement of price or output.

An ordinal quality rating (1, 2 or 3) appears in the publication, *The Input–Output Structure of the Canadian Economy* (Statistics Canada 1987). These ratings are applied to the outputs, inputs and gross domestic product of industries and to the expenditure of each final demand category. If the deflators of the main outputs or intermediate inputs of an industry or items of a final demand category are very high quality, then the constant price estimate will have the same rank as the current price estimate. On the other hand, if the deflators are deemed lower quality, a current price rank of 1 may become 2 or 3 for constant price. Constant price GDP in the business sector is obtained residually, and the evaluation of quality is dependent on the ratings given to the constant price outputs and intermediate inputs. For the non-business sector, which is directly deflated with the assumption of no change in productivity, quality is based on the values at current prices and the deflators.

[14]For more detailed information on deflators for goods and services see chapters 3 and 4.
[15] See also Statistics Canada, 1989, *A User Guide to the Canadian System of National Accounts,* p. 30.
[16] See page 21.

Table 2.4
Comparison of Constant Price Estimates of GDP at Market Prices Between the Input–Output (I–O) and National Income and Expenditure Accounts (I–E), 1961 to 1996

	Values		Changes		
Year	I–O	I–E	I–O	I–E	Difference
	millions of 1992 dollars		percent		
1961	220,366	220,816	-	-	-
1962	234,502	235,900	6.4	6.8	-0.4
1963	246,727	247,944	5.2	5.1	0.1
1964	263,081	264,174	6.6	6.6	-
1965	280,836	281,249	6.8	6.5	0.3
1966	299,944	299,689	6.8	6.6	0.2
1967	309,078	308,639	3.0	3.0	-
1968	325,806	325,147	5.4	5.4	-
1969	342,960	342,468	5.3	5.3	-
1970	351,044	351,434	2.4	2.6	-0.2
1971	369,974	370,859	5.4	5.5	-0.1
1972	391,262	390,702	6.0	5.4	0.6
1973	420,603	418,797	7.5	7.2	0.3
1974	436,822	436,151	3.9	4.1	-0.2
1975	442,292	445,813	1.2	2.2	-1.0
1976	467,253	470,291	5.6	5.5	0.1
1977	482,332	486,562	3.2	3.5	-0.3
1978	499,639	506,413	3.6	4.1	-0.5
1979	520,235	527,703	4.1	4.2	-0.1
1980	532,504	535,007	2.4	1.4	1.0
1981	551,581	551,305	3.6	3.0	0.6
1982	534,564	535,113	3.0	2.9	0.1
1983	549,701	549,843	3.0	2.8	0.2
1984	580,163	581,038	5.5	5.7	-0.2
1985	610,963	612,416	5.4	5.4	-
1986	628,601	628,575	2.8	2.6	0.2
1987	653,539	654,360	4.0	4.1	-0.1
1988	683,771	686,176	4.6	4.9	-0.3
1989	700,253	703,577	2.4	2.5	-0.1
1990	701,546	705,464	0.2	0.3	-0.1
1991	690,805	692,247	1.5	1.9	-0.4
1992	698,543	698,544	1.1	0.9	0.2
1993	714,473	714,583	2.3	2.3	-
1994	748,081	748,350	4.7	4.7	-
1995	768,812	769,082	2.8	2.8	-
1996	781,861	782,130	1.7	1.7	-
1961–1971			5.3	5.3	-
1961–1981			4.7	4.7	-
1981–1996			2.3	2.3	-
1961–1996			3.7	3.7	-

- nil

Sources: Statistics Canada, 1961–1996, Input–Output Tables.
Statistics Canada, 1998, *National Economic and Financial Accounts, Quarterly Estimates, 1961 – 1992*.
Statistics Canada, Various Years, National Income and Expenditure Accounts.

CHAPTER 3 DEFLATORS FOR GOODS

Overview

Generally, goods are deflated either with unit value indexes derived from surveys or censuses of production, or by price indexes based on price surveys or on administrative data as in the case of imports. As most goods are traded in the market and their unit of measurement is readily identifiable, the information for such measures has been relatively easy to obtain. However, there are cases where the price movement of a commodity may be difficult to measure. These may arise because of the complex nature of the commodity or because of rapid changes in technology or commodity specification. Institutional arrangements, such as intracompany trading, add to these difficulties as they may obscure the pricing process. In such cases, special procedures such as the use of indicators from the input side may be substituted.

Introduction

Since the data year 1986, the input–output tables have a worksheet classification consisting of 670 commodities, of which 561 can be viewed as goods, 89 as services, 13 as non-business (non-market) commodities, and 7 as fictive commodities. Prior to 1986, the input–output classification consisted of 607 commodities, of which 539 were goods. To maintain continuity between this classification and the new one, a 'link' aggregation of 469 commodities was established.

Goods may be distinguished from services because they are tangible and their physical characteristics can readily be observed. In most cases, it is possible to factor them into quantity and price components. Services are delivered as they are produced and tend to be obscure in that it is often difficult to identify them exactly. Consequently, it is difficult to determine the price and quantity components of services. The distinction is not always very clear as some goods are bundled with services. For example, the price of an automobile covers services performed during the warranty period. Also, most goods are purchased for the services they deliver. For the purposes of this study, goods are subdivided into major categories that are as homogeneous as possible with respect to the type of methodology used to derive deflators.

Agricultural products

As a rule, the sources of output deflators for agricultural commodity deflators are farm cash receipts and quantity statistics compiled by the Agriculture Division of Statistics Canada. These data are usually subdivided by element and province of production, in order to generate the most homogeneous breakdown possible. For example, the commodity Fresh fruit, excluding tropical is broken down into 12 elemental groupings (apples, pears, peaches, etc.). A unit value index is constructed by revaluing the quantities of each subgroup at base-year prices and calculating an implicit price index by dividing total farm receipts for the commodity by the sum of the revalued (constant price) estimates. This is a Paasche formula.[17] This implicit price index (IPI) is used to deflate the value of the output of the commodity at current prices.

For some grain commodities, producers receive a partial payment on delivery of the crop to marketing boards and a final payment after the crop is sold. In such cases the deflator is calculated with final payments accrued to the year in which the crop is grown. The constant price output of wheat is calculated by projecting the base-year value of output on the basis of an index of the quantity of crop produced and adjusting the result for quality. An implicit price, calculated with this estimate and its current price equivalent, serves as the deflator for the commodity.

Hay and straw output is deflated with a volume index calculated from crop data produced by the Agriculture Division. For services incidental to agriculture and forestry, a combination of Farm Input Price Indexes applicable to services to agriculture and an index of average weekly earnings for forestry services is used.

Fishing and trapping products

For fisheries products, a unit value index is calculated based on the quantity and landed value of the catch, by species. The information is provided by Fisheries and Oceans Canada. Unit values for fish produced by agriculture (fish farming) are calculated separately.

A unit value index, based on production data by type of fur, is constructed for the commodity Hunting and trapping products.[18]

[17] $IPI=\Sigma P_n Q_n/\Sigma P_o Q_n$, where P=price, Q=quantum, o=base year, n=year of observation

[18] See Statistics Canada, Various years, *Fur Production.*

Forestry products

The two main forest commodities, Logs and Pulpwood, are deflated with unit value indexes based on data from a selected panel of respondents to the annual production surveys by the Manufacturing, Construction and Energy Division (MCED). Purchaser price indexes for these two commodities, calculated by the Prices Division as a component of the Raw Material Price Index, are monitored for price movement comparison. Unit value indexes for Poles, pilings, bolts, etc. and for Fuel wood and other crude wood are also based on value and quantity data from the MCED.[19]

Custom forestry consists of revenue by forest operators providing services using their own labour in conjunction with specialized equipment. Consequently, the deflator is a weighted average of the index of average weekly earnings and the implicit price index of the capital stock of the forestry industry.

Mining products

Metallic minerals

Five metallic minerals are classified at the worksheet level: Gold and alloys in primary forms, Radioactive ores and concentrates, Iron ores and concentrates, Bauxite and alumina, and Other metal ores and concentrates. Gold and alloys in primary forms is deflated with Industrial Product Price Indexes (IPPI) for refined gold bullion and precious metal fabricated basic products obtained from the Prices Division. Iron ores and concentrates are deflated with unit value indexes derived from the data published in the *General Review of the Mineral Industries.*[20] The commodity Bauxite and alumina is deflated with a unit value index based on the quantities and values of imports of bauxite ore and alumina. Data from the Census of Mines combined with published unit values are used to calculate deflators for Radioactive ores and concentrates and Other metal ores and concentrates.[21] The metal value content of nine ores is determined at current and constant prices. Smelting and refining charges are removed from these shipment values. Volume indexes are calculated for both commodities and these are multiplied by base-year values to derive series at constant prices. The price indexes are determined implicitly.

[19]See Statistics Canada, Various years, *Logging Industry* and *Canadian Forestry* for survey details and other information.
[20]Statistics Canada, Various years, *General Review of the Mineral Industries*.
[21]Statistics Canada, Various years, *Metal Mines.*

Non-metallic minerals

This group consists of eight input–output commodities: Sulfur, crude and refined; Asbestos, crude and milled; Gypsum; Salt; Peat; Clays; Natural abrasives and industrial diamonds; and Other crude minerals. Clays and Natural abrasives and industrial diamonds are deflated with IPPI, but unit value indexes are constructed for the other commodities using information from the Annual Census of Mines.[22]

A unit value index, based on mining data, is also used for deflating Potash, which, prior to 1986, is classified as part of the commodity Fertilizers, excluding nitrogenous.

Coal, crude oil and natural gas

Unit value indexes calculated from production data from the Census of Mines are used for the deflation of Coal.

The marketable production of light and heavy crude oil, synthetic crude oil, condensate and pentanes-plus is used in the calculation of a deflator for Crude mineral oils. The quantities are converted to cubic metres and a unit value index is calculated. The same methodology is used for Natural gas, excluding liquefied.

Data on production volume are available from provincial government records.[23] This industry includes those enterprises whose principal activity is oil and gas production from wells or asphaltic sands, as well as natural gas processing plants.

Quarry and sand pit products

Production of sandpits and quarries is classified to three commodities in the input–output tables: Sand (excluding silica) and gravel; Stone and silica sand for industrial use; and Stone for construction.[24] Unit value indexes based on production data[25] are used as deflators.

Services incidental to mining

In the input–output tables, the commodity Services incidental to mining is considered as an output of the Ser-

[22]Statistics Canada, Various years, *General Review of the Mineral Industries*.
[23]See Statistics Canada, Various years, *Crude Petroleum and Natural Gas Production*.
[24]For deflation, the two stone commodities are aggregated to one, Stone crude, for historical continuity, but greater detail is maintained in the worksheets.
[25]See Statistics Canada, Various years, *Quarries and Sand Pits*.

vice industries incidental to mineral extraction. This commodity is an amalgam of all services connected with mining, and oil and gas exploration and production. For deflation, the aggregate expenditure on these services is broken into the following categories:

- Contract drilling for petroleum
- Miscellaneous services incidental to petroleum and natural gas
- Other contract drilling, mainly diamond
- Other services incidental to mining

Beginning in 1986, the deflator for Contract drilling for petroleum is based on a well-cost study prepared by the Petroleum Services Association of Canada and Winterhawk Petroleum Consulting Services.[26] This is an annual study, which provides detailed costs on drilling and completion of 'typical wells' in 12 high-activity areas in western Canada. These costs, which originated from information received from service companies, suppliers and contractors, are an approximation of conditions in an area at a particular time. The survey provides a breakdown of costs by component. A deflator was derived by making annual comparisons of the cost per metre per well of total drilling and producer costs of identical wells. Safety and environmental costs as well as horizontal drilling were excluded from the indexes between 1986 and 1992, but included in later years. In 1998, there was a break in the series because new wells were defined. The index was calculated by using cost estimate changes for each of the components.

Deflators based on the average cost per metre now deflate Other contract drilling, mainly diamond.

The base-year value of the commodity Miscellaneous services incidental to petroleum and natural gas is moved on the basis of the gross output at constant prices of the petroleum and natural gas industry. The deflator for Other contract drilling, mainly diamond is used to deflate the last component, Other services incidental to mining.

Manufactured goods

Price indexes generated from the data collected for the construction of Industry Selling Price Indexes (ISPI), recalculated in co-operation with the Prices Division, were the main source of deflators for manufactured goods between 1961 and 1981. Data on the ISPI were classified and weighted to be compatible with the goods and services classification used in the input–output tables.

Since 1981, the ISPI have been replaced by IPPI. There is a subtle distinction between these two categories of indexes. The ISPI are constructed for representative products sold by specific industries in order to estimate measures of price change for the output of those industries. On the other hand, IPPI are more closely linked to the input–output analysis method, in the sense that they are constructed to reflect product prices over all producing industries. This is more in line with the hypothesis that price movement variation between different industries manufacturing the same product is less significant than price movement variation between different products manufactured by the same industry.

The publication on the concepts and methods of the IPPI outlines certain features of these price indexes, which make them completely consistent with the valuation of flows in the input–output tables. In particular, goods are priced free on board (f.o.b.) establishment, so that pricing excludes taxes on production, transportation by common carrier and distribution services performed by trade services.[27]

These base-weighted price indexes are published monthly. An annual index is calculated by taking the mean of the 12 monthly indexes over the calendar year.

The IPPI are well suited as deflators for the manufacturing sector, because values from the Make Matrix are the source of their base period weights. The lowest level at which both shipment values and price indexes exist is the Principal Commodity Group (PCG) level. The PCG system is a concordance of various classification systems used before the introduction of the Harmonized System of classification in 1988. Although adopting the harmonized system has generally made the PCG classification obsolete, it has been necessary to redefine it in terms of the Harmonized System to maintain a more detailed relationship of prices to commodities for deflation purposes. The new classification is now referred to as the Principal Commodity Group Aggregation or PCGA. Shipment values at the PCGA level are deflated with a matching set of price indexes and aggregated to the input–output worksheet commodity level using current weights. The resulting implicit price index represents the deflator for the commodity. Currently, 1057 values and price indexes are used to deflate 469 input–output commodities in the manufacturing sector. While the elemental price indexes at the PCGA are fixed weighted, the aggregated price indexes are of the Paasche formula-

[26] See Rispoli and Kitchen, 1997, "Methodology on the Deflator for Oil and Gas Drilling."

[27] Statistics Canada, 1986, *Industrial Products Price Indexes,* pp. 15 and 16.

tion[28] and yield a closer approximation to the desired Laspeyres quantity series.

While most manufactured products are deflated by the IPPI weighted with shipment data from the Manufacturing, Construction and Energy Division (MCED) there are several cases for which special procedures and modifications should be noted.

Print media

Revenues from printed publications include the proceeds of sales and of advertising. These are distinct commodities and are deflated separately. Advertising revenues are deducted from gross revenues of publications and the residual is used to weight the IPPI relevant to the deflation of these publications. The commodities affected are Newspapers, Magazines and periodicals, and the pamphlets component of Greeting and post cards, maps, etc.

For the commodity Advertising in print media, a revenue-weighted index of advertising rates is constructed for five groups of publications: trade publications, daily newspapers, consumer magazines, community newspapers and agriculture publications. For the individual publication in each group an index of the average rate per page or line adjusted for circulation (a given rate per page being lower for a larger circulation) is calculated. At the group level the circulation is adjusted for frequency and a price index is calculated by weighting the individual indexes by their share of the frequency-adjusted circulation. Weighting the price indexes of the groups by their revenues derives the deflator for the commodity.

Advertising rates and circulation by media are obtained from the publication *Canadian Advertising Rates and Data (CARD)* and from *Media Digest*. Revenue data are obtained from the Manufacturing, Construction and Energy Division.

Revenues from specialized publishing services are deflated with the Consumer Price Index for reading material and other printed matter.

Custom work

Many manufacturing establishments, in addition to producing tangible goods, perform work on materials provided by customers. Six custom work commodities are classified in the manufacturing sector (Tailoring, Meat and food, Woodworking, Metalworking, Refined petroleum and coal, and Other). Deflators for such services are normally calculated on the basis of an index of average weekly earnings, representing the labour component, and the implicit price index of the capital stock, to reflect the use of capital in the provision of the service.

Computers, video units and printers

Computers and peripherals are characterized by rapid quality improvements. Since 1971, hedonic indexes, which were developed for central processors, disk drives, printers, and displays by IBM and the U.S. Bureau of Economic Analysis, have been used as deflators.[29] Microcomputers have been included since 1982. For the deflation of output, these subindexes are combined with weights based on Canadian production obtainable from the Census of Manufactures.[30] Since most Canadian output of these commodities consists of parts, an unweighted average of the hedonic deflators was included to deflate the parts portion of the commodity. Weights based on import data from the International Trade Division were used for imports. Prior to 1986, computers and peripherals were classified under the commodity Office machines and equipment, along with typewriters, accounting and business machines and cash registers. Since the deflator for the latter was quite different from that of computers and peripherals, a specific price adjustment was made for the industry producing them (see Chapter 6).

Refined petroleum products

Extrapolating base-year values by volume indexes of product outputs[31] deflates the principal outputs of the petroleum refining industry. The main products are gasoline and various types of fuel oil, but oils and greases for lubrication, liquefied petroleum gases, etc. are also included. The output of gasoline is adjusted for quality change in the mix of gasoline sold. For fuel oil, the quantity index is calculated for each type of product separately.

[28] $P_{n/o}^{(agg)} = 1/\Sigma(P_o^i/P_n^i)*(P_n^i Q_n^i/\Sigma P_n^i Q_n^i)$, where $P_{n/o}^{(agg)}$ indicates the composite price index between the base period and the current period, PQ is the transaction value and P the price index of element i; n denotes the current period and o the base period.

[29] Cole *et al.*, 1986, "Quality-Adjusted Price Indexes for Computer Processors and Peripheral Equipment," pp. 41–50

[30] See also Miller, 1996, "Deflation of Computers in the Canadian Input–output Accounts," pp. 93–100.

[31] See Statistics Canada, Various years, *Refined Petroleum Products*.

Aircraft parts and equipment, and shipbuilding

There are two problems characteristic of shipbuilding that make the pricing of output particularly difficult. First, product specifications tend to vary from year to year and estimates of output often include a significant portion of work in progress. As a result, the output deflator is approximated by the implicit price index of intermediate inputs and labour inputs combined.[32] This method is also used for the deflation of Aircraft parts and equipment.

Machinery and equipment

The machinery and equipment categories of the Final Demand Matrix represent gross additions to capital by industry of purchase. Prices Division publishes a set of Machinery and Equipment Price Indexes (MEPI), which are purchaser price indexes[33] measuring price change on these transactions.[34] The industry and commodity designations used are those of the input–output tables. Furthermore, the expenditure weights for the 51 industry groups and 33 commodities are derived from input–output data. The MEPI indexes are calculated for domestic machinery and equipment and for imports. Domestic prices used are manufacturers' selling prices f.o.b. plant. Import prices are represented by U.S. Bureau of Labor Statistics Producer Price Indexes and by a few price series from other countries, adjusted for changes in the exchange rates and for custom tariffs. Both domestic and foreign prices are adjusted for changes in the federal sales tax up to the first quarter of 1991 and for changes in the effective rate of the goods and services tax thereafter. However, as the input–output tables are deflated in basic prices, these taxes are removed prior to deflation.[35] Capital expenditure on computers is deflated with MEPI constructed from hedonic price indexes with weights based on Canadian production data or import data.

The import deflator for commodities deflated with MEPI is a weighted average of import MEPI by purchasing industry. Prior to 1986, the output of these commodities was also deflated as a weighted average of domestic MEPI. However, since 1986, the output of these commodities is deflated by IPPI.

The most important criterion for deciding to deflate commodities with MEPI is the importance of purchases for fixed capital formation as recorded in the Final Demand Matrix relative to their intermediate use. Currently, 33 commodities are deflated with the MEPI series.

Construction

In the input–output tables, construction is subdivided into eight commodities: Residential; Nonresidential building; Road, highway and airport runway; Gas and oil facility; Dams and irrigation projects; Railway and telecommunications; Other engineering; and Repair construction. The deflation of these commodities is accomplished using deflators developed by IEAD.[36]

Investment in Residential construction is deflated with price indexes. Construction work put in place for single dwellings, semi-detached dwellings and row housing is deflated by the new housing price indexes (excluding land). These indexes measure changes in the contractors' selling prices of new residential houses, where detailed specifications remain the same between two consecutive periods.[37]

Revenues from the construction of apartments are deflated with an apartment price index.[38] These indexes measure changes in the contractors' selling price of apartment building construction. They relate to both general and trade contractors' work, including overhead and profit but excluding the cost of land, land assembly, design and development, and real estate fees. Alterations and improvements to existing housing are deflated with a specially constructed labour and materials price index, weighted on the basis of information from the Homeowner Repair and Renovation Survey.[39] This index is made up of a residential material price index based on IPPI (60%) and a union wage index for the construction industry (40%).[40]

Deflation of Non-residential building construction is carried out using non-residential construction output price indexes[41] for five types of structure (office buildings, ware-

[32]See section above on Services incidental to mining.
[33]Basic price plus federal sales tax or goods and services tax.
[34]Statistics Canada, Second quarter 1993, *Construction Price Statistics*, pp. 62–69.
[35] If the MEPI received from the Prices Division is denoted by $P_n(1+t_n)$ for the current year and by $P_o(1+t_o)$ for the base year, where P and t represent the basic price index and tax rate, and the subscripts n and o indicate the current and base years respectively, the adjustment is achieved by dividing the Prices Division measure by the tax index ratio $(1+t_n)/(1+t_o)$.
[36]Details of the methodology are available in Statistics Canada, 1990, *Guide to the Income and Expenditure Accounts*.
[37]Statistics Canada*, 1993, Construction Price Statistics*, Table 4.1.
[38]*Ibid.*, Table 5.1.
[39]See Statistics Canada, Various years, *Homeowner Repair and Renovation Expenditure*, and Statistics Canada, *1990, Guide to the Income and Expenditure Accounts,* p. 96.
[40]Statistics Canada, Various years, *Construction Price Statistics,* pp.14, 20, and tables 1.1, 1.2, 2.1 and 2.2.

houses, shopping centres, industrial buildings and institutional buildings) and weighted by current estimates of investment by type of structure.

The deflation of Engineering construction is also carried out by structural category to the extent possible, using a mixture of output price indexes and price indexes based on inputs of materials and labour. Deflation is carried out separately for hydro, thermal and nuclear generating plants, power transmission and distribution lines, transformer lines, dams and irrigation, oil gas and water storage tanks, sewage systems, oil and natural gas refineries, telecommunications plant, exploration and development drilling, railways, highways and other engineering structures. Output price indexes are employed, except for railways and sewage disposal plants indexes. Price indexes for storage tanks are no longer available and they have been discontinued for the electric utility construction and telecommunications plant[42] indexes since the reference year 1998. Railways, sewers and sewer disposal plants and other engineering use an input price approach.

Finally, Repair construction is deflated by an implicit price index for the alterations and improvements component of residential construction discussed above.

Electric power, gas and other utilities

Electric power output is deflated by unit value indexes that are based on quantity and value data for residential and agricultural consumption, commercial/industrial consumption and exports.[43] Exports are deflated with a unit value index based on export data.

Gas distribution is the output of the delivery of gas by local distributors. The deflator is calculated based on the distribution of gas by type of service (residential, commercial, industrial and direct) and province. Values at constant prices were derived by projecting base-year distribution revenues for each category by indexes of the volume of gas sold. These values were summed over all categories and divided into total revenues at current prices to obtain a deflator for Gas distribution.[44]

The commodity Other utilities consists of water (1% or less), private garbage disposal (over 90%), and steam (about 6%). The deflator is constructed based on an index of average weekly earnings for other utilities for waste disposal, a unit value index for steam and a consumer price index for water.

Import deflators

Specific import deflators are constructed and used for the deflation of imports if adequate data are available—otherwise, output deflators are used. These deflators are also used for the deflation of re-exports. This section deals with deflators for both goods and services.

For the deflation of goods, the main data source of import price indexes is the International Trade Division.[45] These indexes are made available at a very high level of detail on a customs or Trade of Canada basis. They are based on unit values, United States Producer Price Indexes (PPI) or other foreign price indexes. All non-Canadian price indexes are adjusted for exchange rate fluctuations. These indexes are supplemented with MEPI and other deflators constructed in the Input–Output Division from quantity and value data in the International Trade Division publications,[46] U.S. Producer Price Indexes[47] and Japanese export price indexes.[48]

In the input–output accounts, imports are valued at the Canadian border inclusive of duties; that is, the valuation includes all charges involved in conveying imports to the border plus import duties.[49] Three distinct procedures are followed to deflate imported goods. First, for deflators constructed from trade data and foreign producer or export price indexes,[50] the import deflator is applied to the value at current prices net of transportation to the border and customs duties. Transportation to border charges are deflated with the domestic transportation margin defla-

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[41] *Ibid.,* Table 6.1.
[42] *Ibid.*, Tables 9.1, 10.1 and 10.2.
[43] See Statistics Canada, Various years, *Electric Power Statistics*, Vol. 2.
[44] See Statistics Canada, Various years, *Gas Utilities, Transport and Distribution Systems.*

[45] The methods used to construct merchandise trade price and volume indexes are described in the Statistics Canada reference paper *The 1971-Based Price and Volume Indexes of Canada's External Trade*.
[46] See Statistics Canada, Various years, *Imports, Merchandise Trade*.
[47] U.S. Bureau of Labor Statistics, Various years, *Producer Price Indexes, Annual Supplement*.
[48] Bank of Japan, Various years, *Price Indexes Annual*.
[49] See Statistics Canada, 1987, *Input–Output Structure of the Canadian Economy, 1961–1981,* p. 23.
[50] As indicated, trade data are valued on a customs basis, that is f.o.b. place of direct shipment to Canada (see Statistics Canada, Various years, *Imports, Merchandise Trade (1998)*, p. vii), and deflators constructed from foreign producer or export price indexes are based on the value in the foreign country, but adjusted for exchange rate variations.

tor. Customs duties are calculated in constant prices by applying the base-year rate to the value of the import at constant prices net of transportation to the border and duties. An implicit price index based on the sum of these three components is calculated for the commodity. A slightly different procedure is employed when import MEPI are used as deflators. In this case, transportation to border is deducted from the basic price value of the import and deflated as above, and the residual is deflated with the tax adjusted MEPI.[51] Finally, where output deflators are used as proxies, the deflator is applied to the basic price valuation of the import.

Imports of services are deflated with output deflators, except for sales of services by head offices to motor vehicle subsidiaries, for which a special procedure is used. In real terms such services are assumed to be a constant proportion of value added.

Export deflators

Exports consist of commodities produced domestically, hereafter referred to simply as exports, and re-exports which are goods imported and re-exported without any value being added to them. Re-exports are deflated with import deflators.

Since exports are part of the production of domestic industry, output deflators are widely used for the deflation of exports. However, it is conceivable that there are cases where the price movement of an exported product differs from that prevailing in the domestic market. For this reason there are some important cases where special export deflators have been regarded as appropriate. For some of the more important manufactured goods such as woodpulp and newsprint, special export IPPI have been constructed by the Prices Division. In other cases, exports may represent only a subset of the goods included in an input–output commodity. For example, the output of the commodity Metal ores and concentrates includes nickel ore, but its export contains little or none of it. Finally, for some relatively homogenous commodities, such as wheat and crude oil, readily available volume data are used to construct suitable export deflators.

[51]See section above on Machinery and equipment.

CHAPTER 4 DEFLATORS FOR SERVICES

Overview

Quality ratings for the constant price estimates are relatively weaker for the service commodities as there are more data deficiencies and conceptual and definition problems compared with goods. Prices of services purchased directly by households are normally measured by the Consumer Price Index (CPI). This index is measured at purchaser prices and may be converted to a basic price base by removing any tax or other margins that may be included in the index. However, excluding the price index for consulting engineers and price indexes for professional informatics services and business long distance telephone services, price indexes based on surveys are not available. As a result, price movements have to be measured indirectly by various methods, including the following:

- Volume and quasi-volume data are used to derive constant price estimates. Examples include volume series for radio and television advertising and estimates of volume for financial assets derived by deflating the current price values of these assets by a general price index.
- Unit value indexes deflate certain forms of transportation.
- Price indexes built for the household sector are used as proxies for the deflation of services purchased by businesses. Examples include the use of the price indexes of non-life insurance of households for business non-life insurance.
- Price indicators of major cost elements as proxies. For example, indexes of average weekly earnings are used to deflate the output of some business services. In other cases implicit price indexes for inputs have been used.
- Averages of base year and current year rates are used for a significant portion of trade margins.
- Finally, for some commodities where no appropriate proxy could be found, the CPI all-items price index is used. Examples include warehousing, courier services, and royalties and licences. It is considered that the use of a general deflator is preferable to a poor proxy.

Some of these indirect methods contribute to the degree of error in the estimates. Research and development of more direct measurement of price movement of service commodities is needed to improve the quality of the estimates.

Because of the great diversity of the service industries with respect to deflation, the sources and methods of deflation of the commodities produced by each industry will be described separately.

Transportation

The Transportation Industry includes passenger, freight and pipeline transport, specialty transport, services incidental to transport, as well as parking services and travel agent services.

Passenger transport services by rail, bus (city and interurban), subway, taxi and ferry are deflated with the appropriate consumer price indexes. Parking and travel agent services also use CPI deflators.

Air transport deflators for business and personal travel are derived from data on revenues and passenger-kilometres for selected classes of travel obtained from the Transportation Division.

Indexes for freight transportation have been constructed for water, rail, truck and air modes.

For Water transport, the deflator is calculated from information on the volume of freight carried by Canadian carriers on both domestic and international routes. The Transportation Division compiles these data from port activity information.[52]

The deflator for Rail transport is a unit value index calculated from revenue and tonne-kilometre data for interprovincial movement of 69 commodity groups. In addition, north and south Canada–United States freight movement is factored into the index. Freight subsidy payments on western grain are deducted from revenue in the calculations. The Dispute Resolutions Branch of the Canadian Transportation Agency provides the information and calculations.

In the case of Truck transportation, the deflator is based on unit value indexes of revenue and tonne-kilometres for 76 commodities classified by distance groups[53] from the domestic For-Hire Trucking (Commodity Origin/Des-

[52]See Statistics Canada, Various years, *Shipping in Canada*.
[53]See Statistics Canada, Various years, *Trucking in Canada*.

tination) Survey.[54] Volume indexes from the same survey are also used to check the results of this deflator. The results are compared with the Tornqvist index developed by Transport Canada using the same data. These unit value indexes have exhibited some volatility and are subject to quantity/quality mix problems in adjacent time periods. As a result, the deflator in any given year could be based on all of the above data plus any relevant information available on the trucking industry.

Air freight is deflated by a volume-based index derived from tonne-kilometre data published by Transportation Division.

Services incidental to transport is divided into services incidental to water, air, rail and other categories. The water category is deflated by a composite index of cargo-handling fees, harbour dues and pilotage fees as well as an index of average weekly earnings for revenues of marine shipping agencies, and salvage operations.[55]

Air and rail categories use volume indicators of the output of the total industry at constant prices.

Other services incidental to transport consist of freight-forwarding activity. This commodity is deflated with current weighted price indexes of truck, rail and water freight indexes.

Pipelines are used mainly to transport crude oil, natural gas, liquefied petroleum gases and petroleum products. For crude oil (domestic and export) and natural gas (domestic only) transportation, the base-year pipeline margin is multiplied by a volume index of the quantity of product (in cubic metre-kilometres) carried to obtain constant price margins. Constant price pipeline margins for exports of natural gas are calculated residually by subtracting the deflated basic value of gas exported, the tax margin and the wholesale margin from the deflated purchaser value.

Base-year margins on liquefied petroleum gases and petroleum products are also projected on the bases of product and distance measured in cubic metre-kilometres.

Storage and warehousing

The commodity Grain storage and handling is treated as a margin and the value at constant prices is estimated by projecting its base-year value by an index of the constant price value of each type and use of grain. Grain is moved from farms to primary elevators and then to terminal elevators before shipment to final buyers. There are a plethora of rates for elevation services, storage and a number of additional services including removal of dockage, cleaning and drying of grain where required. These rates vary by type of grain and terminal. They can only be used properly if the value of each of these activities can be isolated. Such a separation is not currently available. The value of grain purchased for intermediate and final use is recorded in basic prices in the Use and Final Demand matrices. The storage margin matrix records the storage costs associated with each of these purchases. For any year, the ratio of the cost of storage to the value of grain purchased summarizes the price of storage services per dollar of grain sold. Therefore, applying the base-year ratio to the deflated value of grain for subsequent years provides an estimate of the deflated value of storage. A deflator for the output of storage is calculated implicitly by summing all the values at constant prices so derived and dividing the result into the value of storage at current prices. This method assumes that there is no change in the structure of services between base years.

The commodity Other storage and warehousing is deflated with the CPI all-items price index. This is used because of the absence of any appropriate proxies. For example, the non-residential rental deflator, which appears to be closest, is considered unsuitable as a possible proxy for this commodity as it is based on class A office buildings and is too highly sensitive to the business cycle.

Communication

Communication services include three commodities at the W level aggregation: Radio and television broadcasting; Telephone and other telecommunications; and Postal services.

This sector is characterized by significant and ongoing changes involving new services. Over the last two decades, the voice transmission services of telecommunication carriers have expanded into data transmission and facsimile in one direction and from wired to wireless services in the other. Also, the sector is evolving from one dominated by monopolies to one that has become increasingly competitive as the regulatory authorities relax

[54]See also Ferland, 1990,"A Price Index for Truck Transport in the Canadian Input–Output Accounts," pp. 67–77.

[55]Sources of data include the Maritime Employers' Association; Logistic Stevedoring Inc.; the Port of Vancouver; the *Canada Gazette*; and Statistics Canada, Various years, *Shipping in Canada*.

controls. Indeed, telecommunication carriers and broadcasters are set to compete directly by offering the same services, as cable operators seek to provide telephone and Internet access services.

The value of output at current prices assigned to radio and television is based on revenues from advertising and from cablevision. The advertising service represents the air time bought by firms for advertising their product. The revenue generated by the sale of air time is a measure of output. From an advertising point of view, programming is an input to the industry to bring viewers in front of the screen. A number of factors influence the price of an advertisement, including the time of day, the time of the year, the viewers' age group, the type of program and the size of the market (local, regional, national). Relating advertising prices to the number and type of viewers or listeners could summarize all these factors.

The ideal deflator would be one where rates for particular time slots and viewing areas could be summarized into average rates, so that average changes in rates over time could be calculated. However, although some average rates are available for some of the regional and specialty stations for 15- and 30-second prime-time activity, there is no information with which to weight them. Moreover, information on national stations is in the form of very wide price ranges and could not be used. Therefore, to obtain revenue at constant prices the method is to estimate the real value of advertising on the basis of the number of audience or viewing hours of programs with which the advertisement is associated. Advertising derives its real value on the basis of effective accessibility. That is to say, it depends on the number of prospective buyers of the goods or services seeing the advertisement. As a result, there is an inverse relationship between the effective cost of advertising and the size of the viewing or listening clientele. For a given nominal rate, the real price of an advertisement will be smaller the greater its exposure to the viewing or listening public. Therefore, it is assumed that the real value of the advertisement is zero if there are no viewers or listeners. Nominal rates for prime-time television are higher than for times when there is less viewing. Extremely high nominal rates exist for advertising space at specialty television events like the Super Bowl, but when the size of audience is taken into account the real rate may be considerably lower. Constant price advertising revenues, therefore, are estimated by projecting base-year values by an index of audience/viewer hours. Dividing these results into the current price value can then derive an implicit price. For radio, audience information is obtained from the publication *Media Digest*.[56] For television, viewer data come from the Education, Culture and Tourism Division, which also publishes revenue data. In the absence of advertising rates, the use of audience/viewer hours as a projector is considered acceptable.

Cable services are delivered to subscribers in programming packages for a fee. Price changes are measured by the appropriate Consumer Price Index for cablevision, which is used as the deflator.

The telephone industry has been subject to significant changes relevant to the competitive environment and pricing over the last few years. Significant technological improvements have occurred with respect to wired services and switching equipment. Wireless services in the form of cellular telephones and satellite communication have appeared. Services now include voice, facsimile and data transmission. These changes have led to the entry of new firms into the market, making the service more competitive and leading to various new marketing arrangements.

In the deflation, the task is to measure the total volume of all forms of transfer provided by communications firms. A number of indicators, which consist of available volume data, are used to produce an estimate of these services. These include the number of toll calls, local service access lines, wide area access lines, cellular services subscribers, toll minutes of resellers, and other volume measures. The corresponding base-year revenues multiply the volume indexes. The results are summed and divided into the estimate at current prices to obtain a deflator.[57]

The rapid technological and structural developments taking place in this industry make it necessary to accommodate new data with new methods. Prices Division's new index measuring price changes for the use of wired services by business is now available from 1996 onwards and will be incorporated in the deflator.

Postal services are deflated by the CPI for postal services.

Private Courier services are deflated with the all-items CPI. The CPI for Postal services, which is based on the price of mailing a letter, is considered an inappropriate proxy for this item. Mailing a letter involves a monopoly with a controlled price in a mature market. The change in

[56]See Canadian Media Director's Council, Various years, *Media Digest*.

[57] Statistics Canada's Prices Division is producing a price index, beginning with 1996, for business long-distance telephone services.

price reflects not only economic but also political considerations. Historically, these prices do not reflect general price movements. Because Courier services are competitive, their price movement reflects market forces in this growing industry.

Wholesale and retail services

Wholesale and retail services allow the transfer of goods from the producer to the ultimate buyer. The treatment of these services in the input–output tables was examined in Chapter 2.

Financial services

Central bank services

The central bank is shown separately as an input–output industry producing a single commodity. At current prices, the output of the central bank is defined as the sum of its operating expenses. Since the central bank provides the infrastructure for the monetary system to operate, its real output has been computed to remain proportional to financial intermediary services indirectly measured (FISIM) at constant prices. In the input–output accounts, FISIM is produced by deposit-accepting institutions (i.e., banks, trust and mortgage companies and their subsidiaries and credit unions) and by sales finance companies. This method is problematic as it deviates from the measurement convention used at current prices. To be consistent with current price definitions of output equal to operating costs, output at constant prices will be calculated in future by deflating operating expenditures.

Bank, trust and mortgage company services

Canadian chartered banks (known as Schedule I banks), chartered banks (known as Schedule II banks—principally foreign bank operations in Canada), and trust and mortgage companies that are deposit-accepting are included in the input–output industry, Banks and other deposit-accepting intermediaries. A few other deposit-accepting institutions, such as Alberta Treasury Branches and Ontario Savings Offices, are also included here.

Both domestic and foreign banks are presented on an 'enterprise basis' in the production accounts of the Canadian System of National Accounts (CSNA). Their financial statistics are obtained from consolidated financial statements that incorporate subsidiary corporations of chartered banks, even though their subsidiaries would be classified in other input–output industries if they were independently owned. These subsidiaries include securities dealers and brokers, mutual fund operations, investment and wealth management companies, insurance carriers and other financial services operators. These institutions deal with both Canadian and non-Canadian clients. In the CSNA, both types of transactions are shown, although services provided to non-residents of Canada are shown as exports of Canadian production to the foreign sector.[58] All production measures relate to financial assets and liabilities that are booked in Canada.

Input–output tables show the production of the following seven commodities for Banks and Other Deposit Accepting Institutions:

- Imputed service charges
- Explicit service charges
- Stock and bond commissions
- Mutual funds cost of service
- Other financial intermediary services
- Insurance
- Real estate commissions

Items 2 through 7 are *all* explicitly charged services.

Imputed services

This item is a national accounting imputation for the services rendered by these institutions in intermediating between lenders and borrowers. These services are known as financial intermediation services indirectly measured (FISIM) and are fully consistent with recommendations of the revised International System of National Accounts (1993 SNA). FISIM is the difference between gross 'property income' (which may include sources other than interest) and interest expense. Production then includes items such as lease receivables but will generally not include revenues which represent realized capital gains (or losses) on disposition of property. By far the largest component of imputed services is the interest spread an institution earns by paying a lower interest rate on its liabilities than it earns on its assets.

The reports filed with the regulator, the Office of Superintendent of Financial Institutions (OSFI), make interest income and interest expense information available for each major line of business (e.g., saving accounts, residential mortgages). This level of detail is used to compute interest spreads (FISIM) by line of business and

[58]Prior to the historical revision of the CSNA, only services provided to Canadian residents were included in industry gross output and GDP. Services to non-residents were netted out based on information about the assets and liabilities of non-residents with chartered banks.

subsequently allocate values to CSNA sectors (i.e., to business industries, which include mortgages on real estate), persons, exports to the foreign sector and to separate out the interbank business. In the input–output accounts of the CSNA, charges allocated to the business sector are estimated by industry, and those allocated to governments are separated into various levels of government.

Imputed interest or FISIM output at constant prices is income from interest spreads that institutions would have earned with margin rates that prevailed in the base year on assets and liabilities expressed in base-year prices. Assets and liabilities should be converted to base-year prices by a simple deflation by the index of purchasing power of money. The all-items CPI is used for this purpose.

Interest spread on each line of business (e.g., credit card loans, term deposits) is estimated individually. This is done by choosing an interest rate that represents the cost of funds appropriate to a line of business. An interest margin for a line of business is estimated as the difference between the observed interest rate (e.g., the rate received on a loan, or paid on a deposit) and the cost of those funds. In practice, several rates are used corresponding to the term to maturity of each asset and liability. Total interest income, or FISIM, for each line of business is computed as the product of its margin rate and the average annual balance of the asset or liability in question during the year in base-year prices.

Using this approach, FISIM is calculated as imputed revenue each time funds are borrowed and each time they are lent out for each line of business. That portion of lending that is out of institutions' own funds generates FISIM when it is lent out.[59] Applying these base-year margins to assets and liabilities of the base year (in that year's own prices) yields FISIM at current prices for the base year. Conceptually, this is equal to net interest income earned in the base year. Computationally, this identity is maintained as a constraint in the calculation of margin rates. Furthermore, the average cost of funds for assets is constrained to be equal to the average cost of funds for liabilities, thus providing an additional element of consistency.

Explicitly charged services

The most significant service charges are securities commissions and underwriting fees earned through their security dealer subsidiaries, credit and debit card charges earned from transaction processing, mutual fund fees from their fund operations, and account management charges. These and other charges are detailed in consolidated statements of financial institutions submitted to the regulator. Only service charges earned on booked-in-Canada activities enter into the output and GDP calculation. Service charges make up financial institutions' second-largest source of income after net interest. They are allocated to various sectors of the CSNA and, in input–output tables, are further allocated by industry and level of government.

The Explicit service charges commodity consists of charges generally related to the operation of deposit accounts or for loans. To measure them at constant prices, base-year charges are projected by the year-to-year movements of the underlying service at constant prices. For instance, charges on retail deposits are computed by projecting the base-year value of these charges by the movement of the average balances of retail deposits at constant prices.[60] Charges on assets are calculated in the same way.

The commodity Stock and bond commissions at constant prices is calculated by deflating current price charges reported on the consolidated reports of banks by the price index for the output of this commodity by investment dealers. The price index for investment dealers' output is calculated based on data for all investment dealers, both those that are subsidiaries of banks (and whose production is recorded in this industry) and those that are independent.[61]

Bank income from mutual funds appears as output of the commodity Mutual funds cost of services. It is deflated by the implicit price index for the output of all (bank and non-bank) mutual funds (discussed below).

[59]Prior to the historical revision, the CSNA calculated imputed interest on all funds, including from lending of institutions' own equity. The 1993 SNA recommends that institutions' own funds be removed entirely from the calculation of FISIM, allowing no imputation for services rendered to borrowers when such equity is lent out by institutions. This approach would, incidentally, allow no imputation for the services of finance companies who may rely substantially on their own resources for lending. The CSNA, in both current and constant prices, imputes FISIM on the *lending* of own funds (based on the difference between the effective interest rate and the cost of funds) but imputes no services on the acquisition of the funds.

[60]Balances in constant prices are always calculated by simply deflating average annual balances by the index of purchasing power of money, taken as the all-items CPI.

[61]See the section below on investment dealers.

The Other financial intermediary services commodity mostly includes revenues earned from offering credit card and debit card services to businesses. At constant prices, this commodity's movement should reflect the volume of transactions effected by credit and debit card facilities of financial institutions (assuming no significant changes in quality occurs). As there are no direct data sources on the volume of transactions, two proxies are constructed to estimate this movement. First, the constant price movement of retail sales of goods and services is used under the assumption that these methods of payment make up a constant proportion of sales. Second, the movement of bank credit card balances at constant prices is used under the assumption that they are highly correlated annually with the volume of transactions.

Other financial services

Other financial services consist of royalties and licence fees (excluding natural resources), the stock and bond commissions and other income of investment dealers, imputed service charges of sales finance and consumer loan companies, mutual fund services, and pension funds.

Royalties and licence fees

This commodity is deflated by the all-items CPI as a general index of price inflation.

Investment dealer and brokerage services

Investment dealers and securities brokers are shown in two industries: Banks and Other Deposit Accepting Intermediaries, and Other Finance. Businesses that are subsidiaries of chartered banks are classified in the former, whereas those that are not presented in the consolidated statement of banks are classified in the latter industry.

Two main activities are measured: underwriting of securities and security brokerage services (both as principal and for clients). Production includes underwriting income, commissions and other revenues from security transactions, and other operating revenue.

Revenues from underwriting at constant prices are estimated by projecting base-year income with the volume of underwriting done by the industry. The movement of the latter is computed as the movement of total new issues (excluding those of the federal government) deflated by the all-items CPI to exclude changes in the purchasing power of money. Trading-related income at constant prices is estimated by projecting base-year commissions (by source) by an index of the aggregate volume of trading activity. The latter is computed as the amount of equities trading business in Canadian exchanges and the Canadian Dealing Network plus the amount of business conducted by Canadian companies in foreign markets. From the combination of the two main activities, an implicit output price index is computed for the industry. This implicit price is used to deflate the stock and bond commissions output shown as part of the output of banks as well as the part that appears as the output of the Other finance industry.

Imputed service charges, sales finance companies

A financial intermediation service charge (FISIM) is imputed for sales finance companies and shown as a single commodity in the input–output accounts. At constant prices, this imputation is calculated by a price deflator derived using a methodology similar to the one used for banking. The industry's base-year interest spread is projected by their assets at constant prices (assets deflated by the all-items CPI) to calculate output at constant prices. Sales finance services are only imputed on the company asset side since companies do not take deposits, but rather borrow the required funds on capital markets.

Mutual funds, cost of service

This commodity consists of sales charges or 'loads,' and investment management charges earned by mutual fund companies. The output of this commodity is deflated by a price index, which incorporates both revenue elements. The two types of charges are distinguished and deflated separately. Management expenses, which are charges for portfolio management and other expenses, are calculated at constant prices by projecting base-year charges by the value of assets under management at constant prices (i.e., assets deflated by all-items CPI). Sales or load charges, which are levied either at the purchase or redemption of units, are calculated by projecting the base-year value by assets under management in constant price.

Trusteed pension funds, cost of service

The cost of service of Pension funds is expressed as a separate commodity in the input–output tables. At constant prices, the cost of service is measured by projecting the base-year value by the funds' assets under management at constant prices. Assets are converted into constant prices by dividing them by the all-items CPI to return the assets' value to their purchasing power in the base year.

Insurance

The insurance industry in input–output accounts comprises Life insurance and Non-life insurance. The latter consists of property and casualty insurance and accident and sickness insurance. The life insurance industry also performs investment management services by offering segregated investment funds to the public. In both current and constant prices, life and non-life insurance data are estimated separately and then combined into one worksheet industry. At this level, input–output tables cover five separate commodities for the industry's output (Life insurance, Non-life insurance, Insurance commissions, Non-residential rental, and Other financial intermediary services).

Life insurance

The definition of output of life insurance in the CSNA was modified to agree with the concepts and methods recommended in the 1993 SNA. The latter defines output as premiums (net of reinsurance), plus investment income attributed to the funds held by carriers as technical (or actuarial) reserves, less claims due for the period, less changes in actuarial reserves. Some of the investment income of technical reserves originates from rental of non-residential real estate. This income is classified separately as the Non-residential rental commodity in the input–output tables, whereas other investment income is embedded in the value of the Life insurance commodity. Income related to segregated fund operations is shown as Other financial intermediary services and deflated by the deflator for this commodity.

At constant prices, the Life insurance commodity is computed by projecting the value of the commodity in the base year by the volume of life insurance. The aggregate dollar value of life insurance policies (owned or in force) represents the volume of insurance service provided to the policy holder before adjusting for changes in the purchasing power of what potential claims could buy. The 'volume' of life insurance is computed by deflating this value by the Canadian all-items CPI. Accordingly, the constant price value of policies owned by Canadians is used to compute real personal and intermediate expenditure on life insurance. Output at constant prices is based on worldwide activities of Canadian carriers. Data used to construct deflators are obtained from the Canadian Life and Health Insurance Association and the Superintendent of Financial Institutions.

Non-life insurance

Non-life insurance includes property and casualty insurance, and accident and sickness insurance. All output of accident and sickness insurance in Canada is included in the Non-life insurance commodity, including the part that is conducted by life insurance companies.

The output of property and casualty insurance in the CSNA matches the concept and measurement recommended in the 1993 SNA. Accordingly, output is defined as premiums earned during the period, less claims and expenses of claims adjustment, plus investment income attributable to technical reserves. At constant prices, output is estimated by projecting base-year output for each of the following three lines of insurance business: property insurance, automobile insurance, and miscellaneous (all other) insurance. For each line, the projecting variable is the value of premiums for the current year, deflated by an insurance premium price index taken from the CPI, or a weighted average of such price indexes. Since expenditure on insurance (the value of benefits received by policy holders) is defined as premiums net of claims and related costs, projecting this by premiums in base-year prices yields the value of current year benefits in the base year. Output at constant prices is allocated to appropriate final demand categories by deflating those expenditures by the implicit prices of auto, property and miscellaneous insurance. Accident and sickness insurance is not covered by the CPI. The output of accident and sickness insurance at constant prices is computed by projecting the base-year value by the number of persons covered for each type of insurance.

Insurance agents' services

Finally, the input–output insurance industry shows production services by agents involved in the sales and service of both life and non-life insurance. Most of the production of this commodity is from the Insurance and Real Estate Agent industry where independent agents are classified, with a small portion originating from the Insurance Industry. The constant price output of the commodity is computed by projecting the base-year value by the real output of the Life and Non-life insurance commodities.

Real estate

Real estate activity gives rise to the production of two types of services: those of real estate operators and those of real estate agents. Real estate agents are engaged mainly in buying, selling, managing and appraising real estate for others. Their income consists of commissions

and management fees that are deflated by a price index for real estate commissions based on unit sales of existing houses by province from the Multiple Listing Service.[62]

Real estate operators are engaged primarily in operating or owning and operating buildings and dwellings. Their principal output is real estate rental, which is subdivided into Cash residential rental and Non-residential rental. Non-residential rental is deflated using a deflator constructed from data on occupancy of office space for most Canadian cities.[63] Base-year rental costs per square foot are estimated for each city, using a weighted average of the previous five years of rentals, with weights becoming progressively larger for later years. These are multiplied by the occupied space, that is, square footage adjusted for vacancy rate, for each year to yield estimates at constant prices. City estimates are summed and an index of values at constant prices constructed. An implicit price index is then calculated by dividing the index of revenues at current prices by this index.

Residential rental includes cash residential rental on tenant-occupied dwellings as well as imputed rental on owner occupied housing. Estimates of Cash residential rental at current prices are estimated on the basis of the stock of tenant-occupied dwellings multiplied by the average contract rental per dwelling, estimated on the basis of information from the Labour Force Survey.[64] A similar procedure is followed for imputed rental using the owner-occupied stock of dwellings and adjusting the average rental by a coefficient based on the average number of rooms in each type of dwelling. The series at constant prices are established for the base year using the value of the stock of tenant-occupied (or owner occupied) dwellings as described above, with subsequent years based on stock data valued at constant prices. For this, the implicit price index of the gross capital formation estimates of residential construction, excluding real estate commissions, is used as a deflator. These stock values at constant prices are then multiplied by the gross average space rental of the base year.[65]

[62]See Statistics Canada, 1990, *Guide to the Income and Expenditure Accounts*, p. 96.
[63]Colliers Macaulay Nicolls Inc., Various years, *Canadian Real Estate Review.* The cities included are Halifax, Montréal, Ottawa, Toronto, Winnipeg, Saskatchewan, Edmonton, Calgary, Vancouver and Victoria.
[64]The method is described more fully in Statistics Canada, 1990, *Guide to the Income and Expenditure Accounts*, p. 64.
[65] *Ibid.,* p. 94.

Owner-occupied dwellings

This 'industry' produces the commodity Gross imputed rent, owner-occupied dwellings,in the sense that an owner–occupier is the recipient of services from his dwelling in the same way that a landlord receives rental from a tenant for services provided by the building rented. The deflation procedure is similar to the one used for Cash residential rental.

Education service industries

Private education services are deflated by the Consumer Price Index for other education and cultural services.

Health

Private health practitioners and medical laboratories

A weighted price index consisting of the following three components is developed to deflate the output of this industry:

- a payments-schedule-changes index produced by the Canadian Institute of Health Information for the revenue of physicians;
- the Consumer Price Index for dental care; and
- the Consumer Price Index for health care for paramedical practitioners, laboratories and private duty nurses.

Other health and social services

Other health and social services consists of Ambulance services, Private residential care facilities, Private hospital services, Child care outside the home, and Other health and social services. Ambulance services are deflated by an index of average weekly earnings for non-institutional health services. A deflator for special care facilities based on employment, on the assumption that operating expenditures are proportional to employment,[66] deflates Private residential care facilities and Private hospital services. The Consumer Price Index for childcare is used for child care outside the home. The commodity Other health and social services, which includes services produced by non-profit organizations such as the Red Cross, the Victorian Order of Nurses, and the St. John Ambulance Brigade, is deflated with the Consumer Price Index for other health care.

[66]Statistics Canada, 1990, *Guide to the Income and Expenditure Accounts*, p. 95.

Legal services

This section covers the deflation of revenues for legal advice and legal services provided to businesses and persons by lawyers and notaries. These services are varied and no price indicators are as yet developed. Instead, the deflator for these revenues is derived as a weighted average of various related legal services indicators. These include the number of crimes by category (criminal law); divorces (family law); deaths (estate law); and business-related transactions, registrations, applications, etc. (corporate law). Also included are the Canadian Real Estate Association multiple listing service listings and sales of new houses (real estate law). The data are gathered monthly and subsequently annualized,[67] but it has been difficult to obtain updated revenue weights. Moreover, these unit value indexes have exhibited some volatility. As a result, the index of average weekly earnings of employees of offices of lawyers and notaries has been included in the calculation.

Accounting services

Included here are auditing, accounting and bookkeeping services. In the absence of output price or quantity indicators, the deflator is based on a major input, namely, an index of average weekly earnings for accounting and bookkeeping services.

Architect, engineering and scientific services

The Prices Division has developed a price index for consulting engineering services (formerly deflated with an index of average weekly earnings also). This index is based on a survey of consulting engineering companies serving Canadian and foreign clients in 10 fields of specialization. It combines an index of the wage component of contracts and an index measuring changes in the profitability of consulting engineering activities, that is, of the ratio of total revenue at fiscal year end to all expenses incurred in the completion of the contracts.[68] This price index is used as a deflator for the commodity Architect, engineering and scientific services. It is a significant improvement on the index of average weekly earnings, previously used, because in times of recession this index tended to rise if lower-paid employees were laid off first and to fall in the period of recovery as new employees were hired at the lower end of the earnings spectrum.

Advertising services

The deflator for Advertising services is a weighted average of price indexes developed for print media advertising and for radio and television advertising. For print media, advertising rates of various publications adjusted for circulation are combined to derive a price index.[69] This was combined with the deflators for radio and television advertising based on audience hours to derive the total price index.

Computer services

Measuring a price for computer services is proving to be an overwhelming task. The input–output classification identifies three commodities: Software products development, Computer lease and rental hardware, and Professional and processing computer service. However, some of these are disaggregated further for deflation. The Prices Division has produced an index for professional informatics services based mainly on labour and other input costs.[70] This index is similar to the price index for consulting engineers, which proved to be a significant improvement over the index of average weekly earnings. It has been used since 1995 for professional services consisting of custom software development, facilities management, contract systems analysis, corporate EDP consulting, systems and technical consulting, contract systems analysis and programming, and other professional services.

The deflators for other computer services reflect more closely the type of quality changes taking place in the hardware industry. The deflator for computer leasing is based on a three-year average of the computer and peripherals deflator. The deflator for software product development is estimated assuming a 6% decrease in price from each previous year. Finally, a deflator for processing services is derived by combining the following items:

- a 6% decline per year in price for network applications;
- the year-to-year change in the all-items CPI divided by two for network electronic information and data entry;
- a three-year average of the computer and peripherals deflator for shared processing;
- the deflator for other education for training and education; and
- the all-items CPI for other processing services.

[67]See Statistics Canada, 2000, *Gross Domestic Product by Industry*, p. 139.
[68]Statistics Canada, 1998, *Construction Price Statistics*, pp. 61–66.
[69]See Chapter 3.
[70]This price index increases at the rate of 3% to 4% per year between 1993 and 1997, exceeding the all-items CPI.

Other services to businesses and persons

The commodity Other services to business and persons includes employment agencies and personnel suppliers, management and business consultants, and miscellaneous services to business. It is deflated with the implicit price index of the sum of intermediate inputs, net taxes on production and labour income of the Miscellaneous Business Services Industry, with the labour income component deflated with the applicable indexes of average weekly earnings.

Accommodation and food services

This group consists of three commodities: Accommodation services, Meals, and the sale of alcoholic beverages. Consumer price indexes are used to deflate each of these commodities.

Amusement and recreational services

These services include motion picture and video production, distribution and exhibition, theatre, sports and recreation services, and racetracks and gambling operations. The motion picture segment is deflated with the consumer price index for motion pictures. Revenues from parimutuel betting are deflated by the all-items CPI adjusted by the ratio of sales to prizes for horse racing. A similar procedure is used for lotteries, bingo and casinos except that the adjustment is the ratio of sales to prizes for lotteries. The deflators for the Other recreational services are based on the consumer price indexes for recreational facilities and services, and for spectator entertainment excluding cablevision.[71]

Personal services

These consist of Laundry, cleaning and pressing services, Photographic services, Barbering and beauty services, Funeral services, Child care in home, Private household services and Other personal services. Except for Funeral services all of these services are deflated with the applicable Consumer Price Index. The deflator for Funeral services is based on an index of average weekly earnings for funeral services obtained from the Survey of Employment, Earnings, Payrolls and Hours,[72] the IPPI for coffins and caskets, and the Consumer Price Index for the operation of automotive vehicles. A final adjustment is made to reflect movements in the number of deaths.

Miscellaneous services

The principal services included here are Repair service for machinery and equipment, Rental of office equipment, Services to buildings and dwellings, Rrental of automobiles and trucks, Trade association dues, and Rental of other machinery and equipment including construction machinery. Repair services are deflated by the relevant consumer price indexes where available. Indexes of average weekly earnings are used as proxies for deflators where these price indexes are not available. Rental of office equipment is deflated by the implicit price index for the gross stock of machinery and equipment of business service industries. For Services to buildings and dwellings, an index of average weekly earnings for janitors is used. Rental of automobiles and trucks is deflated by a consumer price index. For trade association revenues, an index of compensation per person in the community, business and personal service industries is used as a proxy for changes in rates of association dues. Labour compensation consists of the labour income of paid workers and imputed labour income for other than paid workers except unpaid family members.[73] Rental of all other machinery and equipment is deflated using the machinery and equipment price index for total domestic machinery and equipment.

[71] See Statistics Canada, 1990, *Guide to the Income and Expenditure Accounts*, p. 94.

[72] *Ibid.*

[73] See Statistics Canada, 1994, *Aggregate Productivity Measures,* Table 12, p. 94 and pp. 137–138.

CHAPTER 5 THE NON-BUSINESS SECTOR

The discussion thus far relates to goods and services that are produced primarily for sale at market prices. That is to say, these goods and services are sold at prices that have a significant influence on the amounts producers are willing to supply and buyers are willing to purchase. Producers of such goods and services are capable of generating a profit or other financial gain. In this chapter, we look at the estimation of real activity in the non-business sector, which consists of government operations and the activity of non-profit institutions serving households. In 1996, this sector was responsible for 18% of total value added at current prices. A major part of its output consists of goods or collective services that are supplied free or at prices that are not economically significant. Since these prices cannot be used as a basis for valuing production, the output of these institutions is valued at their cost of production. These institutions may also produce some market output, which is sold at prices that are based on costs of production or are sufficiently high to have a significant effect on demand for such output.

The fact that such a large part of their output cannot be measured directly means that deflation of value added has to be approached differently from that of the business sector. In particular, instead of using double deflation and calculating value added at constant prices as the difference between gross output at constant prices and the sum of intermediate inputs, the components of value added are deflated directly. The downside to this method is that it assumes no change in the productivity of a very important sector.

Because of this limitation, there has been renewed interest in measuring the output of this sector directly. But this leads to a number of new questions, some of which are raised in Chapter 7.

The non-business sector consists of 13 industries, each of which produces a non-business (non-market) commodity, but may also produce business (market) commodities.

Generally, the industry gross output is measured as the sum of the deflated inputs, and the output of the non-business commodity at constant prices as the difference between the sum of the industry's deflated inputs and the value of its market output at constant prices.

Gross domestic product

Because of the difficulties of defining and measuring its output directly, gross domestic product at constant prices of the non-business sector is estimated by deflating primary inputs directly and assuming there is no change in labour productivity. The only exception is the use of enrollment to estimate the gross expenditure of universities at constant prices. In this case, gross domestic product is calculated as the difference beween deflated total expenditure (calculated on the basis of an index of enrolment of full-time students) and intermediate inputs at constant prices.

There are three primary inputs: wages and salaries, supplementary labour income, and other surplus, which consists of capital consumption allowances only. Estimates at current prices exist for these primary inputs by non-business industry, and deflators are normally calculated on this basis. Capital consumption allowances are deflated using deflators derived from the capital stock estimates of net capital stock at current and constant prices based on a straight-line depreciation method. These are obtained from the Investment and Capital Stock Division. In the case of waterworks, a deflator based on the implicit price index for the capital stock of water systems is used in place of that used for the rest of Other municipal government expenditure.

Generally, deflators for wages and salaries and supplementary labour income are based on labour data for employment by hours. However, for primary and secondary education, values at constant prices are calculated on the basis of an index of the number of full-time teachers. In the case of defence and other federal government expenditure, the method accounts for changes in the composition of labour input as follows:

- **Defence expenditure** is estimated using employment indexes. The military portion is based on base-year salaries by rank.

- **Other federal government expenditure** is based on employment. The employees are aggregated using their groups and levels so that changes in the composition of the public service are reflected in the estimate. Separate indexes by industry, based on their own employment series, are used where possible.

CHAPTER 6 SPECIFIC PRICING

Generally, the output of a commodity is deflated with the same deflator regardless of the industry that produces it. Exports are deflated by the output deflator, except for a small number of commodities for which there are specific export deflators. Imports are deflated with specific import deflators where these are available or with output deflators in other cases. Intermediate and other final uses are treated as a residual and deflated with the implicit price index of the domestic supply (output plus imports less exports) of the commodity. The input–output tables attempt to describe the economy with 671 commodities and 243 industries. Some of these commodities are not homogeneous for deflation purposes. Therefore, there are occasions when the pricing of some commodity flows is adjusted.

Already mentioned are specific import and export deflators and the deflation of the machinery and equipment entries in the Final Demand Matrix by price indexes, which vary by commodity and industry of purchase. In addition, there are several instances where the price appropriate for a particular flow may be different from the prices used for other flows of the commodity. In such a case, this cell would be deflated with its own specific price. For example, the deflator for passenger transportation by air is a price index for business travel. However, the estimate obtained for personal expenditure in the Final Demand Matrix is replaced by a new value derived by deflating the value at current prices with a price index for personal travel.

Deflation is currently carried out at the worksheet level of 679 commodities and primary inputs from 1986, and 615 for 1961 to 1986.

This chapter lists some of the cases where special pricing adjustments have been made. These adjustments usually require compensating adjustments elsewhere in the accounts to maintain commodity balances. In the air transportation example noted earlier, the initial estimate for output at constant prices is adjusted by the amount by which personal expenditure is altered by the use of the specific price index.

Operationally, two kinds of balancing procedures exist. Specific cells (most often one cell) may be modified for the first type. The air transportation adjustment cited is an example. Alternatively, the adjustment may be spread over all other uses of the commodity. This may be accomplished by introducing the second price into the program before calculating the residual price and modifying the residual equation to take this into account.[74]

The following commodities are adjusted for the current period:

- **Wheat:** The residual deflator is not used for the input of wheat into the cereal grain flour, flour mixes and cereal food industry. Instead, the value at constant prices is based on the volume of the output of wheat flour by this industry.

- **Use of fresh fruit, excluding tropical, by the wine industry:** For input into this industry, a special deflator for grapes replaces the deflator for Fresh fruit, excluding tropical.

- **Input of vegetables, fresh or chilled into the cane and beet sugar industry:** A special deflator for sugar beet replaces the deflator for Other vegetables, fresh or chilled, for inputs into the sugar industry.

- **Pipeline margins on crude mineral oils inputs into the petroleum refining industry and exports:** The Pipeline transportation margin is initially deflated by a price index based on the price of transporting natural gas. Transactions relating to pipeline transportation of natural gas are recorded in the Natural Gas Pipeline Transport Industry, while transactions for pipeline transportation of crude oil and other commodities such as motor gasoline, fuel oil and liquefied petroleum gases are found in the Crude Oil Pipeline Transport Industry. As price movements of transportation of these commodities are different from that of natural gas, a unit value index, based on the revenue and quantities of the goods carried, is used to deflate their production and use.

- **Personal expenditure on natural gas:** Basic values of this commodity are deflated with a unit value index for sales for industrial and business use. For personal expenditure this is replaced by a unit value index based on the volume of natural gas used in residences and apartments. Tax margins are adjusted proportionately and gas distribution margins are calculated as the difference between the purchaser price estimates, deflated with the consumer price index for piped gas, and the sum of the basic price, tax margin and pipeline margin estimates.

[74]This type of adjustment is basically an extension of the methodology for the use of special export and import deflators.

- **Input of malt into the brewery industry:** Malt is included in the input–output commodity Other flours and processed grains. The deflator for this commodity is a weighted average of IPPI for malt, milled rice, and milled cereal grains not elsewhere specified. Since only the malt component is relevant for input into the brewery industry, the IPPI for malt is used.

- **Metal scrap, excluding iron and steel:** This commodity consists of scrap from various types of non-ferrous metals. Its deflator is constructed from IPPI for aluminum, copper and other non-ferrous metals. This average deflator is inappropriate for some uses of the commodity and has been replaced by specific prices in the following cases:
  - the deflator for gold for input into the jewelry and precious metals industry; and
  - the deflator for copper scrap for input into the copper rolling, casting and extruding industry.

- **Gasoline:** Two modifications are made to the flows deflated by the deflator for motor gasoline:
  - For personal expenditure on this commodity the basic price value at constant prices is estimated on the basis of the change in the quantity used. Taxes are adjusted in proportion to the change in the basic price value and trade margins are calculated as the difference between the purchaser price estimates deflated with the CPI and the sum of the new basic price and tax valuations and the transportation, storage, pipeline and gas margins. The result is then divided between the wholesale and retail trade margins on the basis of the original split.
  - Inputs into agriculture (major SIC groups 1 and 2), valued at purchaser prices, are deflated with the Farm Input Price Index, and the rate of change in values at constant prices between the current year and the previous year is applied to the basic price value of the previous year. Tax margins are adjusted proportionately, and a procedure similar to that followed for personal expenditure above is used for trade margins.

- **Fuel oil:** Three specific prices are introduced into the deflation of fuel oil:
  - The basic value at constant prices for light fuel oil in personal expenditure is estimated on the basis of volume data.
  - Inputs of aviation fuel into the air transport industry are deflated with a volume index derived from input quantity data reported by the Transportation Division.
  - Inputs into the livestock and field crops industries for light fuel oil and diesel fuel are deflated with Farm Input Price Indexes. The procedure described for adjustments to tax and trade margins for gasoline is also followed for these adjustments to fuel oil.

- **Bicycles:** Inputs of the commodity Bicycles into the sporting goods industry consist mainly of parts, which are largely imported. Therefore, this input is deflated with an export index, published by the Bank of Japan, for bicycle parts and accessories.

- **Art and decorative goods, miscellaneous end products:** This commodity is deflated with a weighted IPPI for trophies, hollowware, candles, novelties, and models and patterns. However, production by the stamped, pressed and coated metals industry, which consists of gold coins, is deflated with the IPPI for Gold and alloys in primary forms.

- **Air transportation:** The deflator for this commodity is a price index for business travel. For personal expenditure on air travel, a price index for personal travel only is used and the value of output is adjusted by the difference between the new constant price estimate and that originally obtained using the business travel price index.

- **Telephone and telegraph:** The appropriate tax-adjusted CPI deflates personal expenditure on telephone and telegraph services. To balance the commodity an adjustment is made to its output.

- **Electric power:** A procedure similar to that followed for telephone and telegraph is used for personal expenditure on electric power. Inputs into the agriculture industry are deflated by a unit value index based on residential and agricultural consumption with balancing adjustments to output.

- **Other utilities:** The deflator for this commodity is a weighted average of an index of average weekly earnings for Other utilities, and a unit value index for steam. However, as the output of the electric power industry consists only of steam,

the initial result is adjusted based on a unit value index for the quantity of steam sold. The difference in value is apportioned between the industries that purchase steam, namely, the pulp and paper and chemical industries.

- **Wholesaling margins: (1) Passenger cars and trucks.** Generally, wholesale margins are calculated by multiplying the value of the item at constant prices to which the wholesale margin is applicable by the average of the base and current year margin ratios, or as part of the difference between the deflated purchaser and basic price values. An implicit price index based on these calculations is then used to deflate the output of such margins. This procedure is not followed for deflation of the wholesale margin on goods purchased for resale by the motor vehicle industry. Instead, the margin at current prices is deflated by a weighted average of the price indexes for automobiles and trucks. Wholesale margins for personal expenditures of passenger cars and trucks, and business purchases of these items for use in agriculture, trade, and business services are equally adjusted.

  (2) Other commodities. Appropriate modifications are made to the wholesale margin inputs and final demand entries in respect of adjustments to the basic price values of any commodities to which wholesale margins are attached. The output of the wholesale trade industry is adjusted for the net change resulting from these modifications.

- **Retail margins:** Uses the same adjusting procedure as (2) in wholesaling margins.

- **Personal expenditure on financial services:** The deflators applied to the various financial costs incurred by persons are based on assets and liabilities and commission charges applicable, where possible, to personal consumers only.

- **Input of other services to business and persons into radio and television broadcasting:** The input of these services into the radio and television broadcasting industry is deflated with an index of average weekly earnings for management consulting services.

- **Unallocated imports and exports:** Personal expenditure on imports and exports that are unallocated to other commodities include travel expenditure payments and receipts, military pay and allowances, and gifts in kind. Travel expenditure payments are deflated with a weighted average of the United States consumer price indexes for food away from home, shelter, apparel and upkeep, private transportation and other goods and services adjusted for the exchange rate.[75] This deflator is also used for the input of travel expenditure payments into the travel and entertainment industry. Similarly, the deflator for travel expenditure receipts is a weighted average of applicable Canadian consumer price indexes. The deflator for gifts in kind is a weighted average of the consumer price indexes for food purchased from stores and clothing. Military pay and allowances are deflated with a weighted average of the cost of living indexes from the United Kingdom, the Federal Republic of Germany and the United States, also adjusted for the exchange rate.[76]

- **Subsidies: (1) Livestock and field crop farms.** These subsidies are calculated on the basis of the movements of commodity output or input at constant prices of identifiable commodities to which the subsidies apply and on the gross output of the industry for the remainder.

  (2) Railway transport and related services. These refer mainly to government payments under the *Western Grain Transportation Act*. The 1992 value of such payments is projected on the basis of the tonnage of grain carried to derive estimates at constant prices. Other subsidies at constant prices are calculated on the basis of the gross output of the industry. The western grain subsidy was terminated in 1995.

- **Other taxes on production: (1) Livestock farms**. These taxes comprise property taxes, federal and provincial stabilization levies, producer levies to the Canadian Dairy Commission, and motor vehicle licences.
  - Property taxes are deflated with a tax per acre series calculated from Agriculture Division data.
  - Canadian Dairy Commission levies are deflated with a series based on volume of output of milk.

[75]See Statistics Canada, 1990, *Guide to the Income and Expenditure Accounts*, p. 95.
[76]*Ibid.*

- Motor vehicle licences paid by farmers are deflated with a Farm Input Price Index for vehicle licences.
- The residual, which includes payments for all government stabilization programs, is deflated with a volume index of numbers of livestock from the Census of Agriculture.

(2) Field crop farms. These taxes include similar items as in the livestock industry, with the addition of crop insurance premiums.

- Property taxes and vehicle licences are treated the same as in the livestock industry.
- Stabilization levies are deflated with a levy per acre series based on the seeded acreage of principal field crops.
- Crop insurance premiums are deflated with a Farm Input Price Index.
- The residual amount after these four expenditure categories are deflated is small, and its price movement is imputed to the total.

(3) Petroleum and gas wells. The value of other taxes on production at constant prices paid by this industry is projected on the value of the output of the industry at constant prices after adjustments to the output of crude mineral oils, natural gas and liquefied petroleum gases.

(4) Transfer costs, non-residential construction; and Housing. The value of taxes on production at constant prices paid includes land and deed transfer taxes with respect to purchases of real estate. Estimates at constant prices are obtained by projecting the base-year values of these taxes on the deflated values of residential and non-residential building construction.

These specific price adjustments are applicable to the period beginning with 1986. Additional adjustments are applicable to the earlier period when the commodity classification was less detailed. These include the following:

- **Output of maple sugar, syrup and other syrup:** The output of this commodity includes syrup produced on farms classified under the field crop farms industry as well as syrup produced by four manufacturing industries. A unit value index based on farm production of maple syrup is applied to agricultural production, but the output of other syrups by manufacturing industries is deflated with an IPPI.

- **Paper cartons, bags, cans and bottles:** The output of this commodity by the Plastic Bag industry is deflated by the IPPI for plastic bags instead of the composite deflator for paper bags, boxes, and plastic bags.

- **Output of knitted wear:** The input–output commodity knitted wear is produced by three input–output industries: men's and boys' clothing, women's clothing, and children's clothing. Generally, all output of knitted wear is deflated with the overall output deflator of this commodity. However, IPPIs and shipment weights are available at the Principal Commodity Group Aggregation (PCGA) level and in sufficient detail to make it possible to calculate specific deflators for the output of this commodity by each of the three industries.

- **Output of clothing:** A procedure, similar to that followed for knitted wear, is adopted for clothing.

- **Lumber, treated lumber and wood:** The output of this commodity by the miscellaneous wood industry consists mainly of treated lumber. As a result, the IPPI for preserved and treated wood is used as a deflator instead of the composite index used for the output of other industries.

- **Other wood products:** This commodity is initially deflated by a composite index based on five subcommodities at the PCGA level. The sawmill, particle and wafer board, and miscellaneous wood industries produce it. For deflation of the output of the particle and wafer board industry a specific price index is constructed, based on the IPPI for particle board and a specially constructed unit value index for wafer board.

- **Office machines and equipment:** This commodity included both computers and peripherals, and miscellaneous office and business machines, but was produced by two industries: computers and peripherals, and other office machines. Since the computers and peripherals price index dominated the deflator, a specific price index for miscellaneous office and business machines was used to deflate the output of the other office machines industry.

- **Aircraft:** Purchases of this commodity for fixed capital formation are deflated with a MEPI and the output deflator would normally be a weighted average of the domestic MEPI. However, as the pattern of output differs significantly from that of purchases of new machinery and equipment, an IPPI is used for the deflation of production by the aircraft and aircraft parts industry.

- **Glass, plate, sheet and wool:** This commodity includes, *inter alia*, fibre-optic cable, which is produced by the communications, energy, wire and cable industry and used mainly by the railway and telecommunication construction industry. As fibre-optic cable is not included in the deflator for the commodity glass, plate, sheet and wool, a specific price is applied to the output and input of these two industries.

- **Fertilizers, excluding nitrogenous:** This commodity consists of manure produced by the agriculture industry; potash, a mining product; and chemical fertilizers, which are manufactured. Manure is deflated with a unit value index based on volume and value data from the Agriculture Division. For potash, another unit value index based on similar mining data is used. Finally, production by the chemical and other manufacturing industries is deflated with an IPPI.

- **Photographic and photocopy equipment:** This commodity includes optical and photographic equipment as well as photograph film and plate. The purchase of optical and photographic equipment is recorded under the personal expenditure category recreation, sporting and camping equipment, but that of photographic film and plate is shown under the category for reading and entertainment supplies. The former is deflated with the CPI for cameras and the latter with that for film.

- **Water transportation:** For personal expenditure on water transportation the Consumer Price Index for ferry transportation is used instead of the output deflator for water transportation, which is based on freight data.

- **Rail transportation:** Personal expenditure on rail transportation is deflated by a Consumer Price Index. This replaces the output deflator for rail transportation, which is calculated as a unit value index for rail freight.

- **Other services incidental to transport:** This commodity is deflated with a composite deflator based on the price indexes for parking, travel tours and freight forwarding. The deflator for personal expenditure on this commodity excludes the freight-forwarding element, as this is not considered important in personal expenditure.

CHAPTER 7 CHALLENGES AND NEW DEVELOPMENTS

Several issues, which have arisen in the recent past, have alerted us to the some of the weaker areas in measuring real activity in the economy. These problems range from methodological issues regarding the measurement of prices and volumes and their application to particular sectors or commodities, to data inadequacies and the practical difficulties of measuring some of the areas involved. The rapid growth of the service sector and the speed of technological change have increased the urgency for solutions to these problems. One area of concern, especially for those engaged in productivity measurement, is the inability to estimate the output of non-market activity, which accounts for some 19% of the economy. This chapter will discuss new developments with respect to the following: the direct measurement of output in three industries of the non-business sector; pricing of services; special problems with the high technology sector; and the need for chain indexes.

Output of non-business industries

As indicated in Chapter 5, non-business output is not measured directly at constant prices. Rather, the aggregate for each industry at constant prices is derived as the sum of intermediate and primary inputs. This method assumes constant productivity, which means that there is no productivity measurement for over 19% of the economy that it represents. This has led to efforts to measure the value of the outputs of these services at constant prices, so that calculations of value added similar to those used for the business sector can be introduced. The measurement of output, however, leads to a number of new problems. Some non-business services are delivered directly to individuals, as in health care in hospitals, others mainly to groups of individuals, as in education. Still others are not delivered to individuals, but are consumed collectively as in the case of general government, national defence or the police. For services delivered to individuals it may be possible to measure the quanta of their outputs by estimating the value at constant prices of the services produced and delivered. However, there are often problems determining exactly what these outputs are. Since services are produced and consumed at the same time, measurement often may involve indicators based on actual consumption. Estimates for three of the non-business industries, making up about 45% of the sector, have been generated but have not yet been incorporated in the accounts.[77] This section provides a summary of the methods used for each of these industries.

Non-business commodities, for which all the output can be measured directly, include government funding of hospitals, residential care facilities, universities and other education.[78]

Hospitals

The output of hospitals is the treatment of patients. The method adopted is to value services delivered at base-year costs. The essential problem is to establish the base-year cost of the services provided and to multiply the average base-year cost by the number of treatments. Separate estimates are provided for acute inpatients (55%), chronic care patients (14%), and day surgery and outpatient clinical visits (30%). Each of these categories has different cost structures. Revenue is allocated between these classes primarily on the basis of information in Part 1 of the Annual Return of Health Care Facilities–Hospitals Survey, which shows the expenses of hospitals based on accounting data. Expense data by department can be split between inpatient and outpatient. Also, some resources, including labour and the services of certain departments such as radiology, can be similarly allocated. The cost structure of acute vis-à-vis chronic care is determined by analysing those institutions specializing in one type of care only, and then applying a weighted structure to those engaged in both acute and chronic care. A first estimate of hospital output is obtained by multiplying average base-year costs by the number of patients in the case of acute care, by the number of patient days for chronic care, and by the number of visits for day surgery, clinics, physiotherapy and the emergency department.

The results for acute care are refined by combining information from the hospital separations database with estimates on resource intensity weights provided by the Canadian Institute for Health Information (CIHI).[79] The CIHI has aggregated the morbidity conditions encountered in hospitals into 500 case mix groups to each of which a resource intensity weight is estimated. The Resource In-

[77]The use of output measures for non-market services is discussed in Commission of European Communities *et al.*), 1993, *System of National Accounts,* p. 402.

[78]See Kitchen, 1997, "Measuring the Constant Dollar Output of Hospitals and Education."

[79]Canadian Institute of Health Information, 1995, *Resource Intensity Weights: Summary of Methodology, 1995–1996.*

tensity Weight compares the cost of treating a specific condition with the overall average and is derived from data on both Canada and the United States. The change in output of the acute care inpatient category would be the change in the product of the resource intensity weights and the number of patients summed over all case mix groups. Thus, the measure accounts for the quantity of treatment that different types of patients received. This methodology, which was applied for the years 1992 to 1993 and 1993 to 1994, shows changes of 1.27% and .95% to output owing to increases in intensity. A similar estimate is planned for day surgery patients in the future.

These results measure the amount of service evaluated in base-year prices. It may become difficult for the measure to capture improvements adequately as medical innovations are introduced. For example, when a procedure becomes an outpatient procedure, instead of requiring the patient to be admitted, the economic output drops. However, the amount of health care delivered does not decrease. As more effective treatments become operational, the cost of health care often increases because the new treatment may be more sophisticated and costly. The extra intensity should be reflected in the output measure. The continual evolution of medical and hospital procedures seem to recommend that emphasis be placed on the measurement of year-to-year changes and the adoption of chain indexes.

Residential care facilities

The output of residential care facilities is the care provided to the residents. There are seven types of care: room and board only; room and board with guidance and counseling; room and board with custodial care; type 1 care; type 2 care; type 3 care; and higher type care. Output is measured using price indexes for type of care by province. These price indexes are based on year-to-year cost comparisons at the institution level. National indexes are calculated for each type of care by aggregating provincial type of care indexes. An overall index for residential care facilities is derived by multiplying each type of care's national weight by the index for that type of care.[80] Revenue for the industry is derived from two sources: households and government. The index calculated here deflates the total revenue of the industry. The Consumer Price Index for special care facilities is used to deflate personal expenditure on residential care, with the value of government expenditure at constant prices equal to the difference between the two values. On a 1986 base, this methodology results in an increase of 12.2% in output at constant prices for 1993 over the existing methodology, which is based on an employment index and assumes no productivity change.

Education

The output of education services consists principally of the teaching and guidance provided by producers of education services to the students.

The output estimate at constant prices for any year is calculated by multiplying the base-year cost per student of different types of education by the number of students[81] for that year. Education is broken down into primary, secondary, special, trade schools, community colleges and universities. In the case of community colleges and universities, students pay part of the cost. In these cases, the fees paid by the students are deflated with the appropriate CPI. The government output at constant prices is the difference between the total output and the value at constant prices of the student contribution.

Base-year costs consist of government grants and student fees (where applicable) in the base year. Government grants have traditionally been assigned by a formula on the basis of the relative costs of the programs. The most complex estimate comes from universities, where the several fields of study have different relative costs. Each program has a weight that reflects the value of grants and the fees that the students pay. For each category, estimates of grants per student[82] were derived and base-year university revenue was estimated as the sum for all categories of the grants per student, multiplied by the number of students, plus the fees paid by students. The base-year cost of other educational institutions was estimated in a similar manner. Community colleges had less information and, as a result, the weighting pattern was much simpler. Separate weights were derived for each of the other educational types mentioned earlier.

Estimates of education output were derived by province and subsequently aggregated to a national total.

The estimates produced by these methods are simply a measure of the quantum of services delivered. Both hospital and educational services are largely means to fu-

[80]See Kitchen and Nock, 1998, "Measuring the Constant Dollar Output of Residential Care Facilities."

[81]Kitchen and Lupien, 1995, "Indice d'Output pour l'Éducation."
[82]Part-time students were converted to full-time equivalents.

ture well-being: restoration to good health and the prolonging of life in the case of hospitals, and future earnings and occupational satisfaction in the case of education. Differences in base-year costs may reflect some quality differences. For example, the cost of attending university is expected to be higher than the cost of going to secondary school, but those who attend university are expected to earn higher average incomes. Beyond that, no attempt is made to incorporate any measure of the flow of benefits arising from the human capital formation embodied in the product of education. Moreover, it is expected that the year-to-year change in the quality of education services would be extremely small. Hospital services produced also have consequences with respect to the quality of life of the person treated. No such measure is attempted.

Gross domestic product

If the direct output measures for hospitals, education and residential care facilities are used, gross domestic product at factor cost will be calculated using the double deflation method. This is similar to the business sector.

Pricing of services

The service sector has grown tremendously over the past two decades. Traditionally, much effort and many resources have been put into the pricing of goods. Doing the same thing for services has proved rather perplexing in a number of cases. This is due to a number of reasons related to the nature of services.

Many services differ in quality between one client and the next so that it is difficult to standardize charges. This leads to some degree of bargaining between producer and consumer. Moreover, there may be considerable variation from one producer to another in the prices charged for the same service.

Some personal services may be priced with relatively less difficulty, and many of these are measured in the Consumer Price Index. But the pricing becomes difficult for services, even those delivered to individuals, when they are bundled. Frequently, a change in the bundle is accompanied by a price change, and it is difficult to assess the pure price change. Well-known bundles exist for banking, telephone and cable services.

Most problematic are services delivered to businesses. Many of these services are done by contract and may have features unique to the requirements of each business. Large contracts are often subject to bargaining between producer and consumer, or to tender. All of these factors make it very difficult to measure prices directly.

Finally, some services are influenced by rapid technological changes resulting in accelerating quality change and a wealth of new products.

Task force on service price indexes

The problems and gaps in measuring service price indexes and volumes have severe consequences for the quality of the constant price estimates produced by Statistics Canada. At the present time, productivity of some activities in the economy is not measured. In others, the quality of the measure may be in question if the input or output deflators are wanting. We have noted that intermediate services may be more problematical in that transactions are less visible than services provided to final buyers. These services are netted out in the calculation of total GDP, but the GDP of the sectors affected would be incorrect. Preliminary examination of the problem has led to the creation of a task force to investigate the issues and to develop a strategy to close the gaps in service price and volume data. The initial strategy has been to concentrate on the more difficult area of business services, but progress has been slow. Indexes for price movements associated with the services of consulting engineers, professional informatics services and long-distance telephone services for businesses have been produced. In addition, work has proceeded on price indexes for explicit bank charges, hotels, motels and restaurants and air transportation. However, concentrating on these areas exclusively slows progress. The new strategy will include also commodities, which may be less difficult conceptually and practically.

The high technology sector

Another challenge to producing plausible constant price estimates is the rapid developments taking place in the high technology sector. The principal industries directly affected are electronic computers and office equipment, communication equipment, computer services and software, and telephone and other communications services. Technological changes in electronic components have made possible the development of products with tremendously increased capacities for processing and storing information. This phenomenon has had significant implications for the measurement of price change and real output. The effect was first seen in the marked changes in capacity of new computers coming on to the market and their markedly lower prices compared with older models. But rapid technological change has major impli-

cations for production in communications, medical equipment and other fields where the discovery and continued development of fibre optics and laser technology are revolutionizing the industries using them. One solution to the problem has been the development and use of hedonic price indexes for computers. This has led to tremendous revisions in the price indexes of computers and peripherals, which showed declines of up to 15% per year, with consequential monumental increases to the value of output and gross capital formation. These hedonic price indexes measure quality change in the price of a good by measuring changes in the prices of the characteristics embodied in it.

The use of hedonic price indexes has not been without controversy. One problem is that these rapid price declines are not evident for any other related commodity. For example, although computers derive their increased capacity from the silicon chips, these rapid declines are absent in the price indexes of inputs such as semiconductors and circuit boards (see Table 7.1).

This could lead to overestimating the value added in the computer industry. In Canada, however, the input of these items is relatively small: the major input into the industry, computer parts, is deflated with the computer deflator.[83]

A second point is that the method leads to huge increases in the capital stock of industries using computers, resulting in an underestimation of their productivity. Proponents of this view argue that the technological advances should not be embodied in the capital input, but should be regarded as technical progress.

The other problem, which arises when using hedonic price indexes for computers, is that the price index is based on the prices of characteristics of the current machines. While this seems to indicate that the quality adjustments of the hedonic index is based more on user value than resource cost, there is some skepticism as to whether the new machines are exploited to the full amount of their potential in the same year that they are produced. This leads to the question of whether there should be some adjustment to these indexes. In such a case, there seems to be a case for using a chain version of the hedonic indexes. This would recognize that the latest characteristics on new computers would on average not be fully utilized immediately.

The technological explosion has had a major impact on the service industries, where the changing nature of services offered and new products have been accompanied by new marketing arrangements. The revolution in telecommunication equipment has made available new goods (e.g., cellular telephones), new services and new pricing arrangements. Laser-splitting fibre-optic lines have made long distance telephone service progressively cheaper and Internet access, e-mail, video and other services more available. Nighttime calling rates are as low as five cents a minute in some parts of the United States. Wireless services now complement or compete with wire-line services. Cellular telephones are accompanied by cellular services. Many of the new commodities are intermediate or capital goods, but their effect is a rapid expansion in the number and quality of services and the lower-

[83] Hedonic price indexes calculated in the United States for semiconductors decline more rapidly than the hedonic price indexes for computers. See Triplett, 1996, "Industry Productivity Measures and Hedonic Price Indexes: Do They Fit?"

Table 7.1
Comparison of computer and peripherals price indexes with semi-conductors and other electronic components

Year	Computers and peripherals (3291)	Semi-conductors (3619)	Integrated circuits (3621)	Printed circuits (3622)	Other electronic equipment components (3623)
	price indexes				
1992	1000	1000	1000	1000	1000
1993	892	1083	977	1070	1003
1994	836	1131	958	1118	1002
1995	722	1098	957	1065	1000
1996	597	1092	964	998	1005

Source: Statistics Canada, Industry Measures and Analysis Division.

ing of prices. This dynamism is accompanied by a proliferation of new firms, both in the hardware and software branches of the sector, working on unending variations of developmental aspects of the area.

Hand in hand with rapid technological advances in hardware go the rapid productivity increases in software and other computer services. The underlying engine that enables people to write software for systems is hardware. The 286 computer could not accommodate the powerful software associated with the Pentium. Nor would it handle CD-ROMs, Internet access, and the countless software applications that are now available in almost every field of endeavour. The enormous improvements in computer hardware that have taken place in recent years have led to a multiplicity of computer services and software. These changes are evident both in the vastly increased quality of these services and in the variety of new services adaptable to a wide range of applications. Quality improvements in hardware imply quality improvements in software and services that are at least as productive and extensive as that of the machines involved. These factors should be reflected in the price indexes of computer services and software. Hence, given the steep declines of the hardware index, price indexes of computer services may be expected to show significant decreases. However, traditional methods of controlling for quality change in the construction of price indexes were developed for goods, but are very difficult to apply to service commodities, except, perhaps, for a limited number of services such as packaged software. For other services, such measurement is almost forbidding, especially since many of them may be customized services; identifying their characteristics is extremely difficult. Hence, a methodology that would account for quality changes in software and services is just as vital as it is for hardware. We have conservatively allowed the price index to decline by 6% per year for some computer services, although the hardware price indexes declined by much more in some years.[84]

In many industries, computer use has not had the expected impact on productivity. This may be partly due to a period of adjustment before economies could be realized or because the demand for the service may be such that output cannot be rapidly expanded to the capacity of the machine. The banking industry, for example, opened new branches and extended opening hours well after the introduction of automatic teller machines (ATMs). Closing branches and shortening hours began happening at least 10 years after ATMs were installed. They are extremely convenient to clients, who can avoid long lineups and have access to certain services outside of normal banking hours. However, the fact that a customer could now use an ATM a few times a week instead of lining up to see a teller once a week is only measured if the client holds larger average balances in his deposit or loan accounts. The fact is that the automatic machine may not make the client any better off. The added satisfaction given by 24-hour accessibility to ATMs, telebanking or Internet banking is not measured at the present time. In addition, deflators have to be developed for other new high technology-bred services, such as the rapidly growing debit card services. In another example, most garages now have readily available a record of the client's car service and repair history. This information may allow the client to obtain quicker and more efficient service at the counter. But throughput of cars in the service bays may not be any quicker, although computer-assisted tools may improve the quality of service. Productivity will only be apparent when the new equipment is followed by an increase in output relative to inputs. The recent closing of bank offices and shortening of hours may indicate the realization of such gains, and it is left to see whether this will show up in the statistics. But the added customer satisfaction derived from ATMs will be difficult to capture in the statistics with the current method of measurement. Hence, the apparent lack of productivity in industries using the new technology may be partly because appropriate methodologies for the measurement of new services have not been adequately developed. But it is also possible that in some industries, productivity may be delayed until real structural adjustments can be accomplished, or it may not be realized to a significant degree if there are other bottlenecks in the establishments.

One form of service that should, perhaps, be singled out is that offered by Internet service providers (ISPs). This is an example of a new service generated solely through the technological revolution, and the speed at which it is growing gives it a special urgency. The Internet is a global system of networked computers that allows user-to-user communication and transfer of data files from one machine to any other on the network. ISPs enable individuals and organizations to obtain access to the World Wide Web by maintaining networks linked to the Internet via high speed connection lines. This service is available to businesses and others who wish to make available

[84] A comparison of U.S. prepackaged software price indexes and the computer and peripherals price index between 1986 and 1998 shows some similarity in the direction of change, though not in the magnitude of the indexes. Thus, for backcasting for the period before 1986, an indicator series equal to 60% of the annual change in the price index for computers and peripherals is used. See U.S. Bureau of Economic Analysis, 1999, "Recognition of Software as Investment in the U.S. National Accounts."

information to others about their activities, and to those who wish to access the information so provided. ISPs charge fees to clients for the time spent to access information on the Internet. These fees depend on the type of connection, modem speed, and level of service provided. The packages also provide subscribers with space on which they may erect their own sites. This service has given a new dimension to advertising, information and commerce. While these activities are still small relative to similar types of activity, the speed of expansion and development has been overwhelming. For example, it is estimated that advertising revenues rose from $1.6 million in 1996 to $9.8 million in 1997. These revenues were expected to reach $56 million for 1999.[85] Moreover, there are a number of companies engaged in developing software and hardware designed to extend these services and make them more efficient. Telephone companies, and cable companies also provide Internet services. However the industry is currently very volatile and given to a fast rate of change and rapid turnover of firms, presenting quite a challenge to measurement.[86]

These developments have made measuring prices and activity in the information technology sector challenging. The sector still appears to be evolving and may eventually reach a more stable plateau.

Chain indexes

As stated in Chapter 2, the measures derived by the deflation can be regarded as fixed-based Laspeyres quantum measures. These measures can be shown to be biased upwards where purchasers of goods and services are able to substitute goods and services that become relatively less expensive for those that become relatively more expensive. This type of behaviour exists where there is a negative correlation between price and quantity relatives and points to the need for unbiased indexes or superlative indexes.

Difficulties also occur where the quality and characteristics of individual commodities are changing so rapidly as to make the fixed-base indexes suspect. Rapid technological progress and the introduction of new goods tend to make the baskets of goods and services of the base year obsolete. Goods and services with significant quality change are, in fact, new goods and services as the services they provide may be significantly different from those of the corresponding goods or services in the base year. Hence, comparing prices in consecutive years is preferable to comparing prices of a given year with a distant base year. Moreover, using the chain index makes it possible to substitute the new goods or services in the index as they become important. This is particularly relevant in certain types of communications equipment, informatics equipment and services, and some hospital procedures, and argues for chain Laspeyres volume indexes at the elemental level and chain Fisher indexes for aggregates. This implies deriving year-to-year real changes by deflating each year with an index based on the preceding year's prices, and to chain the results in order to make comparisons with other years. In this way, the results of the deflated year will be additive and aggregative indexes of the Laspeyres type can be calculated. A similar procedure using Laspeyres price indexes will yield Paasche volume indexes. The Laspeyres and Paasche indexes can then be used to derive Fisher indexes.

One of the factors that have led to a rethinking on the use of chain indexes is the use of the hedonic indexes for computers. This type of index takes account of the massive quality changes occurring in this commodity. This has led to very steep declines in the price index, which get more pronounced as we move away from the base year. As a result, there are sharp increases in deflated values. Calculations based on these values would also reflect these quality improvements although these quality changes may not be applicable to the variable being calculated. A case in point is the trade margins associated with computers. Wholesale margins at constant prices are calculated as a ratio of the value of computers at constant prices. Hence, as the computer price index, calculated on a fixed base, rapidly falls, the wholesale margin gets larger and larger. The use of chain indexes will lessen the impact on the series at constant prices, as the indexes will be rebased each year.[87]

The International System of National Accounts recommends using the year-to-year Fisher Ideal volume and price indexes for measuring the rate of growth of GDP volume and inflation of adjacent years respectively. Failing that, Laspeyres volume and Paasche price indexes are considered acceptable alternatives.[88] Comparisons with other years can be obtained by chaining.

[85]Canadian Media Directors' Council, *Media Digest 1998–99*, p. 16.

[86]See Hillary and Baldwin, 1999, "Challenges Facing Canada's Internet Service Providers," pp. 35–50.

[87]See Miller, 1996, "Deflation of Computers in the Canadian Input–Output Accounts."

[88]See Commission of European Communities *et al.*, 1993, *System of National Accounts,* Ch. 16, Paragraph 73, p. 392. Triplett (1996) shows that when relative price changes are substantial, and price induced substitution is also substantial, substantial bias will still be present in a chain Laspeyres index.

Using a transformation (shown in the following section) of the data in the existing current and constant price tables, chain indexes were calculated for GDP at factor cost by industry. These are aggregate indexes. Table 7.2 shows the differences in the year-to-year rates of change between the volume indexes obtained using the Laspeyres chain index formula and the Laspeyres fixed-base formula for the years 1993 to 1996 with the 1992 base year for 47 business sector industries at the M level of aggregation. These indexes are for the most part quite close, with a difference of over 2% occurring in 16 out of 141 cases. Fixed-base indexes are higher in 13 of the 16 cases. Table 7.3 compares the year-to-year Laspeyres and Fisher indexes. Here only 6 of 188 show differences of more than 2% with Fisher chain indexes exceeding the Laspeyres chain indexes in all cases. In five out of the six cases fixed-base indexes exceed the Fisher ones. Generally, the two chain indexes are much closer to each other than they are to the fixed-base index. Also, there are about twice as many cases in 1996, the year furthest from the base year, as in 1994 and 1995 together, while in 1993 all differences are less than 1%. The most significant difference is in the petroleum refining and coal products industry for 1996 where the Laspeyres fixed-base index exceeds the Laspeyres chain index by 15% compared with a difference of 6% between the two chain indexes. This case is somewhat problematic. The chain indexes are closer to the growth rate of GDP at current prices, which fell 22% compared with 12.5% for the Laspeyres chain and 5.6% for the Fisher chain. On the other hand, the fixed-base Laspeyres index rose 3.3% which is in line with a 6.2% increase in gross output. It is not known if the general results would be as close if the elemental price indexes were constructed as chain-linked indexes to begin with.

Note on the use of existing current and constant dollar data to derive chain indexes

A Laspeyres volume index for the value added of a particular industry with previous year as base may be defined as

$$\frac{\Sigma P_{t-1}Q_t - \Sigma p_{t-1}q_t}{\Sigma P_{t-1}Q_{t-1} - \Sigma p_{t-1}q_{t-1}}$$

where P, Q and PQ refer to the price, quantity and value of the output of a commodity, and p, q and pq are similar variables for the intermediate inputs of a commodity; the subscripts t, t-1 and o indicate that the information relates to the current year, immediately preceding year and base year, respectively. Σ denotes that the information is summed over all outputs or intermediate inputs of the industry.

The values in the denominator can be read from the current price input–output tables of the preceding year and the terms in the numerator can be rewritten so that they also can be derived from the tables. For example,

$$\Sigma P_{t-1}Q_t = \Sigma P_{t-1}Q_{t-1}\,(P_oQ_t/P_oQ_{t-1})$$

This, in effect, multiplies, for each industry, the preceding year's current values of each commodity output by the quantum change.

Similarly, the corresponding Paasche volume index may be written as

$$\frac{\Sigma P_tQ_t - \Sigma p_tq_t}{\Sigma P_tQ_{t-1} - \Sigma p_tq_{t-1}}$$

In this case the numerator can readily be obtained from the tables, but it is also possible to rewrite the terms in the denominator so as to derive them also. Thus,

$$\Sigma P_tQ_{t-1} = \Sigma P_tQ_t\,(P_oQ_{t-1}/P_oQ_t)$$

In this case, for each industry the current year's values of each output is divided by the quantum change from the preceding year.

A Fisher volume index can be derived by taking the geometric average of the Laspeyres and Paasche indexes. This would provide an estimate of year-to-year growth of GDP.

Deflation of provincial input–output tables

The Input–Output Division now produces provincial input–output tables and interprovincial commodity flows annually. This opens up the possibility of producing provincial tables and interprovincial flows in constant prices. At the present time, the constant price gross domestic products derived from the deflated national tables serve as benchmarks for the annual provincial gross domestic products. It is conceivable that the quality of the constant price national tables would be enhanced if the provincial tables were deflated at the same time. Consequently, the benchmarks are likely to be of higher quality. Moreover, the gross domestic product derived from each province's input–output table in constant prices could now replace the national GDP as the benchmark for that province's gross domestic product. Such an undertaking would likely

be based on new methods and models, which are more suited to the special features of the provinces. For instance, while in manufacturing, national prices will, in many cases, be used as deflators, provincial weights can be used for aggregating them from lower aggregation levels to the worksheet level.

Table 7.2
Differences in Year-to-year Rates of Change between Laspeyres Chain and Fixed-Based Volume Indexes of Gross Domestic Product, 1993 to 1996 (1992=100)

Industries	1993	1994	1995	1996
		percent		
Agricultural and Related Service	0.0	-0.2	1.4	1.8
Fishing and Trapping	0.0	-0.6	2.5	-1.0
Logging and Forestry	0.0	2.6	-0.1	1.1
Mining	0.0	1.1	-0.2	0.6
Crude Petroleum and Natural Gas	0.0	0.2	0.1	-0.3
Quarry and Sand Pit	0.0	-0.2	0.4	0.9
Service Incidental to Mineral Extraction	0.0	-4.6	-0.4	0.1
Food	0.0	-0.2	0.4	-3.8
Beverage	0.0	0.3	0.0	-5.4
Tobacco Products	0.0	-0.3	0.0	-7.9
Rubber Products	0.0	0.6	-1.6	-1.9
Plastic Products	0.0	-0.3	-0.1	-2.1
Leather and Allied Products	0.0	0.0	0.2	-2.6
Primary Textile	0.0	-0.8	-6.6	-0.8
Textile Products	0.0	-0.4	-0.2	-0.2
Clothing	0.0	0.1	0.1	-1.3
Wood	0.0	1.3	4.9	-0.4
Furniture and Fixture	0.0	0.9	-0.4	-0.5
Paper and Allied Products	0.0	-0.1	1.1	-3.2
Printing, Publishing and Allied	0.0	-0.1	-1.2	-0.6
Primary Metal	0.0	-1.1	-0.3	-1.6
Fabricated Metal Product	0.0	-0.3	0.6	0.2
Machinery (Except Electrical Machinery)	0.0	-0.5	0.1	-1.1
Transportation Equipment	0.0	-1.6	-0.6	-2.2
Electrical and Electronic Products	0.0	1.4	-0.9	-2.6
Non-metallic Mineral Products	0.0	-0.3	-0.1	-2.6
Refined Petroleum and Coal Products	0.0	1.8	-2.2	-15.3
Chemical and Chemical Products	0.0	-1.2	0.6	-3.2
Other Manufacturing	0.0	0.4	-0.5	-1.0
Construction	0.0	0.1	0.5	-0.2
Transportation	0.0	-0.1	-0.1	0.5
Pipeline Transport	0.0	0.2	-0.1	0.0
Storage and Warehousing	0.0	0.0	-0.3	-1.5
Communication	0.0	0.0	-0.4	-0.2
Other Utility	0.0	-0.1	0.0	0.0
Wholesale Trade	0.0	-0.4	-0.6	-0.1
Retail Trade	0.0	0.0	0.2	0.0
Finance and Real Estate	0.0	0.0	-0.3	-0.1
Insurance	0.0	-0.1	-0.7	0.5
Owner Occupied Dwellings	0.0	0.0	0.0	0.1
Business Service	0.0	-0.1	-0.2	-0.2
Educational Service	0.0	0.9	0.2	-0.1
Health and Social Service	0.0	0.0	-0.3	0.0
Accommodation, Food and Beverage Services	0.0	0.1	0.0	0.0
Amusement and Recreational Service	0.0	-0.1	-0.5	-0.6
Personal and Household Service	0.0	0.0	0.1	-0.1
Other Service	0.0	-0.1	-0.2	-0.1

Source: Based on Statistics Canada Input–Output tables at current and constant prices for the years 1992 to 1996.

Table 7.3
Differences between Year-to-year Links of Laspeyres and Fisher Chain Volume Indexes of Gross Domestic Product, 1993 to 1996 (1992=100)

Industries	1993	1994	1995	1996
	pour cent			
Agricultural and Related Service	0.3	0.1	-0.2	-1.0
Fishing and Trapping	-0.1	-1.4	0.0	-0.7
Logging and Forestry	0.2	0.4	0.1	-0.4
Mining	-0.2	1.1	-1.4	-0.2
Crude Petroleum and Natural Gas	-0.4	-0.2	0.0	-0.5
Quarry and Sand Pit	0.0	-0.1	-0.3	0.2
Service Incidental to Mineral Extraction	0.1	-2.9	-0.3	-1.1
Food	0.1	0.2	0.0	-1.6
Beverage	0.1	-0.1	-0.2	-2.3
Tobacco Products	0.1	-0.1	-0.1	-3.9
Rubber Products	-0.3	0.4	0.2	-1.2
Plastic Products	0.0	-0.1	-0.3	-0.7
Leather and Allied Products	-0.1	-0.3	0.8	-1.0
Primary Textile	0.0	0.2	-3.3	-4.1
Textile Products	-0.2	-0.3	-0.8	-0.6
Clothing	0.0	0.0	-0.1	-0.7
Wood	-0.1	-0.4	1.9	0.1
Furniture and Fixture	-0.7	0.2	-0.4	-0.4
Paper and Allied Products	-0.1	-0.3	-1.0	-0.9
Printing, Publishing and Allied	0.0	0.0	0.6	-0.7
Primary Metal	0.0	-0.4	-0.2	-1.0
Fabricated Metal Product	0.0	0.3	0.2	-0.4
Machinery (Except Electrical Machinery)	-0.1	0.0	-0.2	-1.0
Transportation Equipment	0.6	-0.9	-0.2	-0.8
Electrical and Electronic Products	-0.5	0.9	0.7	-1.8
Non-metallic Mineral Products	-0.1	-0.3	0.0	-1.2
Refined Petroleum and Coal Products	-1.0	0.7	1.3	-5.9
Chemical and Chemical Products	0.2	-0.5	0.4	-1.7
Other Manufacturing	0.3	0.5	-0.3	-1.2
Construction	-0.2	-0.1	-0.2	0.0
Transportation	0.1	-0.1	-0.1	-0.2
Pipeline Transport	-0.4	-0.1	-0.1	0.0
Storage and Warehousing	0.0	0.0	0.2	-0.6
Communication	0.0	-0.1	-0.2	-0.1
Other Utility	-0.1	0.1	0.0	-0.2
Wholesale Trade	0.0	-0.1	-0.3	-0.1
Retail Trade	-0.2	-0.1	-0.2	-0.2
Finance and Real Estate	0.4	0.0	0.1	0.4
Insurance	0.3	0.2	0.3	0.0
Owner Occupied Dwellings	0.0	0.0	0.0	0.0
Business Service	0.1	0.0	-0.1	0.0
Educational Service	-0.2	-0.7	-0.1	-0.1
Health and Social Service	0.0	-0.1	0.2	0.0
Accommodation, Food and Beverage Services	-0.1	0.0	0.0	0.0
Amusement and Recreational Service	0.0	-0.2	-0.1	-0.4
Personal and Household Service	0.0	-0.1	-0.1	0.0
Other Service	-0.1	0.0	-0.1	0.0

Source: Based on Statistics Canada Input–Output Tables at current and constant prices for the years 1992 to 1996.

CONCLUSION

This report has examined the sources and methods used to deflate input–output tables. However, there is much room for additional development and research. Further work is needed, particularly in developing output deflators for service commodities, such as business services, communications and advertising, and for imports of services, to name only a few. Research on alternative methods of estimating constant price trade margins is in progress, and deflators specific to exports are also desirable. Work on new methods of measuring the output of the non-business sector is continuing, and it is expected that some of this work will be implemented soon. Keeping pace with new developments in industry and the emergence of new commodities, especially in the high technology area, is extremely challenging. Estimation methods change in response to new situations, new data sources, new technological capability in processing information, availability of resources, and structural and policy developments affecting the accounts. International collaboration and current academic thinking are other factors, which have and will continue to influence the course of development of these accounts. For instance, the revised International System of National Accounts recommendations with respect to the deflation of the accounts are expected to be very influential on the future shape of the tables.

APPENDIX 1

Appendix Notes:

AWE: Index of Average Weekly Earnings
CANSIM: Canadian Socio-Economic Information Management System, Statistics Canada's electronic database
CARD: *Canadian Advertising Rates and Data*, McLean Hunter
CDMC: Canadian Media Directors' Council
CIHI: Canadian Institute of Health Information
CLHIA: Canadian Life and Health Insurance Association
CPI: Consumer Price Index
CTCES: Culture, Tourism and the Centre for Education Statistics, Statistics Canada
FISIM: Financial intermediary services indirectly measured
ICSD: Investment and Capital Stock Division, Statistics Canada
IEAD: Income and Expenditure Accounts Division, Statistics Canada
IFIC: Investment Funds Institute of Canada
IOD: Input_Output Division, Statistics Canada
IPI: Implicit price index
IPPI: Industry Product Price Index
MCED: Manufacturing, Construction and Energy Division, Statistics Canada
MSE: Montréal Stock Exchange
MESAD: Micro Economic Studies and Analysis Division, Statistics Canada
OSFI: Office of Superintendent of Financial Institutions
TSE: Toronto Stock Exchange
Unit value index: Index derived from value and quantity data
USBEA: U.S. Bureau of Economic Analysis
Volume: Constant price estimates based on trend in volume data
VSE: Vancouver Stock Exchange
C$: Current dollars
K$: Constant dollars

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
1	Cattle and calves		X				Agriculture Division
2	Hogs		X				"
3	Poultry		X				"
4	Other live animals		X				"
5	Wheat, unmilled, excluding imputed feed		X				"
6	Wheat, unmilled, imputed feed		X				"
7	Corn, excluding imputed feed		X				"
8	Corn fodder, imputed feed		X				"
9	Barley, excluding imputed feed		X				"
10	Other grains, excluding imputed feed		X				"
11	Other grains and fodder, imputed feed		X				"
12	Fluid milk, unprocessed		X				"
13	Eggs in the shell		X				"
14	Honey and beeswax		X				"
15	Fresh fruit, excluding tropical		X				"
16	Potatoes, fresh or chilled		X				"
17	Other vegetables, fresh or chilled		X				"
18	Hay, excluding imputed feed		X				"
19	Hay, imputed feed		X				"
20	Seeds, excluding oil seeds					X	Prices Division
21	Nursery stock, flowers, etc.		X				Agriculture Division (22-202-XIB)*
22	Canola		X				Agriculture Division
23	Soybeans and other oil seeds		X				Agriculture Division (22-207)*
24	Raw tobacco		X				Agriculture Division (23-207)*
25	Raw wool and mink skins		X				Agriculture Division (23-603-UPE)*
26	Services incidental to agriculture					X	Prices Division
27	Services incidental to forestry				X		Labour Statistics Division
28	Logs		X				MCED
29	Poles, piling, bolts, etc.		X				"
30	Pulpwood		X				"
31	Fuelwood and other crude wood		X				"
32	Custom forestry				X	X	ICSD and Labour Statistics Division
33	Fish and seafood, fresh, chilled		X				Canadian Fisheries Statistical Review
34	Hunting and trapping products		X				Agriculture Division, (23-603-UPE)*
35	Gold and alloys in primary forms	X					Prices Division, (62-011-XPB)*
36	Radioactive ores and concentrates		X				Census Of Mines
37	Iron ores and concentrates		X				MCE Division, (26-201-XIB)*
38	Bauxite and alumina						International Trade Division
39	Other metal ores and concentrates		X				Census Of Mines (26-223-XIB)*
40	Coal		X				Census Of Mines (26-206-XIB)*
41	Crude mineral oils		X				MCED (26-213-XPB)*
42	Natural gas, excluding liquified		X				MCED (26-213-XPB and 57-205-XPB)*
43	Sulphur, crude and refined		X				MCED, Census of Mines
44	Asbestos, crude and milled		X				MCED (26-201-XIB)*
45	Gypsum		X				"
46	Salt		X				"
47	Peat		X				"
48	Clays	X					Prices Division
49	Natural abrasives and industrial diamonds	X					"

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
	Cattle and calves	1
	Hogs	2
	Poultry	3
	Other live animals	4
	Wheat, unmilled, excluding imputed feed	5
	Wheat, unmilled, imputed feed	6
	Corn, excluding imputed feed	7
	Corn fodder, imputed feed	8
	Barley, excluding imputed feed	9
	Other grains, excluding imputed feed	10
	Other grains and fodder, imputed feed	11
	Fluid milk, unprocessed	12
	Eggs in the shell	13
	Honey and beeswax	14
	Fresh fruit, excluding tropical	15
	Potatoes, fresh or chilled	16
	Other vegetables, fresh or chilled	17
	Hay, excluding imputed feed	18
	Hay, imputed feed	19
Farm Input Price Indexes	Seeds, excluding oil seeds	20
	Nursery stock, flowers, etc.	21
	Canola	22
	Soybeans and other oil seeds	23
	Raw tobacco	24
	Raw wool and mink skins	25
Farm Input Price Indexes	Services incidental to agriculture	26
	Services incidental to forestry	27
	Logs	28
	Poles, piling, bolts, etc.	29
	Pulpwood	30
	Fuelwood and other crude wood	31
Weighted average of IPI for capital stock and Index of AWE, forestry services ind.	Custom forestry	32
	Fish and seafood, fresh, chilled	33
	Hunting and trapping products	34
	Gold and alloys in primary forms	35
	Radioactive ores and concentrates	36
	Iron ores and concentrates	37
	Bauxite and alumina	38
	Other metal ores and concentrates	39
	Coal	40
	Crude mineral oils	41
	Natural gas, excluding liquified	42
	Sulphur, crude and refined	43
	Asbestos, crude and milled	44
	Gypsum	45
	Salt	46
	Peat	47
	Clays	48
	Natural abrasives and industrial diamonds	49

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
50	Other crude minerals		X				MCED, (26-201-XIB)*
51	Sand (excluding silica) and gravel		X				MCED, (26-225-XIB)*
52	Stone and silica sand for industrial use		X				"
53	Stone for construction		X				"
54	Services incidental to mining					X	Petrol. Services Assoc. Well Cost Study; MCED
55	Beef, fresh, chilled, frozen	X					Prices Division
56	Pork, fresh, chilled, frozen	X					"
57	Other meat, fresh, chilled, frozen	X					"
58	Edible offal, fresh, chilled, frozen	X					"
59	Cured meat	X					"
60	Prepared meat products	X					"
61	Animal fat and lard	X					"
62	Margarine and shortening	X					"
63	Sausage casings	X					"
64	Feeds from animal by-products	X					"
65	Raw animal hides and skins	X					"
66	Animal by-products for ind. use	X					"
67	Custom work, meat and food				X	X	ICSD and Labour Statistics Division
68	Poultry, fresh, chilled, frozen	X					Prices Division
69	Fluid milk, processed	X					"
70	Fresh cream	X					"
71	Butter	X					"
72	Cheese	X					"
73	Evaporated and condensed dairy products	X					"
74	Ice cream	X					"
75	Powder dairy products	X					"
76	Other dairy products	X					"
77	Mayonnaise, salad dressing and mustard	X					"
78	Fish and seafood products fresh, chilled, frozen	X					"
79	Other fish and seafood products	X					"
80	Frozen fruit and juice	X					"
81	Other fruit juice	X					"
82	Other fruit products	X					"
83	Fruit and jam in airtight containers	X					"
84	Frozen potatoes	X					"
85	Other frozen vegetables	X					"
86	Other preserved vegetables	X					"
87	Vegetables and juice in airtight containers	X					"
88	Soups in airtight containers	X					"
89	Infant and junior foods, canned	X					"
90	Sauces, pickles, etc.	X					"
91	Vinegar	X					"
92	Mineral water, fruit drinks and ice	X					"
93	Pasta products, excluding dry pasta	X					"
94	Precooked and frozen food products	X					"
95	Feed supplements and premixes	X					"
96	Complete feeds	X					"
97	Feeds from grain by-products	X					"
98	Feeds from vegetable by-products	X					"

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
	Other crude minerals	50
	Sand (excluding silica) and gravel	51
	Stone and silica sand for ind. use	52
	Stone for construction	53
Special Drilling Cost Index, average cost/metre, gross output, crude petroleum ind.	Services incidental to mining	54
	Beef, fresh, chilled, frozen	55
	Pork, fresh, chilled, frozen	56
	Other meat, fresh, chilled, frozen	57
	Edible offal, fresh, chilled, frozen	58
	Cured meat	59
	Prepared meat products	60
	Animal fat and lard	61
	Margarine and shortening	62
	Sausage casings	63
	Feeds from animal by-products	64
	Raw animal hides and skins	65
	Animal by-products for ind. use	66
Weighted average of IPI for capital stock and AWE deflator for food ind.	Custom work, meat and food	67
	Poultry, fresh, chilled, frozen	68
	Fluid milk, processed	69
	Fresh cream	70
	Butter	71
	Cheese	72
	Evaporated and condensed dairy products	73
	Ice cream	74
	Powder dairy products	75
	Other dairy products	76
	Mayonnaise, salad dressing and mustard	77
	Fish and seafood prod fresh, chilled, frozen	78
	Other fish and seafood products	79
	Frozen fruit and juice	80
	Other fruit juice	81
	Other fruit products	82
	Fruit and jam in airtight containers	83
	Frozen potatoes	84
	Other frozen vegetables	85
	Other preserved vegetables	86
	Vegetables and juice in airtight containers	87
	Soups in airtight containers	88
	Infant and junior foods, canned	89
	Sauces, pickles, etc.	90
	Vinegar	91
	Mineral water, fruit drinks and ice	92
	Pasta products, excluding dry pasta	93
	Precooked and frozen food products	94
	Feed supplements and premixes	95
	Complete feeds	96
	Feeds from grain by-products	97
	Feeds from vegetable by-products	98

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
99	Pet feeds	X					Prices Division
100	Wheat flour	X					"
101	Starches	X					"
102	Breakfast cereal products	X					"
103	Biscuits	X					"
104	Plain bread and rolls	X					"
105	Other bakery products	X					"
106	Food snacks	X					"
107	Cocoa and chocolate	X					"
108	Nuts	X					"
109	Chocolate confectionery	X					"
110	Other confectionery	X					"
111	Sugar	X					"
112	Oil-cake feeds	X					"
113	Crude vegetable oils	X					"
114	Nitrogen function compounds	X					"
115	Other flours and processed grains	X					"
116	Maple sugar and syrup	X	X				Prices and Agriculture divisions
117	Other syrup	X					Prices Division
118	Prepared cake and other mixes	X					"
119	Dehydrated soup mixes and bases	X					"
120	Roasted coffee	X					"
121	Tea	X					"
122	Potato chips and flakes	X					"
123	Spices	X					"
124	Peanut butter	X					"
125	Food and drink powders	X					"
126	Other food products	X					"
127	Infant and junior foods, excluding canned	X					"
128	Dry pasta	X					"
129	Soft drink concentrates	X					"
130	Carbonated soft drinks	X					"
131	Distilled alc. beverages, bought in store	X					"
132	Distilled alc. bev., cons. on lic. premises	X					"
133	Beer, including coolers, bought in store	X					"
134	Beer, including coolers, cons. on lic. premises	X					"
135	Wine, including coolers, bought in store	X					"
136	Wine. including coolers, cons. on lic. premises	X					"
137	Unmanufactured tobacco	X					"
138	Cigarettes	X					"
139	Other tobacco products	X					"
140	Waterproof footwear	X					"
141	Passenger car tires	X					"
142	Truck, bus and off-highway tires	X					"
143	Other tires and tubes	X					"
144	Tire repair material and retreads	X					"
145	Conveyor and transmission belting	X					"
146	Self-adhesive tape	X					"
147	Other rubber products for industrial use	X					"

Additional Details	Commodities	No.
	Pet feeds	99
	Wheat flour	100
	Starches	101
	Breakfast cereal products	102
	Biscuits	103
	Plain bread and rolls	104
	Other bakery products	105
	Food snacks	106
	Cocoa and chocolate	107
	Nuts	108
	Chocolate confectionery	109
	Other confectionery	110
	Sugar	111
	Oil-cake feeds	112
	Crude vegetable oils	113
	Nitrogen function compounds	114
	Other flours and processed grains	115
Weighted IPPI and unit value for farm production	Maple sugar and syrup	116
	Other syrup	117
	Prepared cake and other mixes	118
	Dehydrated soup mixes and bases	119
	Roasted coffee	120
	Tea	121
	Potato chips and flakes	122
	Spices	123
	Peanut butter	124
	Food and drink powders	125
	Other food products	126
	Infant and junior foods, excluding canned	127
	Dry pasta	128
	Soft drink concentrates	129
	Carbonated soft drinks	130
	Distilled alc. beverages, bought in store	131
	Distilled alc. bev., cons. on lic. Premises	132
	Beer, including coolers, bought in store	133
	Beer, including coolers, cons. on lic. premises	134
	Wine, including coolers, bought in store	135
	Wine. including coolers, cons. on lic. premises	136
	Unmanufactured tobacco	137
	Cigarettes	138
	Other tobacco products	139
	Waterproof footwear	140
	Passenger car tires	141
	Truck, bus and off-highway tires	142
	Other tires and tubes	143
	Tire repair material and retreads	144
	Conveyor and transmission belting	145
	Self-adhesive tape	146
	Other rubber products for industrial use	147

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
148	Hose and tubing, mainly rubber	X					Prices Division
149	Plastic film and sheet	X					"
150	Foamed and expanded plastics	X					"
151	Other plastic products, including cups	X					"
152	Plastic building supplies	X					"
153	Other rubber end products	X					"
154	Plastic containers and closures	X					"
155	Plastic pipe and pipe fittings	X					"
156	Leather and misc. leather goods	X					"
157	Footwear, excluding waterproof	X					"
158	Leather gloves	X					"
159	Luggage, briefcases, etc.	X					"
160	Handbags, wallets, etc.	X					"
161	Cotton yarn	X					"
162	Cotton woven fabric	X					"
163	Tire cord fabric	X					"
164	Bedding	X					"
165	Wool and wool mix yarn and thread	X					"
166	Wool and wool mix woven fabric	X					"
167	Felt	X					"
168	Man-made staple fibres	X					"
169	Polyamide resins, including nylon	X					"
170	Filament yarn	X					"
171	Yarn of staple fibres	X					"
172	Tire yarn	X					"
173	Man-made fabric for clothing	X					"
174	Man-made fabric for industrial use	X					"
175	Pile fabric	X					"
176	Cotton thread	X					"
177	Man-made thread	X					"
178	Rope and twine	X					"
179	Narrow fabrics, including lace	X					"
180	Textile floor covering	X					"
181	Textile dyeing and finishing service	X			X	X	Int'l Trade, Labour Statistics and Prices divisions
182	Awnings, tarpaulins, etc.	X					Prices Division
183	Tents, sleeping bags, sails, etc.	X					"
184	Other household textile products	X					"
185	Textile medical products	X					"
186	Other textile products	X					"
187	Hosiery	X					"
188	Knitted fabrics	X					"
189	Men's and boys' knitted clothing	X					"
190	Sweaters	X					"
191	Women's knitted clothing	X					"
192	Children's knitted clothing	X					"
193	Men's and boys' clothing	X					"
194	Women's underwear and sleepwear	X					"
195	Other women's clothing	X					"
196	Children's wear	X					"

Additional Details	Commodities	No.
	Hose and tubing, mainly rubber	148
	Plastic film and sheet	149
	Foamed and expanded plastics	150
	Other plastic products, including cups	151
	Plastic building supplies	152
	Other rubber end products	153
	Plastic containers and closures	154
	Plastic pipe and pipe fittings	155
	Leather and misc. leather goods	156
	Footwear, excluding waterproof	157
	Leather gloves	158
	Luggage, briefcases, etc.	159
	Handbags, wallets, etc.	160
	Cotton yarn	161
	Cotton woven fabric	162
	Tire cord fabric	163
	Bedding	164
	Wool and wool mix yarn and thread	165
	Wool and wool mix woven fabric	166
	Felt	167
	Man-made staple fibres	168
	Polyamide resins, including nylon	169
	Filament yarn	170
	Yarn of staple fibres	171
	Tire yarn	172
	Man-made fabric for clothing	173
	Man-made fabric for industrial use	174
	Pile fabric	175
	Cotton thread	176
	Man-made thread	177
	Rope and twine	178
	Narrow fabrics, including lace	179
	Textile floor covering	180
Wgt'd avg. of IPPI and import deflator commodity 4769 (material), and AWE (labour)	Textile dyeing and finishing service	181
	Awnings, tarpaulins, etc.	182
	Tents, sleeping bags, sails, etc.	183
	Other household textile products	184
	Textile medical products	185
	Other textile products	186
	Hosiery	187
	Knitted fabrics	188
	Men's and boys' knitted clothing	189
	Sweaters	190
	Women's knitted clothing	191
	Children's knitted clothing	192
	Men's and boys' clothing	193
	Women's underwear and sleepwear	194
	Other women's clothing	195
	Children's wear	196

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
197	Other clothing and accessories	X					Prices Division
198	Dressed furs	X					"
199	Fur apparel	X					"
200	Custom tailoring				X	X	ICSD and Labour Statistics Division
201	Wood chips	X					Prices Division
202	Lumber	X					"
203	Treated lumber and wood products	X					"
204	Wood waste	X					"
205	Custom wood work and millwork				X	X	ICSD and Labour Statistics Division
206	Plywood and veneer	X					Prices Division
207	Wooden doors and windows	X					"
208	Kitchen cabinets	X					"
209	Millwork	X					"
210	Wood structural products	X					"
211	Wood prefabricated buildings	X					"
212	Wood containers	X					"
213	Caskets and coffins	X					"
214	Shingles and shakes	X					"
215	Particle and waferboard	X					"
216	Other wood end products	X					"
217	Household furniture	X					"
218	Furniture parts	X					"
219	Office furniture	X					"
220	Commercial and institutional furniture	X					"
221	Mattresses and other furniture	X					"
222	Portable lighting fixtures	X					"
223	Pulp	X					"
224	Newsprint paper		X				MCED
225	Other paper, containing wood	X					Prices Division
226	Other paper, wood-free	X					"
227	Tissue and sanitary paper stock	X					"
228	Wrapping and sack paper, and bag stock	X					"
229	Paperboard, including boxboard	X					"
230	Building board and paper	X					"
231	Asphalt building products	X					"
232	Toilet paper, paper towel, tissue, etc.	X					"
233	Paper waste and scrap	X					"
234	Vinyl floor and wall covering	X					"
235	Paper bags and sacks	X					"
236	Paper boxes, cartons and drums	X					"
237	Plastic bags	X					"
238	Corrugated paper and board	X					"
239	Wallpaper	X					"
240	Other coated paper and products	X					"
241	Aluminum foil	X					"
242	Paper diapers and sanitary napkins	X					"
243	Textile hygiene products	X					"
244	Paper containers for commercial use	X					"
245	Paper stationery	X					"

Additional Details	Commodities	No.
	Other clothing and accessories	197
	Dressed furs	198
	Fur apparel	199
Weighted average of IPI for capital stock and index of AWE, clothing industry	Custom tailoring	200
Weighted IPPI by province	Wood chips	201
	Lumber	202
	Treated lumber and wood products	203
	Wood waste	204
Weighted average of IPI for capital stock and index of AWE, wood products industry	Custom wood work and millwork	205
	Plywood and veneer	206
	Wooden doors and windows	207
	Kitchen cabinets	208
	Millwork	209
	Wood structural products	210
	Wood prefabricated buildings	211
	Wood containers	212
	Caskets and coffins	213
	Shingles and shakes	214
	Particle and waferboard	215
	Other wood end products	216
	Household furniture	217
	Furniture parts	218
	Office furniture	219
	Commercial and institutional furniture	220
	Mattresses and other furniture	221
	Portable lighting fixtures	222
	Pulp	223
	Newsprint paper	224
	Other paper, containing wood	225
	Other paper, wood-free	226
	Tissue and sanitary paper stock	227
	Wrapping and sack paper, and bag stock	228
	Paperboard, including boxboard	229
	Building board and paper	230
	Asphalt building products	231
	Toilet paper, paper towel, tissue, etc.	232
	Paper waste and scrap	233
	Vinyl floor and wall covering	234
	Paper bags and sacks	235
	Paper boxes, cartons and drums	236
	Plastic bags	237
	Corrugated paper and board	238
	Wallpaper	239
	Other coated paper and products	240
	Aluminum foil	241
	Paper diapers and sanitary napkins	242
	Textile hygiene products	243
	Paper containers for commercial use	244
	Paper stationery	245

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
246	Other stationery supplies	X					Prices Division
247	Photographic paper	X					"
248	Paper end products, including household	X					"
249	Newspapers	X					"
250	Magazines and periodicals	X					"
251	Books	X					"
252	Greeting and postcards, maps, etc.	X					"
253	Banknotes, cheques and stamps, etc.	X					"
254	Printed business forms	X					"
255	Advertising flyers, catalogues, directories	X					"
256	Other printed matter	X					"
257	Advertising in print media					X	CARD
258	Specialized publishing service	X					Prices Division
259	Printing plates, type, etc.	X					"
260	Ferro-alloys	X					"
261	Iron and steel ingots, billets, etc.	X					"
262	Steel castings	X					"
263	Steel bars and rods, non-alloy, excl. reinf.	X					"
264	Reinforcing bars and rods	X					"
265	Alloy steel bars and rods	X					"
266	Flat iron and steel, not alloy, not coated	X					"
267	Flat iron and steel, alloy, coated	X					"
268	Iron and steel railway construction material					X	"
269	Tar and pitch	X					"
270	Carbon and graphite products	X					"
271	Oil and gas casing and drill pipe	X					"
272	Oil and gas line pipe	X					"
273	Other iron and steel pipes and tubes	X					"
274	Other cast iron products	X					"
275	Grinding balls and ingot moulds	X					"
276	Cast iron pipe and fittings	X					"
277	Other iron and steel pipe fittings	X					"
278	Nickel in primary forms	X					"
279	Copper in primary forms	X					"
280	Lead in primary forms	X					"
281	Zinc in primary forms	X					"
282	Aluminum ingots, billets, blocks and slabs	X					"
283	Aluminum, other primary forms	X					"
284	Precious metals in primary forms, excluding gold	X					"
285	Other non-ferrous base metals	X					"
286	Other non-ferrous base and fabricated materials	X					"
287	Other inorganic bases and metallic oxides	X					"
288	Metal scrap, excluding iron and steel	X					"
289	Iron and steel scrap	X					"
290	Aluminum and aluminum alloy fabricated material	X					"
291	Copper fabricated materials	X					"
292	Copper alloy fabricated materials	X					"
293	Lead and lead alloy fabricated material	X					"
294	Nickel and nickel alloy fabricated material	X					"

Additional Details	Commodities	No.
	Other stationery supplies	246
	Photographic paper	247
	Paper end products, including household	248
	Newspapers	249
	Magazines and periodicals	250
	Books	251
	Greeting and postcards, maps, etc.	252
	Banknotes, cheques and stamps, etc.	253
	Printed business forms	254
	Advert. flyers, catalog., directories	255
	Other printed matter	256
Published rates and circulation	Advertising in print media	257
Weighted average of IPPI for other printed matter	Specialized publishing service	258
	Printing plates, type, etc.	259
	Ferro-alloys	260
	Iron and steel ingots, billets, etc.	261
	Steel castings	262
	Steel barsandrods, non-alloy, excluding reinforced	263
	Reinforcing bars and rods	264
	Alloy steel bars and rods	265
	Flat iron and steel, not alloy, not coated	266
	Flat iron and steel, alloy, coated	267
Based on information from purchasers	Iron and steel railway construction material	268
	Tar and pitch	269
	Carbon and graphite products	270
	Oil and gas casing and drill pipe	271
	Oil and gas line pipe	272
	Other iron and steel pipes and tubes	273
	Other cast iron products	274
	Grinding balls and ingot moulds	275
	Cast iron pipe and fittings	276
	Other iron and steel pipe fittings	277
	Nickel in primary forms	278
	Copper in primary forms	279
	Lead in primary forms	280
	Zinc in primary forms	281
	Aluminum ingots, billets, blocks and slabs	282
	Aluminum, other primary forms	283
	Precious metals in primary forms excluding gold	284
	Other non-ferrous base metals	285
	Oth. non-ferrous base and fabricated materials	286
	Other inorganic bases and metallic oxides	287
	Metal scrap, excluding. iron and steel	288
	Iron and steel scrap	289
	Aluminum and aluminum alloy fabricated material	290
	Copper fabricated materials	291
	Copper alloy fabricated materials	292
	Lead and lead alloy fabricated material	293
	Nickel and nickel alloy fabricated material	294

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
295	Zinc and zinc alloy fabricated material	X					Prices Division
296	Soldering rods and wire	X					"
297	Fabricated steel plate	X					"
298	Metal tanks	X					"
299	Power boilers	X					"
300	Iron and steel structural materials	X					"
301	Prefabricated metal buildings	X					"
302	Prefabricated metal structures	X					"
303	Metal doors and windows	X					"
304	Other metal building products	X					"
305	Corrugated metal culvert pipe	X					"
306	Iron and steel stampings	X					"
307	Metal roofing, siding, ducts, etc.	X					"
308	Metal kitchen utensils	X					"
309	Other kitchen utensils	X					"
310	Other metal containers and closures	X					"
311	Food, beverage and other cans	X					"
312	Iron and steel wire and cable	X					"
313	Iron and steel wire fencing and screen	X					"
314	Chain, excluding motor vehicle and power trans.	X					"
315	Welding rods, wire electrodes	X					"
316	Wire products, including springs	X					"
317	Fastener hardware	X					"
318	Builders' hardware	X					"
319	Miscellaneous hardware	X					"
320	Machine tools	X					"
321	Tool accessories	X					"
322	Hand and measuring tools	X					"
323	Scissors, razor blades, industrial cutlery, etc.	X					"
324	Household clothes washers and dryers	X					"
325	Household dishwashers	X					"
326	Mowers, snowblowers and other household equip.	X					"
327	Non-electric furnaces and heat equipment	X					"
328	Commercial cooking equipment	X					"
329	Custom metal working				X	X	ICSD and Labour Statistics Division
330	Iron and steel forgings	X					Prices Division
331	Valves	X					"
332	Metal plumbing fixtures and fittings	X					"
333	Plastic plumbing fixtures and fittings	X					"
334	Gas and water meters	X					"
335	Fire fighting and traffic control equipment	X					"
336	Firearms and military hardware	X					"
337	Bulldozers, farm and garden tractors	X					"
338	Other agricultural machinery	X					"
339	Bearings	X					"
340	Mechan. power transmission equipment	X					"
341	Pumps, compressors and blowers	X					"
342	Conveyors, elevators and hoist machinery	X					"

Additional Details	Commodities	No.
	Zinc and zinc alloy fabricated material	295
	Soldering rods and wire	296
	Fabricated steel plate	297
	Metal tanks	298
	Power boilers	299
	Iron and steel structural materials	300
	Prefabricated metal buildings	301
	Prefabricated metal structures	302
	Metal doors and windows	303
	Other metal building products	304
	Corrugated metal culvert pipe	305
	Iron and steel stampings	306
	Metal roofing, siding, ducts, etc.	307
	Metal kitchen utensils	308
	Other kitchen utensils	309
	Other metal containers and closures	310
	Food, beverage and other cans	311
	Iron and steel wire and cable	312
	Iron and steel wire fencing and screen	313
	Chain, excluding motor vehicle and power trans.	314
	Welding rods, wire electrodes	315
	Wire products, including springs	316
	Fastener hardware	317
	Builders' hardware	318
	Miscellaneous hardware	319
	Machine tools	320
	Tool accessories	321
	Hand and measuring tools	322
	Scissors, razor blades, industrial cutlery, etc.	323
	Household clothes washers and dryers	324
	Household dishwashers	325
	Mowers, snowblowers and other household equip.	326
	Non-electric furnaces and heat equipment	327
	Commercial cooking equipment	328
Weighted average of IPI for capital stock and index of AWE, fabricated metal prod.	Custom metal working	329
	Iron and steel forgings	330
	Valves	331
	Metal plumbing fixtures and fittings	332
	Plastic plumbing fixtures and fittings	333
	Gas and water meters	334
	Fire fighting and traffic control equipment	335
	Firearms and military hardware	336
	Bulldozers, farm and garden tractors	337
	Other agricultural machinery	338
	Bearings	339
	Mechan. power transmission equip	340
	Pumps, compressors and blowers	341
	Conveyors, elevators and hoist machinery	342

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
343	Industrial trucks and material handling equipment	X					Prices Division
344	Fans and air circulation units, not industrial	X					"
345	Packaging and bottling machinery	X					"
346	Air purification equipment	X					"
347	Other general purpose machinery	X					"
348	Industrial furnaces, kilns and ovens	X					"
349	Construction and mining machinery	X					"
350	Logging, pulp and paper industry machinery	X					"
351	Metal working machinery	X					"
352	Other industry specific machinery	X					"
353	Service industry machinery	X					"
354	Power hand tools	X					"
355	Air conditioning equipment, wall and window	X					"
356	Air cond., refrig. equip., commercial and transport	X					"
357	Scales and balances	X					"
358	Vending machines	X					"
359	Computers, video units, printers, etc.						Prices Division, USBEA
360	Office machines, excl. photocopy and fax						Prices Division
361	Aircraft	X					"
362	Aircraft engines	X					"
363	Aircraft parts and equipment				X	X	IOD C$, Input deflators and Labour Statistics Division
364	Aircraft service and repairs				X		Labour Statistics Division
365	Automobiles, including passenger vans	X		X			Prices Division
366	Trucks, road tractors and chassis	X					"
367	Buses and chassis	X					"
368	Off-highway trucks	X					"
369	Military motor vehicles	X					"
370	Motor homes, motorcycles and ATVs	X					"
371	Mobile homes	X					"
372	Non-commercial trailers	X					"
373	Commercial trailers and semi-trailers	X					"
374	Truck and bus bodies, and cargo containers	X					"
375	Motor vehicle engines and parts	X					"
376	Motor vehicle electric equipment	X					"
377	Motor vehicle stampings	X					"
378	Motor vehicle steering and suspension	X					"
379	Motor vehicle wheels and brakes	X					"
380	Motor vehicle plastic parts and trim	X					"
381	Motor vehicle fabric accessories	X					"
382	Other motor vehicle parts and accessories	X					"
383	Locomotive and rlwy. & urban trans. rolling stock	X					"
384	Parts for railway and urban trans. rolling stock	X					"
385	Ships, boats and parts, excluding pleasure				X	X	IOD C$, Input deflators and Labour Statistics Division
386	Ship repairs				X		Labour Statistics Division
387	Snowmobiles	X					Prices Division
388	Pleasure boats and sporting craft	X					"
389	Microwave ovens	X					"
390	Small household appliances	X					"

Additional Details	Commodities	No.
	Industrial trucks and material handling equipment	343
	Fans and air circulation units, not industrial	344
	Packaging and bottling machinery	345
	Air purification equipment	346
	Other general purpose machinery	347
	Industrial furnaces, kilns and ovens	348
	Construction and mining machinery	349
	Logging, pulp and paper industry machinery	350
	Metal working machinery	351
	Other industry specific machinery	352
	Service industry machinery	353
	Power hand tools	354
	Air conditioning equipment, wall and window	355
	Air cond., refrig. equip., commercial and transport	356
	Scales and balances	357
	Vending machines	358
Based on hedonic indexes	Computers, video units, printers, etc.	359
	Office machines, excl., photocopy and facsimile	360
	Aircraft	361
	Aircraft engines	362
IPI of intermediate inputs and labour input of aircraft and aircraft parts industry	Aircraft parts and equipment	363
	Aircraft service and repairs	364
	Automobiles, including passenger vans	365
IPPI for light, medium and heavy trucks C$	Trucks, road tractors and chassis	366
	Buses and chassis	367
	Off-highway trucks	368
	Military motor vehicles	369
	Motor homes, motorcycles and ATVs	370
	Mobile homes	371
	Non-commercial trailers	372
	Commercial trailers and semi-trailers	373
	Truck and bus bodies, and cargo containers	374
	Motor vehicle engines and parts	375
	Motor vehicle electric equipment	376
	Motor vehicle stampings	377
	Motor vehicle steering and suspension	378
	Motor vehicle wheels and brakes	379
	Motor vehicle plastic parts and trim	380
	Motor vehicle fabric accessories	381
	Other motor vehicle parts and accessories	382
	Locomotive and rlwy. & urban trans. rolling stock	383
	Parts for railway and urban trans. rolling stock	384
IPI of intermediate inputs and labour input of shipbuilding and repair industry	Ships, boats and parts, excluding pleasure	385
	Ship repairs	386
	Snowmobiles	387
	Pleasure boats and sporting craft	388
	Microwave ovens	389
	Small household appliances	390

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
391	Electric furnace and other electrical heating equip.	X					Prices Division
392	Household refrigerators and freezers	X					"
393	Household cooking equip., excluding microwave	X					"
394	Radio, stereo, CD players	X					"
395	TV, VCR and unrecorded tape	X					"
396	Telephone and related equip., including fax	X					"
397	Broadcasting and radio communications equip.	X					"
398	Radar and radio navigation equipment	X					"
399	Semi-conductors	X					"
400	Printed circuits	X					"
401	Integrated circuits	X					"
402	Other electronic equipment components	X					"
403	Electronic alarm and signal systems	X					"
404	Welding machinery and equipment	X					"
405	Power generation and marine prop., non-electric	X					"
406	Electrical generators and motors	X					"
407	Ballast	X					"
408	Transformers and converters	X					"
409	Industrial electric equipment	X					"
410	Batteries	X					"
411	Wire and cable, insulated, excluding aluminum	X					"
412	Aluminum wire and cable	X					"
413	Wiring materials and electrical meters	X					"
414	Electric light bulbs and tubes	X					"
415	Electric lighting fixtures, excluding portable	X					"
416	Vehicle lighting equipment	X					"
417	Cement	X					"
418	Lime	X					"
419	Concrete products, including sand and lime	X					"
420	Ready-mix concrete	X					"
421	Bricks and other clay building products	X					"
422	Porcelain insulators	X					"
423	Ceramic household products	X					"
424	Refractory products	X					"
425	Natural stone products	X					"
426	Gypsum building products	X					"
427	Mineral wool building products	X					"
428	Asbestos products	X					"
429	Other non-metallic mineral basic products	X					"
430	Glass and other glass products	X					"
431	Safety glass	X					"
432	Optical fibre cables	X					"
433	Glass fibre batts, mats, etc.	X					"
434	Glass containers	X					"
435	Mirrors and glass household products	X					"
436	Abrasive products	X					"
437	Gasoline		X				MCED (45-004-XPB)*
438	Aviation fuel		X				"

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
	Electric furnace and other electrical heating equip.	391
	Household refrigerators and freezers	392
	Household cooking equip., excluding microwave	393
	Radio, stereo, CD players	394
	TV, VCR and unrecorded tape	395
	Telephone and related equip., including facsimile	396
	Broadcasting and radio communications equip.	397
	Radar and radio navigation equipment	398
	Semi-conductors	399
	Printed circuits	400
	Integrated circuits	401
	Other electronic equipment components	402
	Electronic alarm and signal systems	403
	Welding machinery and equipment	404
	Power generation and marine prop., non-electric	405
	Electrical generators and motors	406
	Ballast	407
	Transformers and converters	408
	Industrial electric equipment	409
	Batteries	410
	Wire and cable, insulated, excluding aluminum	411
	Aluminum wire and cable	412
	Wiring materials and electrical meters	413
	Electric light bulbs and tubes	414
	Electric lighting fixtures, excluding portable	415
	Vehicle lighting equipment	416
	Cement	417
	Lime	418
	Concrete products, including sand and lime	419
	Ready-mix concrete	420
	Bricks and other clay building products	421
	Porcelain insulators	422
	Ceramic household products	423
	Refractory products	424
	Natural stone products	425
	Gypsum building products	426
	Mineral wool building products	427
	Asbestos products	428
	Other non-metallic mineral basic products	429
	Glass and other glass products	430
	Safety glass	431
	Optical fibre cables	432
	Glass fibre batts, mats, etc.	433
	Glass containers	434
	Mirrors and glass household products	435
	Abrasive products	436
	Gasoline	437
	Aviation fuel	438

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
439	Diesel oil		X				MCED (45-004-XPB)*
440	Light fuel oil		X				"
441	Heavy fuel oil		X				"
442	Lubricating oils and greases	X					Prices Division
443	Benzene, toluene and xylene	X					"
444	Liquid petroleum gases, including natural gas		X				MCED (45-004-XPB)*
445	Naphtha	X					Prices Division
446	Asphalt compound, hot bulk		X				MCED (45-004-XPB)*
447	Other asphalt products		X				"
448	Petrochemical feed stock		X				"
449	Animalandvegetable fertilizers, imputed		X				Agriculture Division
450	Animal & vegetable fertilizers, excluding imputed		X				"
451	Potash		X				Census Of Mines
452	Chemical fertilizers	X					Prices Division
453	Ethylene polymers	X					"
454	Vinyl polymers	X					"
455	Other polymers	X					"
456	Cellulosic plastic film and sheet	X					"
457	Monoethylene glycol	X					"
458	Pharmaceuticals	X					"
459	Paints and related products	X					"
460	Refined vegetable oils	X					"
461	Oral care products	X					"
462	Soaps	X					"
463	Detergents	X					"
464	Other cleaning products	X					"
465	Other industrial chemical preparations	X					"
466	Cosmetic products	X					"
467	Hair care products	X					"
468	Other personal care products	X					"
469	Bleach and fabric softener	X					"
470	Chlorine	X					"
471	Oxygen	X					"
472	Phosphorous	X					"
473	Other chemical elements	X					"
474	Sulphuric acid	X					"
475	Other inorganic acids and oxygen compounds	X					"
476	Ammonia	X					"
477	Caustic soda	X					"
478	Sodium chlorate	X					"
479	Sodium phosphates	X					"
480	Sodium carbonate	X					"
481	Other metallic salts and peroxysalts	X					"
482	Deuterium oxide (heavy water)	X					"
483	Radioactive chemicals	X					"
484	Other inorganic chemicals	X					"
485	Ethylene	X					"
486	Butylenes	X					"

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
	Diesel oil	439
	Light fuel oil	440
	Heavy fuel oil	441
	Lubricating oils and greases	442
	Benzene, toluene and xylene	443
	Liquid petroleum gases, including natural gas	444
	Naphtha	445
	Asphalt compound, hot bulk	446
	Other asphalt products	447
	Petrochemical feed stock	448
	Animalandvegetable fertilizers, imputed	449
	Animal & vegetable fertilizers, excluding. imputed	450
	Potash	451
	Chemical fertilizers	452
	Ethylene polymers	453
	Vinyl polymers	454
	Other polymers	455
	Cellulosic plastic film and sheet	456
	Monoethylene glycol	457
	Pharmaceuticals	458
	Paints and related products	459
	Refined vegetable oils	460
	Oral care products	461
	Soaps	462
	Detergents	463
	Other cleaning products	464
	Other industrial chemical preparations	465
	Cosmetic products	466
	Hair care products	467
	Other personal care products	468
	Bleach and fabric softener	469
	Chlorine	470
	Oxygen	471
	Phosphorous	472
	Other chemical elements	473
	Sulphuric acid	474
	Other inorganic acids and oxygen compounds	475
	Ammonia	476
	Caustic soda	477
	Sodium chlorate	478
	Sodium phosphates	479
	Sodium carbonate	480
	Other metallic salts and peroxysalts	481
	Deuterium oxide (heavy water)	482
	Radioactive chemicals	483
	Other inorganic chemicals	484
	Ethylene	485
	Butylenes	486

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
487	Butadiene	X					Prices Division
488	Styrene	X					"
489	Vinyl chloride	X					"
490	Other hydrocarbons and derivatives	X					"
491	Methyl alcohol	X					"
492	Other alcohols and derivatives	X					"
493	Ethers, alcohol peroxides, etc.	X					"
494	Other phenols, aldehydes and ketones	X					"
495	Organic acids and derivatives	X					"
496	Organo-inorganic compounds	X					"
497	Other organic chemicals	X					"
498	Titanium dioxide, excluding slag	X					"
499	Carbon	X					"
500	Pigments and dyes	X					"
501	Synthetic rubber	X					"
502	Antifreezing preparations	X					"
503	Additives and automobile chemicals	X					"
504	Rubber and plastic compounding agents	X					"
505	Explosives and non-military ammunition	X					"
506	Military ammunition and ordnance	X					"
507	Crude vegetable materials and extracts	X					"
508	Insecticides and herbicides	X					"
509	Adhesives	X					"
510	Catalysts	X					"
511	Metal working industrial chemicals	X					"
512	Printing and other inks	X					"
513	Polish, cream and wax products	X					"
514	Other oils, fats and waxes	X					"
515	Aircraft & nautical navig. instruments, excl. radio	X					"
516	Lab and scientific instruments	X					"
517	Measuring and controlling instruments	X					"
518	Medical and dental equipment and supplies	X					"
519	Ophthalmic goods	X					"
520	Personal medical goods	X					"
521	Industrial safety equipment	X					"
522	Watches, clocks, etc.	X					"
523	Optical and photo equipment	X					"
524	Photocopy and microfilm equipment	X					"
525	Photographic film and plate	X					"
526	Jewellery, metal tableware, etc.	X					"
527	Brooms, brushes, mops, etc.	X					"
528	Bicycles	X					"
529	Recreational equipment	X					"
530	Toys and games, including electronic	X					"
531	Impregnated and coated fabrics	X					"
532	Floor and wall covering, excluding vinyl	X					"
533	Advertising signs, displays, etc.	X					"
534	Shades and blinds	X					"

Additional Details	Commodities	No.
	Butadiene	487
	Styrene	488
	Vinyl chloride	489
	Other hydrocarbons and derivatives	490
	Methyl alcohol	491
	Other alcohols and derivatives	492
	Ethers, alcohol peroxides, etc.	493
	Other phenols, aldehydes and ketones	494
	Organic acids and derivatives	495
	Organo-inorganic compounds	496
	Other organic chemicals	497
	Titanium dioxide, excluding slag	498
	Carbon	499
	Pigments and dyes	500
	Synthetic rubber	501
	Antifreezing preparations	502
	Additives and automobile chemicals	503
	Rubber and plastic compounding agents	504
	Explosives and non-military ammunition	505
	Military ammunition and ordnance	506
	Crude vegetable materials and extracts	507
	Insecticides and herbicides	508
	Adhesives	509
	Catalysts	510
	Metal working industrial chemicals	511
	Printing and other inks	512
	Polish, cream and wax products	513
	Other oils, fats and waxes	514
	Aircraft & nautical navig.instruments, excl. radio	515
	Lab and scientific instruments	516
	Measuring and controlling instruments	517
	Medical and dental equipment and supplies	518
	Opthalmic goods	519
	Personal medical goods	520
	Industrial safety equipment	521
	Watches, clocks, etc.	522
	Optical and photo equipment	523
	Photocopy and microfilm equipment	524
	Photographic film and plate	525
	Jewellry, metal tableware, etc.	526
	Brooms, brushes, mops, etc.	527
	Bicycles	528
	Recreational equipment	529
	Toys and games, including electronic	530
	Impregnated and coated fabrics	531
	Floor and wall covering, excluding vinyl	532
	Advertising signs, displays, etc.	533
	Shades and blinds	534

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
535	Custom work, refined petroleum and coal				X	X	ICSD and Labour Statistics Division
536	Custom work, miscellaneous				X	X	"
537	Animal hair, fur dyeing, etc.	X					Prices Division
538	Other metal end products	X					"
539	Sewing needs	X					"
540	Recordings, musical instruments & artists' supply	X					"
541	Smokers' supplies	X					"
542	Art and decorative goods, misc. end products	X					"
543	Repair construction	X				X	IEAD
544	Residential construction					X	"
545	Non-residential building construction					X	"
546	Road, highway and airport runway construction					X	"
547	Gas and oil facility construction					X	"
548	Dams and irrigation projects					X	"
549	Railway and telecommunications construction					X	"
550	Other engineering construction					X	"
551	Air transport, passenger		X				Transportation Division
552	Air transport, freight		X				"
553	Air transport, specialty		X				"
554	Services incidental to air transport		X				"
555	School bus and other transportation		X				"
556	Ambulance services				X		Labour Statistics Division
557	Travel agents, tour wholesaler & operator service			X			Prices Division
558	Parking services			X			"
559	Other services incidental to transport					X	Transportation Division
560	Water transport, passenger			X			Prices Division
561	Water transport, freight		X				Transportation Division
562	Water transport, other		X				"
563	Services incidental to water transport				X	X	(54-205)* Ports Can. Ann. Rep., *Canada Gazette Pt. 2*
564	Rail transport, passenger			X			Prices Division
565	Rail transport, freight		X				Canadian Transportation Agency
566	Service incidental to rail transport		X				Transportation Division
567	Truck transportation		X				"
568	Bus transport, passenger			X			Prices Division
569	Bus transport, parcel express		X				Transportation Division
570	Urban transit			X			Prices Division
571	Taxicab transportation			X			"
572	Pipeline transportation					X	MCED (26-213-XPB, 57-205-XPB and 55201-XPB)*
573	Highway and bridge maintenance					X	
574	Grain storage					X	
575	Other storage and warehousing			X			Prices Division
576	Radio and television broadcasting					X	CTCES, (56-204)* and CMDC *Media Digest*
577	Telephone and other telecommunications					X	Service Industry Division, (56-203-XPB and 56-002-XIB)*
578	Postal services			X			IEAD
579	Electric power		X				MCED (57-202)*
580	Gas distribution		X				MCED (57-205-XPB)*
581	Coke	X					Prices Division
582	Water supply			X			IEAD and Prices Division

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
Weighted average of IPI for capital stock and Index of AWE, ref. petrol and coal Ind.	Custom work, refined petroleum and coal	535
Weighted average of IPI for capital stock and Index of AWE, all industries	Custom work, miscellaneous	536
	Animal hair, fur dyeing, etc.	537
	Other metal end products	538
	Sewing needs	539
	Recordings, musical instruments & artists' supply	540
	Smokers' supplies	541
	Art and decorative goods, misc. end products	542
Based on construction price indexes from Prices Division	Repair construction	543
"	Residential construction	544
"	Non-residential building construction	545
"	Road, highway and airport runway construction	546
"	Gas and oil facility construction	547
"	Dams and irrigation projects	548
"	Railway and telecommunications construction	549
"	Other engineering construction	550
	Air transport, passenger	551
	Air transport, freight	552
	Air transport, specialty	553
	Services incidental to air transport	554
	School bus and other transportation	555
	Ambulance services	556
IPI from IEA personal expenditure; tax component removed	Travel agents, tour wholesaler & operator service	557
Tax component removed	Parking services	558
Weighted average of freight deflators by mode of transport	Other services incidental to transport	559
IPI from IEA personal expenditure; tax component removed	Water transport, passenger	560
	Water transport, freight	561
	Water transport, other	562
Tonnage handled, revenue per tonne, pilotage tariffs and AWE	Services incidental to water transport	563
Tax component removed	Rail transport, passenger	564
	Rail transport, freight	565
	Service incidental to rail transport	566
	Truck transportation	567
Tax component removed	Bus transport, passenger	568
	Bus transport, parcel express	569
	Urban transit	570
Tax component removed	Taxicab transportation	571
	Pipeline transportation	572
Price index of tolls: assumed=100	Highway and bridge maintenance	573
Base-year rates	Grain storage	574
All-items CPI used as proxy	Other storage and warehousing	575
Price relates audience hours to advertising revenue	Radio and television broadcasting	576
Mostly quantity series	Telephone and other telecommunications	577
Tax component removed	Postal services	578
	Electric power	579
	Gas distribution	580
	Coke	581
IPI from IEA personal expenditure based on CPIs	Water supply	582

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
583	Other utilities				X	X	Labour Statistics Division
584	Wholesaling margins					X	
585	Repair service for machinery and equipment			X			IEAD
586	Rental of office equipment					X	ICSD (13-568)*
587	Retailing margins					X	
588	Retailing service					X	
589	Central bank service					X	Office of Superintendent of Financial Institutions
590	Implicit serv. charge, banks and other dep. Acc.					X	"
591	Explicit serv. charge, banks and other dep. Acc.					X	"
592	Implicit serv. chg., credit unions & caisses pop.					X	"
593	Explicit serv. chg., credit unions & caisses pop.				X		IEAD and AWE
594	Royalties (excluding resource)			X		X	Prices Division
595	Stock and bond commissions					X	IFIC, TSE, MSE, VSE, CANSIM
596	Implicit serv. chg., sales fin. & consumer loan					X	IEAD
597	Mutual funds					X	IFIC, *The Globe and Mail*
598	Other financial intermediary services					X	
599	Real estate commissions and management fees					X	Real Estate Board and IEAD
600	Life insurance					X	CLHIA
601	Non-life insurance					X	Prices Division and CLHIA
602	Pension funds					X	CANSIM
603	Insurance commissions			X		X	Prices Division and CLHIA
604	Imputed rent, owner-occupied dwelling			X			IEAD
605	Cash residential rent			X			"
606	Imputed lodging			X			"
607	Lodging in universities			X			"
608	Other paid lodging, excluding universities			X			"
609	Non-residential rent					X	Colliers, etc.,*Canadian Real Estate Review*
610	Private education services			X			IEAD and Prices Division
611	Private hospital services					X	"
612	Private residential care facilities					X	"
613	Child care outside home			X			"
614	Other health and social services			X	X		IEAD, Prices and Labour Statistics divisions
615	Health practitioners and laboratory services			X	X	X	IEAD, Prices Division and CIHI
616	Motion picture production and distribution			X			Prices Division
617	Motion picture exhibition			X			IEAD and Prices Division
618	Lottery, bingo, casino, etc. services			X			IEAD
619	Race track services			X			"
620	Other recreational services			X			IEAD and Prices Division
621	Architect, engineering, scientific service					X	Prices Division
622	Accounting and legal services				X	X	Labour Statistics Division
623	Advertising services					X	CARD and Culture Division
624	Laundry, cleaning and pressing services			X			Prices Division
625	Accommodation services			X			"
626	Meals						"
627	Barber and beauty services						"
628	Funeral services	X		X	X	X	IEAD
629	Child care in home						IEAD and Prices Division
630	Private household service			X			Prices Division

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
Based on AWE for waste removal plus Unit Value Index for steam	Other utilities	583
Average base and current-year rates	Wholesaling margins	584
Tax component removed	Repair service for machinery and equipment	585
IPI of capital stock of machinery and equipment of business service industry	Rental of office equipment	586
Average base and current-year rates	Retailing margins	587
"	Retailing service	588
IPI of operating expenditures	Central bank service	589
Base-year margin rates multiplied by deflated values of relevant assets and liabilities	Implicit serv. charge, banks and other dep. acc	590
Base-year revenue projected by volume of services	Explicit service charge, banks and other dep. acc	591
Base-year margin rates multiplied by deflated values of relevant assets and liabilities	Implicit service chg., credit unions & caisses pop.	592
Base-year revenues projected by deflated assets and liabilities; AWE for credit card	Explicit service chg., credit unions & caisses pop.	593
All-items CPI	Royalties (excluding resource)	594
Base-year revenues projected by volume of new issues and trading activity	Stock and bond commissions	595
Base-year margin rates multiplied by deflated values of relevant assets	Implicit serv. Chg., sales fin. & consumer loan	596
Base-year revenues projected by deflated values of assets under management	Mutual funds	597
Various deflators or volume indicators, depending on producing industry	Other financial intermediary services	598
Sale prices of real estate sold	Real estate commissions and management fees	599
Volume of life insurance owned	Life insurance	600
Insurance price model	Non-life insurance	601
Volume of assets managed	Pension funds	602
Volume of insurance business	Insurance commissions	603
IPI of capital formation of residential construction and base-year rental	Imputed rent, owner occupied dwelling	604
	Cash residential rent	605
IPI from IEA personal expenditure (similar to commodities 5570 and 5580)	Imputed lodging	606
IPI from IEA personal expenditure (similar to commodities 5570 and 5580) and tax adj.	Lodging in universities	607
IPI from IEA personal expenditure (similar to commodities 5570 and 5580)	Other paid lodging, excluding universities	608
Volume of rented space weighted by cost for major cities	Non-residential rent	609
IPI from IEA personal expenditure based on CPIs, and tax adjusted	Private education services	610
Based on labour income	Private hospital services	611
"	Private residential care facilities	612
IPI from IEA personal expenditure	Child care outside home	613
IPI from IEA personal expenditure based on CPIs and AWE	Other health and social services	614
Pay-schedule-changes-physicians, IPI (IEA personal expenditure), CPI, and AWE	Health practitioners and laboratory services	615
All-items CPI used as proxy	Motion picture productin and distribution	616
Tax component removed	Motion picture exhibition	617
IPI from IEA personal expend.: all-items CPI with adj., and tax component removed	Lottery, bingo, casino, etc. services	618
"	Race track services	619
Tax component removed	Other recreational services	620
Price index for consulting engineers	Architect, engineering, scientific service	621
Volume indicators and/or AWE index	Accounting and legal services	622
Weighted combination of output deflator for broadcasting and print ads	Advertising services	623
Tax component removed	Laundry, cleaning and pressing services	624
"	Accommodation services	625
"	Meals	626
"	Barber and beauty services	627
IPI from IEA pers. expend.: based on AWE, IPPI (coffins, etc.), CPI, number of deaths	Funeral services	628
IPI from IEA personal expenditure	Child care in home	629
	Private household service	630

APPENDIX 2: SUMMARY OF OUTPUT DEFLATORS (continued)

No.	Commodities	Deflator					Source
		IPPI	Unit Value Index/ Volume	CPI	AWE Index	Other	
631	Other personal services			X			IEAD, Prices Division
632	Photographic services			X			Prices Division
633	Services to buildings and dwellings				X		Labour Statistics Division, IEAD
634	Software products development					X	
635	Computer lease and rental (hardware)					X	
636	Professional and processing computer service					X	Prices Division
637	Other services to business and persons				X		IOD C$ and Labour Statistics Division
638	Courier service			X			Prices Division
639	Rental of automobiles and trucks			X			"
640	Trade association dues					X	MESAD
641	Rental, video and recreation equipment			X			Prices Division
642	Rental, other mach. and equip., incl. const.						"
643	Spare parts and maintenance supplies					X	
644	Office supplies					X	
645	Cafeteria supplies					X	
646	Transportation margins					X	
647	Laboratory equipment and supplies					X	
648	Travelling and entertainment					X	
649	Advertising and promotion					X	
650	Religious organizations					X	
651	Welfare organizations					X	
652	Non-commercial sports and recreation clubs					X	
653	Non-commercial educational institutions					X	
654	Other non-commercial organizations					X	
655	Gov't funding of hospital					X	
656	Gov't funding of residential care					X	
657	Gov't funding of universities		X				CTCES (81-003-XPB)*
658	Gov't funding of other education					X	
659	Defence					X	
660	Other municipal gov't					X	
661	Other provincial gov't					X	
662	Other federal gov't					X	
663						X	
670	Unallocated imports and exports					X	IEAD
671	Government services						Prices Division
672	Taxes on products					X	
673	Subsidies on products					X	
674	Subsidies on production					X	
675	Taxes on production						IEAD

*Statistics Canada Catalogue numbers.

Additional Details	Commodities	No.
IPI from IEA personal expenditure based on CPIs	Other personal services	631
Tax component removed	Photographic services	632
IPI from IEA personal expenditure	Services to buildings and dwellings	633
6% decrease per year	Software products development	634
Three-year average of computer hardware deflator	Computer lease and rental (hardware)	635
Price index for professional informatics services and adjusted all-items CPI	Professional and processing computer service	636
IPI of intermediate inputs and labour income of miscelaneous business service ind.	Other services to business and persons	637
All-items CPI used as proxy; tax adjusted	Courier service	638
Tax component removed	Rental of automobiles and trucks	639
Index of compensation per person, communication, business and personal service ind.	Trade association dues	640
Tax component removed	Rental, video and recreation equipment	641
Price index for total machinery and equipment, tax adjusted	Rental, other mach and equip including const.	642
Input IPI of fictive industry: operating supplies	Spare parts and maintenance supplies	643
Input IPI of fictive industry: office supplies	Office supplies	644
Input IPI of fictive industry: cafeteria supplies	Cafeteria supplies	645
Average of air, water, rail and truck freight deflators	Transportation margins	646
Input IPI of fictive industry: laboratory supplies	Laboratory equipment and supplies	647
Input IPI of fictive industry: travel and entertainment	Travelling and entertainment	648
Input IPI of fictive industry: advertising and promotion	Advertising and promotion	649
IPI of inputs of non-business industry: religious organizations	Religious organizations	650
IPI of inputs of non-business industry: welfare organizations	Welfare organizations	651
IPI of inputs of non-business industry: sports and recreation clubs	Non-commercial sports and recreation clubs	652
IPI of inputs of non-business industry: educational institutions	Non-commercial educational institutions	653
IPI of inputs of non-business industry: other organizations	Other non-commercial organizations	654
IPI of inputs of non-business industry: hospitals	Gov't funding of hospital	655
IPI of inputs of non-business industry: residential care facilities	Gov't funding of residential care	656
University students by degree and discipline	Gov't funding of universities	657
IPI of inputs of non-business industry: other educational services	Gov't funding of other education	658
IPI of inputs of non-business industry: defence	Defence	659
IPI of inputs of non-business industry: other municipal government	Other municipal gov't	660
IPI of inputs of non-business industry: other provincial and territorial government	Other provincial gov't	661
IPI of inputs of non-business industry: other federal government	Other federal gov't	662
		663
IPI from IEA personal Expenditure: Canadian and U.S. CPIs	Unallocated imports and exports	670
All-items CPI	Government services	671
Base-year rate	Taxes on products	672
"	Subsidies on products	673
"	Subsidies on production	674
"	Taxes on production	675

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
4	Other live animals	X					International Trade Division
15	Fresh fruit, excluding tropical	X					"
16	Potatoes, fresh or chilled	X					"
17	Other vegetables, fresh or chilled	X					"
20	Seeds, excluding oil seeds	X					"
21	Nursery stock, flowers, etc.	X					"
23	Soybeans and other oil seeds	X					"
25	Raw wool and mink skins	X					"
28	Logs	X					"
30	Pulpwood	X					"
33	Fish and seafood, fresh, chilled	X					"
34	Hunting and trapping products	X					"
37	Iron ores and concentrates	X					"
38	Bauxite and alumina		X				"
40	Coal	X					"
46	Salt	X					"
48	Clays	X					"
49	Natural abrasives and industrial diamonds	X					"
50	Other crude minerals	X					"
52	Stone and silica sand for industrial use	X					"
53	Stone for construction	X					"
55	Beef, fresh, chilled, frozen		X				Int'l Trade Division data
56	Pork, fresh, chilled, frozen		X				"
57	Other meat, fresh, chilled, frozen		X				"
58	Edible offal, fresh, chilled, frozen		X				"
60	Prepared meat products	X					International Trade Division
61	Animal fat and lard	X					"
62	Margarine and shortening	X					"
63	Sausage casings	X					"
64	Feeds from animal by-products	X					"
65	Raw animal hides and skins	X					"
77	Mayonnaise, salad dressing and mustard	X					"
78	Fish and seafood products fresh, chilled, frozen	X					"
79	Other fish and seafood products	X					"
80	Frozen fruit and juice	X					"
81	Other fruit juice		X				Int'l Trade Division data
82	Other fruit products	X					"
83	Fruit and jam in airtight containers	X					"
87	Vegetables and juice in airtight containers	X					"
90	Sauces, pickles, etc.	X					"
92	Mineral water, fruit drinks and ice	X					"
95	Feed supplements and premixes	X					"
98	Feeds from vegetable by-products	X					"
99	Pet feeds	X					"
102	Breakfast cereal products		X				Int'l Trade Division data
103	Biscuits		X				"
105	Other bakery products	X					"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
106	Food snacks	X					International Trade Division
107	Cocoa and chocolate	X					"
108	Nuts	X					"
109	Chocolate confectionery	X					"
110	Other confectionery	X					"
111	Sugar	X					"
112	Oil-cake feeds	X					"
113	Crude vegetable oils		X				Int'l Trade Division data
114	Nitrogen function compounds	X					International Trade Division
115	Other flours and processed grains	X					"
117	Other syrup	X					"
119	Dehydrated soup mixes and bases	X					"
120	Roasted coffee		X				Int'l Trade Division data
121	Tea	X					International Trade Division
122	Potato chips and flakes	X					"
126	Other food products	X					"
128	Dry pasta		X				Int'l Trade Division data
131	Distilled alcoholic beverages, bought in store		X				"
133	Beer, including coolers, bought in store	X					International Trade Division
135	Wine, including coolers, bought in store	X					"
139	Other tobacco products	X					"
140	Waterproof footwear	X					"
141	Passenger car tires	X					"
142	Truck, bus and off-highway tires	X					"
143	Other tires and tubes	X					"
144	Tire repair material and retreads	X					"
145	Conveyor and transmission belting		X				Int'l Trade Division data
146	Self-adhesive tape	X					International Trade Division
147	Other rubber products for industrial use	X					"
148	Hose and tubing, mainly rubber	X					"
149	Plastic film and sheet	X					"
150	Foamed and expanded plastics	X					"
151	Other plastic products, including cups	X					"
152	Plastic building supplies			X			"
153	Other rubber end products	X					"
154	Plastic containers and closures	X					"
155	Plastic pipe and pipe fittings	X					"
156	Leather and miscellaneous leather goods	X					"
157	Footwear, excluding waterproof	X					"
159	Luggage, briefcases, etc.	X					"
160	Handbags, wallets, etc.	X					"
161	Cotton yarn	X					"
162	Cotton woven fabric	X					"
163	Tire cord fabric	X					"
164	Bedding	X					"
165	Wool and wool mix yarn and thread	X					"
166	Wool and wool mix woven fabric	X					"
167	Felt	X					"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
168	Man-made staple fibres	X					International Trade Division
170	Filament yarn	X					"
171	Yarn of staple fibres	X					"
172	Tire yarn	X					"
173	Man-made fabric for clothing	X					"
174	Man-made fabric for industrial use	X					"
175	Pile fabric	X					"
178	Rope and twine	X					"
180	Textile floor covering	X					"
182	Awnings, tarpaulins, etc.	X					"
183	Tents, sleeping bags, sails, etc.			X			"
184	Other household textile products	X					"
185	Textile medical products	X					"
186	Other textile products	X					"
187	Hosiery	X					"
188	Knitted fabrics	X					"
189	Men's and boys' knitted clothing	X					"
190	Sweaters	X					"
191	Women's knitted clothing	X					"
192	Children's knitted clothing		X				Int'l Trade Division data
193	Men's and boys' clothing	X					International Trade Division
194	Women's underwear and sleepwear	X					"
195	Other women's clothing	X					"
196	Children's wear		X				Int'l Trade Division data
197	Other clothing and accessories	X					International Trade Division
198	Dressed furs	X					"
199	Fur apparel	X					"
201	Wood chips	X					"
206	Plywood and veneer	X					"
207	Wooden doors and windows	X					"
208	Kitchen cabinets	X					"
209	Millwork	X					"
210	Wood structural products	X					"
211	Wood prefabricated buildings	X					"
212	Wood containers	X					"
213	Caskets and coffins	X					"
215	Particle and waferboard	X					"
216	Other wood end products	X					"
217	Household furniture	X					"
218	Furniture parts					X	"
219	Office furniture					X	Prices Division
220	Commercial and institutional furniture					X	"
221	Mattresses and other furniture	X					International Trade Division
222	Portable lighting fixtures	X					"
223	Pulp	X					"
225	Other paper, containing wood	X					"
226	Other paper, wood-free	X					"
229	Paperboard, including boxboard	X					"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
231	Asphalt building products	X					International Trade Division
232	Toilet paper, paper towel, tissue, etc.	X					"
233	Paper waste and scrap	X					"
234	Vinyl floor and wall covering	X					"
235	Paper bags and sacks	X					"
236	Paper boxes, cartons and drums	X					"
237	Plastic bags	X					"
239	Wallpaper	X					"
240	Other coated paper and products	X					"
241	Aluminum foil	X					"
242	Paper diapers and sanitary napkins	X					"
243	Textile hygiene products	X					"
244	Paper containers for commercial use	X					"
245	Paper stationery	X					"
246	Other stationery supplies	X					"
247	Photographic paper	X					"
248	Paper end products, including household	X					"
249	Newspapers	X					"
250	Magazines and periodicals	X					"
251	Books	X					"
252	Greeting and postcards, maps, etc.	X					"
253	Banknotes, cheques and stamps, etc.	X					"
254	Printed business forms	X					"
255	Advertising, flyers, catalogies, directories	X					"
256	Other printed matter	X					"
259	Printing plates, type, etc.	X					"
260	Ferro-alloys	X					"
261	Iron and steel ingots, billets, etc.	X					"
262	Steel castings	X					"
263	Steel bars and rods, non-alloy, excl. reinf.	X					"
264	Reinforcing bars and rods	X					"
265	Alloy steel bars and rods	X					"
266	Flat iron and steel, not alloy, not coated	X					"
267	Flat iron and steel, alloy, coated	X					"
270	Carbon and graphite products	X					"
272	Oil and gas line pipe		X				Int'l Trade Division Data
273	Other iron and steel pipes and tubes	X					International Trade Division
274	Other cast iron products	X					"
275	Grinding balls and ingot moulds	X					"
277	Other iron and steel pipe fittings	X					"
278	Nickel in primary forms	X					"
279	Copper in primary forms	X					"
280	Lead in primary forms	X					"
282	Aluminum ingots, billets, blocks and slabs	X					"
284	Precious metals in primary forms, excl. gold	X					"
285	Other non-ferrous base metals	X					"
286	Other non-ferrous base and fabricated material				X		Prices Division
288	Metal scrap, excluding iron and steel	X					International Trade Division

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
289	Iron and steel scrap	X					International Trade Division
290	Aluminum and aluminum alloy fabricated material	X					"
291	Copper fabricated materials	X					"
292	Copper alloy fabricated materials	X					"
294	Nickel and nickel alloy fabricated material	X					"
295	Zinc and zinc alloy fabricated material	X					"
298	Metal tanks					X	Prices Division
299	Power boilers	X					International Trade Division
300	Iron and steel structural materials	X					"
301	Prefabricated metal buildings	X					"
302	Prefabricated metal structures	X					"
303	Metal doors and windows	X					"
304	Other metal building products	X					"
306	Iron and steel stampings	X					"
307	Metal roofing, siding, ducts, etc.	X					"
308	Metal kitchen utensils	X					"
309	Other kitchen utensils	X					"
310	Other metal containers and closures	X					"
311	Food, beverage and other cans	X					"
312	Iron and steel wire and cable	X					"
313	Iron and steel wire fencing and screen	X					"
314	Chain, excluding motor vehicles and power trans.	X					"
315	Welding rods, wire electrodes	X					"
316	Wire products, including springs	X					"
317	Fastener hardware	X					"
318	Builders' hardware	X					"
319	Miscellaneous hardware	X					"
320	Machine tools					X	Prices Division
321	Tool accessories	X					International Trade Division
322	Hand and measuring tools	X					"
323	Scissors, razor blades, industrial cutlery, etc.	X					"
324	Household clothes washers and dryers	X					"
325	Household dishwashers	X					"
326	Mowers, snowblowers, and other household equip.	X					"
327	Non-electric furnaces and heat equipment	X					"
328	Commercial cooking equipment					X	Prices Division
332	Metal plumbing fixtures and fittings	X					International Trade Division
333	Plastic plumbing fixtures and fittings	X					"
334	Gas and water meters	X					"
335	Fire fighting and traffic control equipment	X					"
336	Firearms and military hardware	X					"
337	Bulldozers, farm and garden tractors					X	Prices Division
338	Other agricultural machinery					X	"
339	Bearings	X					International Trade Division
340	Mechan. power transmission equipment	X					"
341	Pumps, compressors and blowers					X	Prices Division
342	Conveyors, elevators and hoist machinery					X	"
343	Industrial trucks and material handling equipment					X	"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
344	Fans and air circulation units, not industrial	X					International Trade Division
345	Packaging and bottling machinery					X	Prices Division
346	Air purification equipment					X	"
347	Other general purpose machinery					X	"
348	Industrial furnaces, kilns and ovens					X	"
349	Construction and mining machinery					X	"
350	Logging, pulp and paper industry machinery					X	"
351	Metal working machinery					X	"
352	Other industry specific machinery					X	"
353	Service industry machinery					X	"
354	Power hand tools	X					International Trade Division
355	Air conditioning equipment, wall and window	X					"
356	Air cond., refrig., commercial and transport	X					"
357	Scales and balances	X					"
358	Vending machines	X					"
359	Computers, video units, printers, etc.					X	Prices Division
360	Office machines, excluding photocopy and fax					X	"
361	Aircraft					X	"
362	Aircraft engines	X					International Trade Division
363	Aircraft parts and equipment	X					"
366	Trucks, road tractors and chassis				X		Prices Division
367	Buses and chassis					X	"
368	Off-highway trucks	X					International Trade Division
369	Military motor vehicles	X					"
370	Motor homes, motorcycles and ATVs	X					"
371	Mobile homes	X					"
372	Non-commercial trailers	X					"
373	Commercial trailers and semi-trailers					X	Prices Division
374	Truck and bus bodies, and cargo containers					X	"
375	Motor vehicle engines and parts	X					International Trade Division
376	Motor vehicle electric equipment	X					"
377	Motor vehicle stampings			X			"
378	Motor vehicle steering and suspension	X					"
379	Motor vehicle wheels and brakes	X					"
380	Motor vehicle plastic parts and trim	X					"
381	Motor vehicle fabric accessories	X					"
382	Other motor vehicle parts and accessories	X					"
383	Locomotive railway and urban trans. rolling stock					X	Prices Division
384	Parts for railway and urban trans. rolling stock	X					International Trade Division
385	Ships, boats and parts, excluding pleasure	X					"
387	Snowmobiles	X					"
388	Pleasure boats and sporting craft	X					"
389	Microwave ovens	X					"
390	Small household appliances	X					"
391	Electric furnace and other electric heating equip.	X					"
392	Household refrigerators and freezers	X					"
393	Household cooking equip., excluding microwave	X					"
394	Radio, stereo, CD players	X					"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
395	TV, VCR and unrecorded tape	X					International Trade Division
396	Telephone and related equipment, including fax					X	Prices Division
397	Broadcasting and radio communications equip.					X	"
398	Radar and radio navigation equipment					X	"
399	Semi-conductors	X					International Trade Division
400	Printed circuits	X					"
401	Integrated circuits	X					"
402	Other electronic equipment components	X					"
403	Electronic alarm and signal systems	X					"
404	Welding machinery and equipment					X	Prices Division
405	Power generation and marine prop., non-electric					X	"
406	Electrical generators and motors					X	"
407	Ballast	X					International Trade Division
408	Transformers and converters					X	Prices Division
409	Industrial electric equipment					X	"
410	Batteries	X					International Trade Division
411	Wire and cable, insulated, excluding aluminum	X					"
413	Wiring materials and electrical meters	X					"
414	Electric light bulbs and tubes	X					"
415	Electric lighting fixtures, excluding portable	X					"
416	Vehicle lighting equipment	X					"
417	Cement	X					"
418	Lime	X					"
419	Concrete products, including sand and lime	X					"
421	Bricks and other clay building products	X					"
422	Porcelain insulators	X					"
423	Ceramic household products	X					"
424	Refractory products	X					"
425	Natural stone products	X					"
426	Gypsum building products	X					"
427	Mineral wool building products	X					"
428	Asbestos products	X					"
429	Other non-metallic mineral basic products	X					"
430	Glass and other glass products	X					"
431	Safety glass	X					"
432	Optical fibre cables	X					"
433	Glass fibre batts, mats, etc.	X					"
434	Glass containers	X					"
435	Mirrors and glass household products	X					"
436	Abrasive products	X					"
439	Diesel oil	X					"
440	Light fuel oil	X					"
441	Heavy fuel oil	X					"
442	Lubricating oils and greases	X					"
444	Liquid petroleum gases, including natural gas	X					"
452	Chemical fertilizers	X					"
453	Ethylene polymers	X					"
454	Vinyl polymers	X					"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
455	Other polymers	X					International Trade Division
458	Pharmaceuticals	X					"
459	Paints and related products	X					"
460	Refined vegetable oils		X				Int'l Trade Division data
461	Oral care products	X					International Trade Division
462	Soaps	X					"
463	Detergents	X					"
464	Other cleaning products	X					"
465	Other industrial chemical preparations	X					"
466	Cosmetic products	X					"
467	Hair care products	X					"
468	Other personal care products	X					"
469	Bleach and fabric softener	X					"
475	Other inorganic acids and oxygen compounds	X					"
477	Caustic soda	X					"
486	Butylenes	X					"
489	Vinyl chloride	X					"
490	Other hydrocarbons and derivatives	X					"
493	Ethers, alcohol peroxides, etc.	X					"
494	Other phenols, aldehydes and ketones	X					"
495	Organic acids and derivatives	X					"
496	Organo-inorganic compounds	X					"
497	Other organic chemicals	X					"
500	Pigments and dyes	X					"
501	Synthetic rubber	X					"
503	Additives and automobile chemicals	X					"
505	Explosives and non-military ammunition	X					"
506	Military ammunition and ordnance	X					"
507	Crude vegetable materials and extracts	X					"
508	Insecticides and herbicides	X					"
509	Adhesives	X					"
510	Catalysts	X					"
512	Printing and other inks	X					"
513	Polish, cream and wax products	X					"
514	Other oils, fats and waxes	X					"
515	Aircraft and nautical navigation instr., excl. radio	X					"
516	Lab and scientific instruments					X	Prices Division
517	Measuring and controlling instruments	X					International Trade Division
518	Medical and dental equipment and supplies	X					"
519	Ophthalmic goods	X					"
520	Personal medical goods	X					"
521	Industrial safety equip	X					"
522	Watches, clocks, etc.	X					"
523	Optical and photo equipment	X					"
524	Photocopy and microfilm equipment	X					"
525	Photographic film and plate	X					"
526	Jewellery, metal tableware, etc.	X					"
527	Brooms, brushes, mops, etc.	X					"

APPENDIX 3: IMPORT DEFLATORS BY COMMODITY (continued)

No.	Commodities	International Trade Division Price Index	Unit Value Index	BLS [U.S.A.]	IPPI	MEPI	Sources
528	Bicycles	X					International Trade Division
529	Recreational equipment	X					"
530	Toys and games, including electronic	X					"
531	Impregnated and coated fabrics	X					"
532	Floor and wall covering, excluding vinyl	X					"
533	Advertising signs, displays, etc.	X					"
534	Shades and blinds	X					"
537	Animal hair, fur dyeing, etc.		X				Int'l Trade Division data
538	Other metal end products	X					International Trade Division
539	Sewing needs	X					"
540	Recordings, musical instruments and art supply	X					"
541	Smokers' supplies	X					"
542	Art and decorative goods, misc. end products	X					"
579	Electric power	X					"
581	Coke	X					"
664	Raw cotton	X					"
665	Natural rubber and gums	X					"
666	Raw sugar	X					"
667	Cocoa beans	X					"
668	Coffee, not roasted	X					"
669	Tropical fruit	X					"

APPENDIX 4: SPECIFIC EXPORT DEFLATORS

	IPPI	UNIT VALUE/ VOLUME	OTHER	
5 Wheat, unmilled, excluding imputed feed		X		
28 Logs		X	X	
39 Other metal ores and concentrates		X		
40 Coal		X		
42 Natural Gas, excluding liquefied		X		Volume: 26-213 and 57-205*
56 Pork, fresh, chilled and frozen	X			
78 Fish and seafood products, fresh, chilled, frozen	X			
79 Other fish and seafood products	X			
131 Distilled alcoholic beverages, bought in store	X			
223 Wood pulp	X		X	Currently weighted IPPI and Unit Value Index
214 Shingles and shakes	X			
224 Newsprint paper		X		
225 Other paper, containing wood	X			
226 Other paper, wood-free	X			
240 Other coated paper and products	X			
398 Radar and radio navigation equipment	X			
579 Electric power		X		Volume: 57-202*
600 Life insurance			X	

*Statistics Canada Catalogue numbers.

APPENDIX 5: LIST OF COMMODITIES DEFLATED WITH MACHINERY AND EQUIPMENT PRICE INDEXES

No.	Commodities
219	Office furniture
220	Commercial and institutional furniture
298	Metal tanks
320	Machine tools
328	Commercial cooking equipment
337	Bulldozers, farm and garden tractors
338	Other agricultural machinery
341	Pumps, compressors, fans and blowers
342	Conveyors, elevators and hoist machinery
343	Industrial trucks and material-handling equipment
345	Packaging and bottling machinery
346	Air purification equipment
347	Other general purpose machinery
348	Industrial furnaces, kilns and ovens
349	Construction and mining machinery
350	Logging, pulp and paper industry machinery
351	Metal working machinery
352	Other industry-specific machinery
353	Service industry machinery
359	Computers, video units, printers, etc.
360	Office machinery, excluding photocopy and facsimile
361	Aircraft
367	Buses and chassis
373	Commercial trailers and semitrailers
374	Truck and bus bodies, and cargo containers
383	Locomotive and railway and urban transit rolling stock
396	Telephone and related equipment, including facsimile
397	Broadcasting and radio communication equipment
398	Radar and radio navigation equipment
404	Welding machinery and equipment
405	Power generators and marine propellors, non-electric
406	Electrical generators and motors
408	Transformers and converters
409	Industrial electric equipment, including safety
516	Laboratory and scientific instruments, and flight simulators

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