



Catalogue no. 15-547-XIE

Gross Domestic Product by Industry

Sources and Methods



2002

 Statistics Canada Statistique Canada

Canada

How to obtain more information

Specific inquiries about this product and related statistics or services should be directed to Industry Measures and Analysis Division, Statistics Canada, Ottawa, Ontario, K1A 0T6 (telephone: (613) 951-4623 or (800) 887-4623). For information on the wide range of data available from Statistics Canada, you can contact us by calling one of our toll-free numbers. You can also contact us by e-mail or by visiting our Web site.

National inquiries line	1 800 263-1136
National telecommunications device for the hearing impaired	1 800 363-7629
Depository Services Program inquiries	1 800 700-1033
Fax line for Depository Services Program	1 800 889-9734
E-mail inquiries	infostats@statcan.ca
Web site	www.statcan.ca

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner and in the official language of their choice. To this end, the Agency has developed standards of service which its employees observe in serving its clients. To obtain a copy of these service standards, please contact Statistics Canada toll free at 1 800 263-1136.

Product informations

This product, Catalogue no. 15-547-XIE, is available on the Internet for free. Users can obtain single issues at <http://www.statcan.ca/english/IPS/Data/15-547-XIE.htm>.



Statistics Canada
Industry Measures and Analysis Division

System of National Accounts

Gross Domestic Product by Industry

Sources and methods

2002

Published by authority of the Minister
responsible for Statistics Canada

© Minister of Industry, 2002

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without prior written permission from Licence Services, Marketing Division, Statistics Canada, Ottawa, Ontario, Canada K1A 0T6

November 2002

Catalogue no. 15-547-XIE

Frequency: Occasional

ISBN 0-662-33146-X

Ottawa

La version française de cette publication est aussi disponible (no 15-547-XIF au catalogue)

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

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 basic price 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, Organization for Economic Co-operation and development, United Nations and World Bank.

Table of contents

Introduction	7
Chapter 1 What is Gross Domestic Product by industry?	9
Measurement of production	11
Differences between output based and expenditure based GDP	12
Chapter 2 Measurement of Gross Domestic Product by industry	15
Annual versus monthly estimates	15
Annual GDP by industry	15
GDP originating in the business sector	16
GDP originating in the non-business sector	17
Monthly GDP by industry	18
Chapter 3 Classification schemes	22
Classification of industries	22
Classification of goods and services	24
Chapter 4 Constant price GDP by industry	26
Current versus constant prices	26
Base year	27
Rebasing	27
Choice of deflation methods	28
Base year valuation of quantities	29
Price deflation	30
Chain volume measures	31
Chapter 5 Statistical adjustments	35
Benchmark adjustment	35
Month-to-month fluctuations in GDP by industry	37
Trading day adjustment	38
Seasonal adjustment	39
Chapter 6 Release of the GDP by industry estimates	42
Presentation of the estimates	42
Timing of the release	42
Dissemination vehicles	43
Revision policy	43
Chapter 7 The history of GDP by industry	46
Index of Industrial Production	46
GDP by industry for the entire economy	49
Glossary	57
Bibliography	74
Index	81

Acknowledgement

This report was prepared by Erika Young under the direction of Kishori Lal, Associate Assistant Chief Statistician, whose expert guidance and patience in reviewing numerous versions of the draft is gratefully acknowledged. Very special thanks are due to Phillip Smith, Assistant Chief Statistician, for his extensive valuable comments. Helpful comments were also made by Karen Wilson, Director General, System of National Accounts. Special thanks to Hans Messinger, Director, and Trish Horricks, Assistant Director, both of the Industry Measures and Analysis Division, for their useful suggestions and encouragement. Finally, valuable contribution was made by H  l  ne Villeneuve, Bernard Lefran  ois and Robert Meloche in the form of reviewing various versions of the draft, making helpful comments, providing editorial and translation services, and assisting in the publication of this document.

Introduction

The topic of this document is **Gross Domestic Product by industry**, as compiled and published by the Canadian System of National Accounts (CSNA) of Statistics Canada.

Gross Domestic Product (GDP) by industry is one of the three GDP series produced by the CSNA. It is also known as the **Output based GDP**, because it sums the value added (output less intermediate consumption of goods and services) of all industries in Canada. This GDP series is published on a monthly basis and thus delivers the earliest and most up-to-date information on current developments in the economy. The other two GDP series are the **income based GDP**, which tallies earnings that are generated by the productive activity, and the **expenditure based GDP**, which is equal to final expenditure on goods and services produced. Both the income and expenditure based GDP measures are published on a quarterly basis.

The meaning of the word 'output' in the output based GDP needs to be elaborated to avoid any confusion between its present definition in the international System of National Accounts 1993 (SNA1993) and the earlier use of it. Output of an economy was always meant to be equal to 'net output' ('gross output' of goods and services less the intermediate use of goods and services in its production). This 'net output' is now called 'value added' and the terms 'gross output' and 'net output' are not used anymore in the SNA1993.

The three alternative GDPs are designed to independently but equivalently portray the production activity of the country, perceived from different perspectives. With information on the sources of goods, services and incomes generated by processes of production, the output and the income based GDP provide a comprehensive and detailed description of the supply side of domestic production. Expenditure based GDP, on the other hand, traces the disposition of the output produced among the various categories of demand and thus offers a demand side view of the Canadian economy.

Changes in the level of production are key indicators of economic activity. Evaluating production therefore is fundamental in monitoring the behaviour of the economy. For this reason GDP is an indispensable tool for a broad range of analytical, modelling and policy formulation purposes. Governments, businesses, trade and labour organizations, academic researchers, journalists and the general public use GDP to evaluate the performance of the economy, to appraise the success of monetary and industrial policies, to explore past trends in production, to forecast future prospects of economic growth, to carry out international comparisons, and so on. Since economic activity is one of the several major factors influencing welfare, movements in GDP may also play a role in the assessment of the general well-being of the country.

Estimates of the three GDP series are produced within the highly integrated conceptual and statistical framework of the CSNA, sharing a consistent set of concepts, definitions and classifications. On an annual basis, the growth rates of the income and expenditure based GDP are identical and the year-to-year movements of the output based GDP deviate only slightly. The small discrepancies in the growth rates (less than two-tenth of one percent in any of the years between 1990 and 1998) are caused primarily by differences in the treatment of taxes and subsidies.

The CSNA distinguishes two types of taxes and subsidies. The first type relates to the factors of production (labour and capital), for example payroll and property taxes, and subsidies producers receive from governments to cover some of the labour related costs of production such as labour training. The second type of taxes and subsidies are applied to products, for example sales taxes levied by federal and provincial governments, and

subsidies for agricultural products such as wheat and milk. Depending on which of these taxes and subsidies are included in the measures, GDP is said to be expressed either at basic prices or at market prices. The output based GDP includes taxes and subsidies only on the factors of production and therefore is at basic prices. The income and expenditure based GDP include all taxes and subsidies, thus both are at market prices.

Historically, estimates of GDP by industry were presented at factor cost. This meant that taxes and subsidies were entirely excluded from the valuation. With the 2001 revision, however, the CSNA adopted the System of National Accounts 1993 (SNA 1993) recommendation and since then GDP by industry is recorded at basic prices. The new basic price GDP by industry is equal to the traditional value at factor cost plus taxes less subsidies on the factors of production.

The decision to produce GDP by industry at basic prices rather than at factor cost was primarily an acknowledgement that basic prices better represent the costs that are incurred by producers in processes of production. In addition, as most countries belonging to the Organization for Economic Co-operation and Development (OECD) provide GDP by industry at basic prices, international comparison was also an important factor leading to this conversion. The shift to basic prices put Canada's value added by industry on a comparable basis with the majority of the OECD countries.

The purpose of this document is to describe in detail the concepts, definitions, data sources and statistical methods underlying the GDP by industry series. The last comprehensive documentation covering GDP by industry was published in 1963. Since then, attempts were made occasionally to document the numerous improvements which have been introduced to the measurement, but a complete and detailed account of all aspects of the GDP by industry series has not been produced until now. With the hope that better understanding will draw more attention to the importance and the usefulness of monthly GDP by industry, this report was written to answer such questions as:

- (1) What is an industry?
- (2) What is GDP by industry?
- (3) What does the expression 'at basic prices' mean?
- (4) What is an industry's 'value added'?
- (5) How is it measured?
- (6) What are the data sources?
- (7) When and how is GDP by industry released to the public?

This document is organized in seven chapters. **Chapter 1** defines GDP by industry, describes its various uses, and discusses how monthly GDP by industry connects with the other components of the CSNA. The most frequently used terms in this document such as industry, output, intermediate inputs and domestic production are also defined here. **Chapter 2** deals with the derivation of the output based estimates, first describing the calculation of annual value added within the framework of the Input-Output tables, followed by the calculation of the monthly estimates. Industry and commodity classification schemes are the topic of **Chapter 3**. The subject of **Chapter 4** is deflation. The choice of deflators, the role of the base year and the method of rebasing are addressed here. **Chapter 5** deals with such technical issues as benchmarking, trading day and seasonal adjustment. **Chapter 6** is devoted to the presentation of the monthly GDP by industry estimates, such as the format, release dates and modes of dissemination. The frequency and the reasons for revisions are also given in this chapter. Finally, in appreciation of what has been done in the past, **Chapter 7** reviews the historical development of monthly GDP by industry from 1926 to the present.

Chapter 1 What is Gross Domestic Product by industry?

Introduction

The subject of this manual is the output based approach to measuring GDP and the resulting summary aggregate known as **GDP by industry**. Before describing in detail how this approach is implemented in the CSNA, it is useful to explain such key terms as value added, industry, establishment, production, output, gross, net, intermediate consumption, market prices, basic prices. This chapter also explains the main differences between the output and the expenditure based GDP measures.

Definition of industry

Fundamental to the concept of GDP by industry is the clear definition of what an industry's output is, or for that matter, what constitutes an industry. An industry is defined as a group of producing entities that primarily use essentially the same kind of production processes in order to produce goods and services. An entity could be a corporation, a mine, a factory, an unincorporated enterprise, and so on. Legal entities, however, such as multi-national corporations, typically produce such a broad array of different products that they are not useful for defining industries for the purpose of compiling production statistics. Nevertheless, most complex organizations are comprised of smaller internal units, usually situated in a single location, whose output is relatively homogeneous and engage in the same kind of production process using more or less the same technology. These units can be used as the basis for a classification system.

The **establishment** serves this purpose in industry statistics. Even establishments may engage in a variety of activities, but usually are confined in scope and one activity dominates. The one with the largest value added is identified as the establishment's primary activity, and the establishment is classified to an **industry** corresponding to that principal or primary activity. The criteria that are used to group establishments into industries are the similarity of input structures, labour skills or the production processes employed. It is useful to note that the group of establishments that comprises a particular industry may change over time as establishments emerge, go out of business, or simply change their production processes. Statistics Canada regularly reviews the classification of establishments to industries and revises previously published industry based statistics depending on the results of this review.

Note that an industry may produce goods other than its principal product. This occurs in a secondary activity. Similarly, some of its principal product may be produced by other industries as well.

Definition of production

It was noted earlier, that aggregate Gross Domestic Product by industry is based on the output measure of production by all industries. In this context it is important to examine the concept of output, the result of production. Output of an automobile assembly plant, for example, is the number of cars produced, or in terms of dollars, the value received on the market for those cars. This concept of production causes difficulties, however, because adding the assembly plant's output, so defined, to that of a tire manufacturer who supplies the assembler with tires, leads to double counting. Since the money a manufacturer receives for a car reflects the value of the entire car including the tires, adding the revenue of the tire manufacturer to the revenue of the car assembler means the tires are counted twice. However, if the cost of the tires is deducted from the receipts

from selling the car, the result is a measure of the automobile assembler's production that does not include the value of tires. Therefore adding this to a similarly defined measure for the tire manufacturer avoids double counting. The assembler is not credited with having contributed the value of the tires to the final product, as only the value he added by assembling the car is recognized. In other words, the value of tires is only counted in GDP of the tire industry and only the value of assembly is included in the GDP of the assembly industry. This newly created additional value by which the car manufacturer augmented the value of tires (and in fact the value of all intermediate inputs) is called **value added**. Value added is exactly what is required in order to obtain the nation's production as the sum of the contributions made by different industries.

Value added, also known as GDP of an industry, is a balancing item between intermediate inputs and outputs. It is an abstract, not an independent entity, and as such cannot be observed directly. However, it can be calculated by subtracting from the value of output the value of all intermediate inputs, whether purchased from other industries or imported. This residual amount indicates how much the industry itself has added to its products and excludes the contributions made by intermediate inputs. Since all intermediate consumption is eliminated, aggregate GDP for the economy as a whole is an unduplicated measure of production.

To arrive at a measure of an unduplicated value of production, only those inputs are eliminated which are entirely used up in the course of production (also known as intermediate inputs). This means that costs associated with the depletion of capital assets, that is capital inputs which are used repeatedly in processes of production for more than one year (for example, buildings, machinery, equipment, and beginning with the 2001 revision of the CSNA, software), are not deducted. The term **gross** in Gross Domestic Product signifies this fact.

Another important aspect of GDP is the restriction of what type of economic activity falls within the boundaries of measurement. It should be stressed that GDP is not designed to measure all productive activity taking place in an economy and some useful forms of production are excluded. For example, production of services for own final consumption within households, volunteer work, unpaid actions of individuals to preserve the environment are not included in the scope of measurement. However, since these activities relate to growing concerns of today's society, the question is frequently asked whether the traditional definition of production should be expanded. Responses to this question naturally reflect different opinions on what the purpose of collecting and analysing statistics on GDP should be.

Those who use GDP in a welfare context want it to reflect any activity that adds to or subtracts from our well-being, whether it results in a market transaction or not. The difficulty in pursuing this goal lies completely in assessing the value of non-market activities relative to that of market activities, and in obtaining data that reflect this assessment. Others, while recognizing the importance of Gross Domestic Product as a welfare measure, are primarily interested in monitoring the evolution and stability of the macro-economy, and in designing policies to keep the economy close to its maximum potential. Most theories of the economy as a dynamic system encompass only market activities, and this places less importance on Gross Domestic Product from a welfare point of view. Even here, however, neglect of non-market activities can skew one's perception of the economy as a dynamic system.

The exclusion of the value of housework provides an example of how this can happen. The value of unpaid housework is a significant share of the nation's output. As more and more women enter the labour force, an increasing number of household services previously provided by women working at home are now purchased on the market. This shift in the source of production increases the volume of activities passing through the market, and therefore measured output increases even though no additional production, broadly defined, has occurred. Viewed as a dynamic system, the economy will appear to be growing when it is not. (Ironically, the word economy originally had to do with household management - from the Greek *oikos* meaning 'household' and

nomos meaning 'governance'.) Studies indicate that the net effect of including household production in Gross Domestic Product would be a reduction in the rate of overall growth. Estimates of the value of unpaid work in Canada for the period from 1961 to 1992 can be found in *Households' Unpaid Work: Measurement and Valuation*, by Jackson, C. and Chandler, W. of Statistics Canada, Catalogue no. 13-603 E, No.3, December 1995.

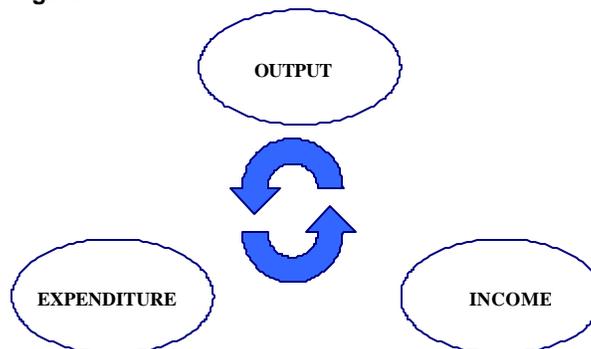
The term **domestic** in Gross Domestic Product refers to yet another aspect of the production boundary. In essence, the term 'domestic' indicates that GDP measures the unduplicated value of production originating within the boundaries of Canada, whether the factors of production are owned by Canadians or non-residents. It should also be noted, that some of the production may take place abroad. For example, despite the fact that value added by personnel of embassies, consulates and military bases posted abroad is produced outside the geographic boundaries of Canada, by convention this output is regarded as part of domestic production.

Measurement of production

The concept of economic production, as it is known today and the approaches to its measurement are of a relatively recent vintage. Although there were attempts as early as the 17th century to measure the wealth of a nation, economists focussed mainly on income received by persons and paid little attention to the interrelation between production and income. The sole objective of measuring the nation's wealth was to appraise the population's fiscal capacity. In the mid 17th century economists began to consider society's production of goods as a measure of the nation's wealth. Initially, however, the concept of economic production covered a very limited field. Land being considered as the sole source of wealth, only agriculture was viewed to be production. In the late 18th century a new opinion emerged, when economists recognized any process which added value to already existing goods to be a 'productive' process. Subsequently the boundaries of the production concept were expanded from agriculture to manufacturing and to certain goods related services, such as transportation and trade.

This definition was widely accepted until the end of the 19th century, when the production boundary was further extended to include services which were not related to the distribution of goods. However, in Material Product Systems, used by countries with centrally planned economies, this narrower definition remained accepted until the end of 1980's. By the mid-20th century, when the development of national income and expenditure accounting began, the concept of production was extended to aggregate demand which was compiled from statistics on the money-exchange transactions of the economy. This wider concept regarded economic life as a circular flow of the results of production activity: goods, services and money. Labour and capital are employed by producers in order to transform inputs of goods and services into outputs of other goods and services. The production activity generates incomes in the form of salaries and wages. This money then finds its way back to producers through expenditure on goods and services for final consumption.

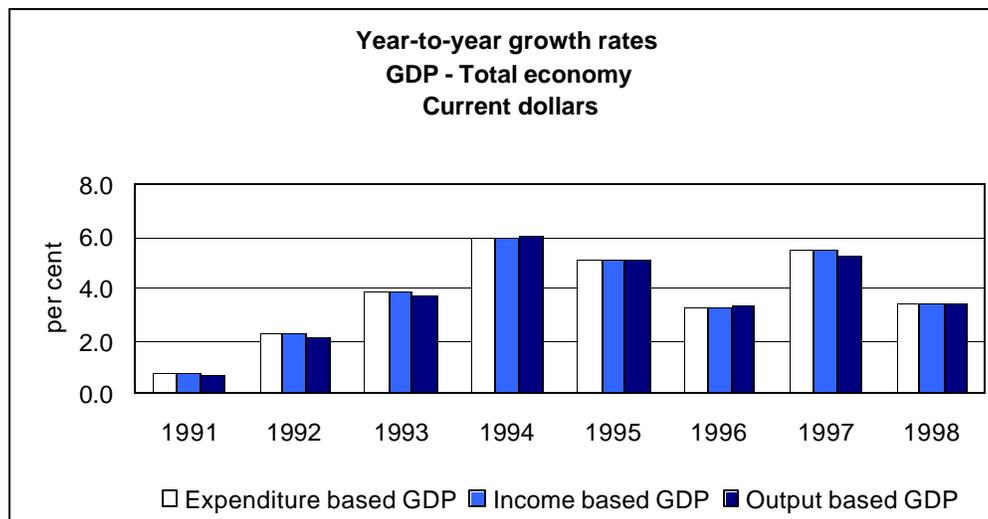
Figure 1



The total value of goods and services supplied by the economic system can be measured, therefore, in three alternative ways: in terms of unduplicated production, incomes generated or final expenditure. The production approach measures the contribution of each industry to total GDP. Aggregate value added by all industries is GDP of the country. The income approach measures the labour and capital costs of production. In other words, this approach involves the summation of all factor incomes that are generated by the production activity. These factor incomes, also known as primary inputs, essentially represent earnings from the employment of labour and the use of capital. Finally, the expenditure approach measures final expenditure on goods and services by consumers, governments, business enterprises and residents of other countries. The sum of purchases by these final demand categories (minus imports) represents the final result of the production activity of resident producers.

As noted previously, depending on which taxes and subsidies are included in the GDP values, it is said to be expressed either at basic prices or at market prices. Output based estimates of GDP, including taxes and subsidies on the factors of production, is at basic prices, while both the income based and expenditure based GDP are at market prices. As shown in Figure 2, the year-over-year growth rates of the three GDP series are close but not identical.

Figure 2



Differences between output based and expenditure based GDP

The CSNA publishes two important constant dollar sub-annual measures of GDP: monthly GDP by industry and quarterly expenditure based GDP. (The quarterly income based GDP estimates are produced only at current prices.) Both the output and expenditure based GDP are designed to measure the total value of production in Canada but, as noted above, at different prices.

Through the output approach GDP is viewed in terms of the producing industries. In this context it is desirable to confine the valuation to the costs which are incurred in creating the products, including taxes and subsidies on the factors of production (labour and capital). These taxes and subsidies are part of the producers' costs and thus have an impact on the amounts producers charge for their products and in turn on the quantities produced. Taxes and subsidies on products are not part of the producers' costs and are therefore treated as transactions

directly between purchasers and governments. Furthermore, taxes and subsidies on products affect the output of some industries more significantly than others, for example, tobacco or liquor are especially heavily taxed items. Consequently, if such unevenly applied taxes are excluded, each industry is placed on a comparable valuation basis and thus the contribution of specific industries to total GDP is more accurately expressed. Monthly GDP is therefore measured at basic prices.

Expenditure based GDP views the economy from the perspective of purchasers. Demand side analysis requires the use of market prices because market prices reflect what purchasers actually pay for the goods and services and thus determine the quantities consumed. Market price valuation therefore includes all taxes less subsidies both on products and on factors of production.

Another important methodological difference between the two GDP series is the approach to deflation. Presently, output based constant dollar GDP is calculated using either fixed weighted Laspeyres type or currently weighted Paasche type formulas, whereas the expenditure based GDP estimates are chained Fisher volume indexes.

The Laspeyres method values quantities of the current period at the prices of a base year, whereas the Paasche type deflation uses the relative importance of the products in the current period. Both methods reflect changes in the volume of output and assume that relative price movements of individual products are not shifting significantly. This assumption usually holds over a small number of years, but in the long term the pattern of relative prices often change to such an extent, that the prices at the beginning of the period become irrelevant to the economic conditions at the end of the period. At that point it becomes necessary to change the base year. In order to avoid distortions arising from shifts in relative prices, the traditional practice is to change the base year regularly every five years or so and to connect the various base year segments of the monthly GDP by industry series together by linking.

With the strong expansion of the Information and Communications Technologies industries, however, relative prices and quantities have evolved at such rapid rate during the past decade that rebasing at the customary 5-year interval became inadequate. Beginning in the 1980's, when soaring output and accelerating quality changes in computer products were accompanied by falling prices, calculations that compared prices of the current period with a distant base year caused sharp increases in deflated values. This gave an unduly enhanced importance to the computer industry. Such difficulties prompted reconsidering the CSNA approach to deflation and to minimize developing biases by improving the timeliness of rebasing.

As a result, Canada embraced the SNA 1993 recommendation to measure real growth between consecutive years instead of years far apart and launched extensive development work to move from Laspeyres volume and Paasche price indexes to the chained Fisher method. Calculated as the geometric mean of the Laspeyres and Paasche indexes, the Fisher index can be viewed as an average of the two, which therefore provides a more appropriate estimate of growth than the Laspeyres or the Paasche formulas on their own. More detail on chaining can be found in Chapter 4 of this report.

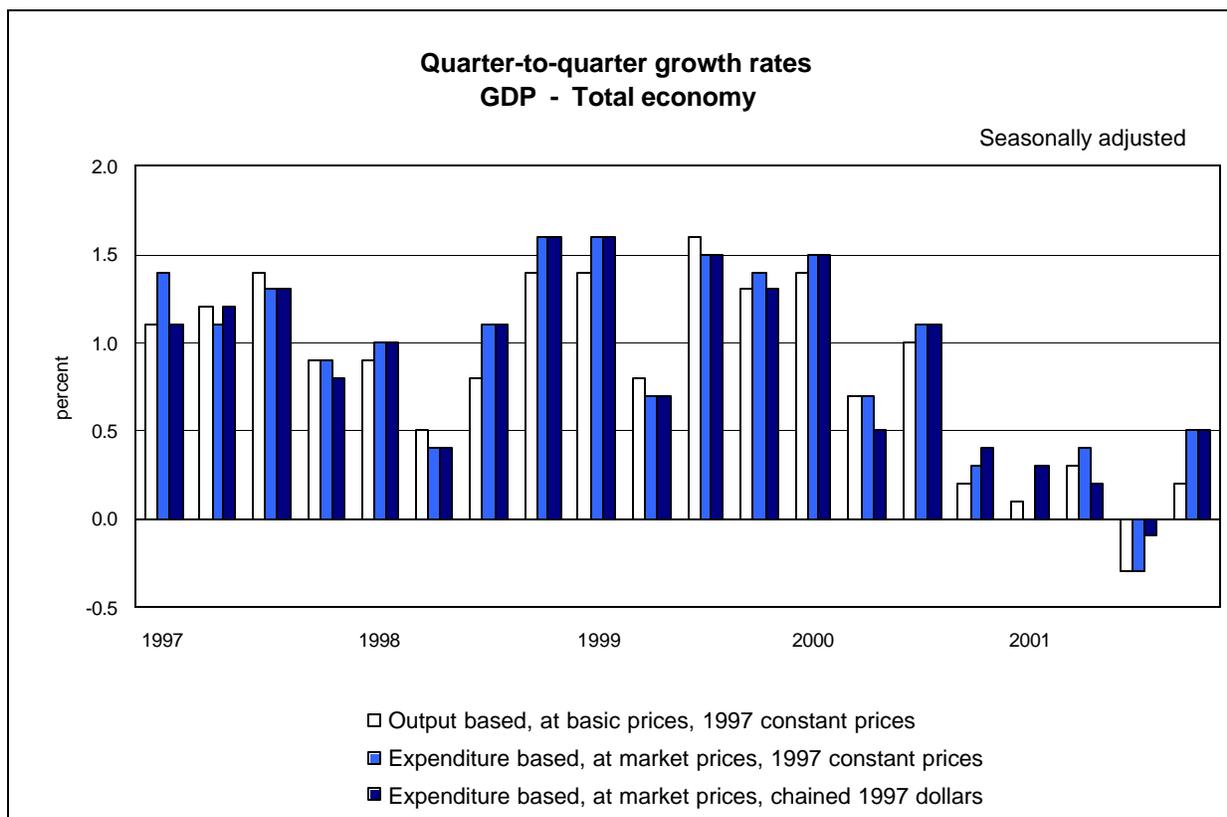
With the first quarter 2001 release, expenditure based GDP already adopted the Fisher index formula, chained quarterly, as the official measure of real growth and currently work is in progress to move to chain volume measures of output based GDP as well. Initially, this will involve updating prices (weights) annually, instead of using the same fixed set of base year prices for periods of five years. Each year's value added therefore will be calculated from the Input-Output (IO) tables using the prices of the previous year and a time series will be produced by linking the year over year movements. Beginning in the fall of 2002, these annually reweighted chain volume measures of value added will serve as annual benchmarks for the monthly GDP series. Research work is being undertaken to also produce quarterly or even monthly chained volume measures of GDP by

industry at as detailed an industry level as possible. The completion of this project, scheduled for 2003, will facilitate a more direct comparison between the expenditure based and output based GDP series.

In addition to the different treatment of taxes and subsidies and the use of different deflation technique, there are some statistical sources of discrepancies as well between the output and the expenditure based GDP. This is due to the fact that the two series are calculated independently, using different data sources and different estimation methods. For example, the output based estimates do not rely on data for exports but instead use data on manufacturer's shipments. The expenditure based estimates use exports but not shipments. Since exports by manufacturers must have been shipped, both GDP estimates will reflect the same underlying activity, but because shipments and exports are not the same concept, they have different values causing a statistical difference between the two GDP series.

Because of the underlying statistical, methodological and valuation differences, the two GDP series are not identical. Figure 3 compares the quarter-to-quarter growth rates. The output based GDP by industry at basic prices is expressed in 1997 constant prices and the expenditure based GDP at market prices is shown both in 1997 constant prices and in chained 1997 dollars. As can be seen, the growth rates of output and expenditure based GDP generally diverge slightly due to basic price versus market price valuation. The quarter-to-quarter differences between the Laspeyres type GDP by industry in 1997 constant prices and the expenditure based GDP in Fisher type chained 1997 dollars, however, show a somewhat wider variation.

Figure 3



Chapter 2 Measurement of Gross Domestic Product by industry

Introduction

This chapter discusses the manner in which the GDP by industry estimates are calculated at Statistics Canada. First, there is a description of **annual** GDP by industry, followed by the derivation of **monthly** GDP by industry. The annual estimates of GDP by industry are derived in the framework of the Input-Output accounts, while the monthly estimates are projections based on indicators such as outputs or labour inputs. The Input-Output based annual values of GDP serve as benchmarks for the monthly estimates.

Annual versus monthly estimates

Although the annual and monthly estimates of GDP by industry are based on the same concepts, definitions and classification schemes, the methodologies underlying the two sets of statistics use different data sources and techniques.

For all but the most recent two years, the annual estimates of GDP by industry are derived within the framework of the Input-Output tables. The data sources are typically annual surveys or censuses.

For two full years and part of the third year following the most recent IO tables and also for sub-annual periods, the lack of applicable data, particularly data on intermediate inputs, precludes a value added calculation. Estimates of GDP in these periods are projections, that are based on such proxy indicators as output or employment. These indicators are usually obtained from monthly surveys.

As a result of using different data sources and methodologies, the annual GDP and the yearly totals of the independently produced monthly estimates are not identical. However, this difference between the two sets of estimates is eliminated by integrating the annual benchmark values into the monthly GDP estimates as soon as the most recent Input-Output tables become available. This blending process, called benchmarking, generates a series which moves as much as possible with the original monthly series and sums to the annual benchmarks.

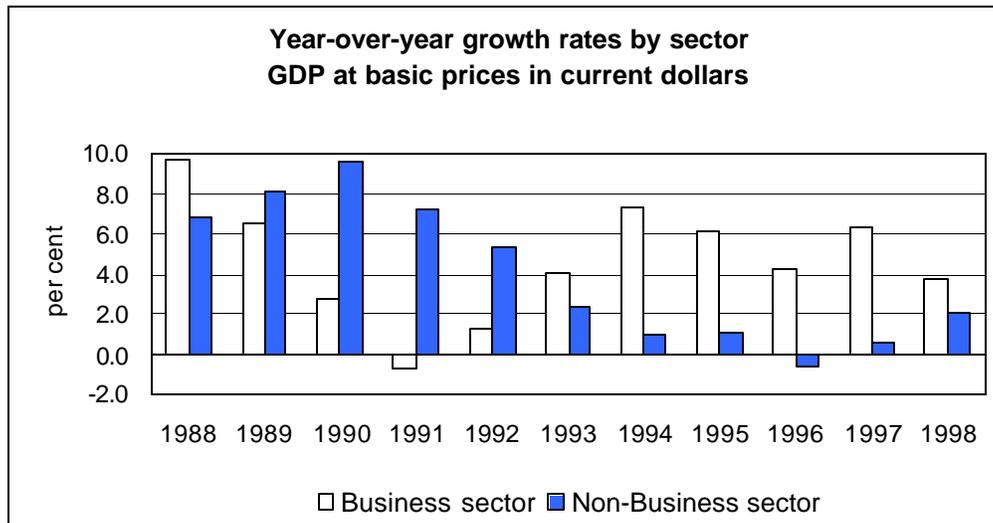
Annual GDP by industry

Annual estimates of GDP are derived from the Input-Output tables. These tables consist of two sets of accounts: the commodity and the industry accounts. The commodity accounts present the supply and disposition of individual commodities, whereas the industry accounts present details of output of industries along with the complete cost of production. Annual GDP by industry is calculated from the industry accounts.

The method of derivation depends on whether an industry is in the business or the non-business sector. The business sector encompasses establishments whose output is sold at prices that are economically significant. Prices are said to be economically significant when they have a significant influence on the amounts producers

are willing to supply and on the amounts purchasers wish to buy. Those establishments which provide most of their output to others free or at prices which are not economically significant, are assigned to the non-business sector. Approximately 80% of total GDP originates in the business sector. Figure 4 illustrates the year-over-year growth rates of the business sector compared to the non-business sector.

Figure 4



For an extensive description readers should refer to *The Input-Output Structure of the Canadian Economy*, Statistics Canada, Catalogue no. 15-510, *The Input-Output Structure of the Canadian Economy in Constant Prices 1961-1981*, Statistics Canada, Catalogue no. 15-511, *Service Industries in the Canadian Input-Output Accounts (Current Prices)*, *Sources of Data and Methods of Estimation*, Statistics Canada, Catalogue no. 15-601E, No. 2 - occasional, and *A Guide to Deflating the Input-Output Accounts, Sources and Methods*, Statistics Canada, Catalogue no. 15F0077GIE, 2001. The following is a brief overview of the calculation of GDP for the business industries, followed by the treatment of the non-business industries.

GDP originating in the business sector

Business industries both sell their products and purchase their intermediate inputs in the market, hence data on the full range of inputs and outputs are generally available. For the business sector, therefore, it is feasible to measure GDP by subtracting intermediate inputs from outputs of industries.

In the CSNA the calculation of annual GDP by industry from the IO tables starts with valuing output at **modified** basic prices. This means that although taxes on products are excluded, the prices used in the calculation are subsidized prices, not prices plus subsidies.

This method of valuing output represents a departure from the SNA 1993 guidelines, which recommend the valuation of output at basic prices. Basic prices represent the value of output at the gate of the producing unit, excluding any taxes and but including subsidies on products.

The Canadian value of output is at modified basic prices, the modification being the exclusion of subsidies receivable on products. The advantage of this method is that prices of output are observed prices as received by the producers and paid by the purchasers. These prices are listed on the invoices, therefore the valuation of transactions is verifiable from enterprise records.

The valuation of intermediate inputs, on the other hand, uses purchasers' prices. Purchasers' prices represent amounts that are actually paid by the producers for their intermediate goods and services (including taxes).

Finally, taking the difference between output at modified basic prices and intermediate inputs at purchasers' prices and adding subsidies on products to this residual amount gives GDP by industry at basic prices. These annual values of GDP by industry at basic prices are then used as benchmarks for the monthly projector based measures.

Taking data from the 1997 Input-Output tables for total economy, Table I illustrates this calculation. Also shown are the differences between GDP at basic prices, GDP at market prices and the traditional GDP at factor cost (a concept no longer used in the CSNA). As can be seen, taxes on products are far more significant in Canada compared with subsidies on products.

Table I GDP for total economy in 1997 - comparison of different valuation concepts	
Value of output at modified basic prices for total economy (\$ billions)	1,664
Less value of intermediate use of goods and services at purchasers' prices	855
Gross Domestic Product at modified basic prices	809
Plus subsidies on products	8
Gross Domestic Product at basic prices	817
Plus taxes on products	76
Less subsidies on products	8
Gross Domestic Product at market prices	885
Less taxes on products	76
Plus subsidies on products	8
Less taxes on factors of production	49
Plus subsidies on factors of production	1
Gross Domestic Product at factor cost	769

An alternative method of calculating annual GDP by industry at basic prices is by adding wages and salaries, supplementary labour income, mixed income and other operating surplus (these items constitute GDP at factor cost), plus taxes less subsidies on the factors of production.

The derivation of constant price annual GDP is based on the technique of deducting intermediate inputs from outputs. First, constant price estimates of intermediate inputs and outputs are calculated by deflating each commodity separately with its own appropriate price index, then constant price value added is derived residually as the difference between the two. This indirect method is known as **double deflation**.

GDP originating in the non-business sector

Non-business industries consist of non-market producers, that produce goods and services for the benefit of persons, businesses or the community as a whole. Their products are supplied either free of charge or sold at prices which are not economically significant, that is, at prices which do not have a significant influence on the amounts producers are willing to supply or on the amounts purchasers wish to buy.

The measurement of output of non-business industries cannot be based on direct observations of transactions between buyers and sellers on markets. Some of the non-business industries provide services to the community as a whole, for example defence, police, fire fighting, correctional or administrative services. These services are consumed by society collectively and are typically financed from taxation revenues received by governments. Since the consumption of collective services is not represented by money-exchange transactions on markets, it is not possible to determine their market value. Some non-business industries do produce goods and services which could be sold on markets. A few examples are the treatment and distribution of water, education, transportation, health services, and so on. For social, economic or political reasons, however, non-business industries choose either to supply their products and services free of charge or if they sell their products, they do so at prices which are not economically significant. Such prices are often intended to raise some revenue in order to reduce the cost of production, but do not necessarily reflect the total cost of production or the market value of the products.

Because prices which are economically not significant do not reflect relative production costs or relative consumer preferences, they do not provide a suitable basis for valuing the outputs of non-business industries. Goods and services produced by non-business establishments are therefore valued based on their costs of production.

Constant price GDP for the non-business industries is calculated by direct (not double) deflation. Direct deflation means that current values of labour income, depreciation of capital stock, taxes are each divided directly by their appropriate price indexes.

Monthly GDP by industry

In regard to the derivation of monthly GDP it is important to remember that complete information on both outputs and inputs can be obtained only from annual surveys and only with a time lag of two to three years. For the most current two years and for sub-annual periods the derivation of GDP must rely on a less comprehensive data base, usually supplied by monthly surveys. Monthly surveys do not cover all the commodities produced by a certain industry, nor all the producers of a certain commodity. Usually only very scarce information is available on intermediate inputs. Nonetheless, monthly surveys do provide sufficient data on each industry to serve as suitable indicators of the sub-annual movement of production.

If the assumption can be made that changes in outputs or in inputs acceptably reflect changes in value added, monthly estimates of GDP can be derived using either outputs or inputs as indicators. In constant prices the assumption that value added moves with output seems reasonable, since technological advances which permit a different amount of output to be produced from the same amount of inputs normally occur slowly. In the monthly GDP by industry system therefore the indicator approach is used for all industries and it is assumed that changes in value added are proportional to the changes in output.

Changes in the production process, for example shifts in production from goods that require a high degree of fabrication to goods that require less, or substitution of an input by another, however, may cause some deviations in the relationship between value added (net output) and output. Furthermore, indicators based on broad categories of products or materials may not reveal changes in value added in sufficient proportions. The size of the divergence depends on the degree of homogeneity of the industries. The more diversified the production of an industry is, the more sensitive value added is to changes in the product mix. Generally, the finer the industrial breakdown is, the more accurately will changes in production be reflected in GDP. This is also true for products and prices within industries. For these reasons (among others) the valuation of GDP is carried out at as detailed industrial breakdown level as possible.

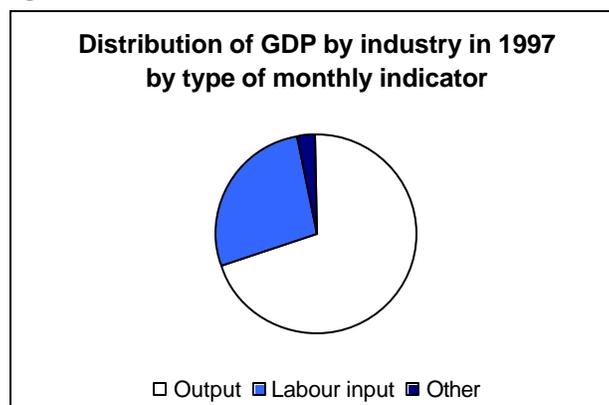
The most frequently used proxy indicator is **output**. Generally, estimating changes in value added at constant prices using output as an indicator yields a close approximation to the change in constant price GDP. However, this method may lead to skewed results if intermediate inputs measured at constant prices do not change in the same proportion as output at constant prices. For example, movements in value added may be distorted when a manufacturer contracts out a varying amount of the business service inputs. Contracting out changes the cost of production and the impact of fluctuations in outsourcing on the manufacturer's value added may not always be reflected in a timely fashion by the output indicator. Even though the use of output as a single indicator may not be perfect, in the absence of complete information on both intermediate inputs and outputs it nevertheless has proven an acceptable alternative to double deflation.

In instances when estimates of output are not available, **labour input** is chosen as an alternative indicator. The number of employees is combined whenever possible with hourly wage rates paid to employees in order to ensure that changes in the composition of the labour force are adequately reflected in the changes of value added. The number of hours worked is also embedded in the indicator system in an attempt to avoid counting unproductive time such as strikes and at the same time ensure that working overtime is appropriately reflected.

Generally, approximating changes in GDP by changes in labour input is subject to the same sort of assumptions and limitations that apply to output as an indicator. Although the labour series usually relate fairly closely to actual work done, they fail to take account of changes in productivity. If, for example, the production process becomes more efficient because of an increase in labour skills or the use of more or better capital equipment, the employment based indicator will underestimate the increase in GDP. Furthermore, employers tend not to adjust their skilled labour force in response to short term fluctuations in operating surplus, which means that labour input may be steady whereas value added is in fact changing.

Despite the potential pitfalls, changes in employee compensation at constant wage rate, or simply changes in numbers employed, yield a fairly close approximation to changes in real value added over a short term of periods.

Figure 5



In a few cases both output and labour input indicators are used in conjunction. An example is the performing arts, spectator sports and heritage institutions industry. Output by this industry is estimated based on gross revenue, derived from a number of sources. Gross revenue by professional sports clubs is estimated based on sporting event attendance. Gross revenue by race tracks is estimated based on revenue from track commission, attendance and sale of programs. Revenue from sale of programs is a percentage of attendance revenue. Finally, gross revenue by other amusement and recreational services is estimated based on labour input.

In some instances the monthly output indicator is derived using some modelling approach. For instance, output by the truck transportation industry is estimated based on gross revenues from direct purchases of freight services by industries for intermediate use. Such expenditure by businesses is projected from each industry's gross output. It is assumed that the amount paid for truck transport is a fixed proportion of an industry's gross output. Another case in point is the residential construction industry. Output of this industry is estimated based on the value of work-put-in-place each month. This monthly value is derived from a model using data on housing starts, completions and average values of building permits, by type of dwelling such as single dwellings, semi-detached dwellings, row housing and apartments.

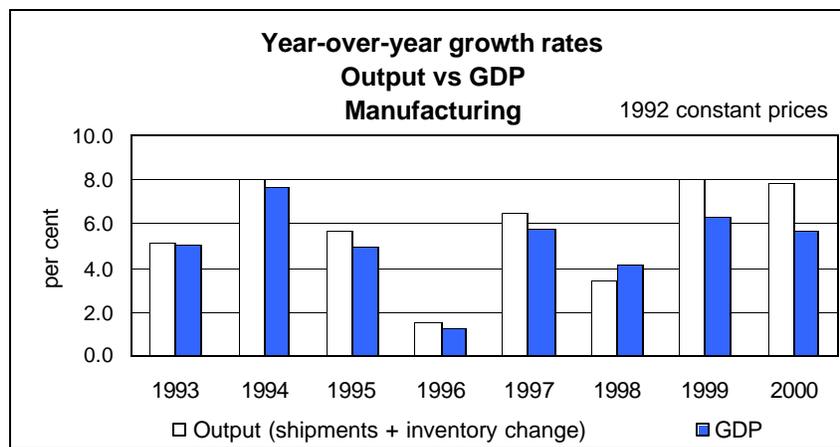
In the case of a very small number of industries for which relevant sub-annual information is entirely lacking, monthly estimates of value added are simply interpolations between the IO based annual benchmark levels.

The choice of which indicator to use for any particular industry depends largely on the availability and suitability of data. In order to determine how well an indicator will work, the quality of the indicator is evaluated based on such criteria as the quality and the timeliness of the source data, the relationship of the monthly estimates to the annual benchmarks including conceptual adequacy, size of the revisions and quality of the seasonal adjustment.

Generally, an indicator is considered to produce good estimates of value added if it measures a large proportion of the economic activity by the industry, monthly revisions to the preliminary data resulting from increased survey response are small, the relationship between the monthly estimates and the annual benchmarks is stable, the irregular movement in the monthly estimates is small relative to the trend-cycle movement, and most importantly, the indicator contains sufficient information reflecting current economic developments. Therefore, the ability of the indicator to reflect events and short term trends in the economy is thoroughly evaluated in the light of background information on markets, economic business cycle turning points, technology, prices, labour disruptions, developments in international trade, government policies and programs, and any other factors that might have an impact on the value of production by the industry in question.

The following is an example illustrating the capacity of manufacturing shipments and inventories to reflect real growth in GDP. This type of indicator of output, shipments adjusted for withdrawals (or additions) of goods in process and finished goods from the producers' inventories, is used for a large number of manufacturing industries. Using 1992 constant price values, Figure 6 compares the year-over-year growth rates in annual manufacturing GDP (from the IO tables) and output (derived from monthly shipments and inventories).

Figure 6



Since GDP by industry covers all production of goods and services in the Canadian economy, a very wide range of input data sources are used to measure the value of output produced. Due to the incomplete coverage of the input data, the methodologies using these projectors, however complex, are typically compromises from the theoretically appropriate model. Additionally, the concepts, classifications, accounting conventions and valuations methods at the input data level may not always coincide with those used in the CSNA. Because of all these facts, the use of a projector system requires the firm implementation of national accounting concepts and definitions of the CSNA and the ongoing analysis of the wide range of factors that can affect industrial output. As a result, the projectors and the corresponding methodologies are continually reviewed in order to detect biases, breaks in continuity, or any other changes in consistency and suitability.

One of the most important feedback on the quality and consistency of the GDP estimates is provided by economic analysis. The projector is considered reliable, if economic intelligence is supported by the value added estimates, that is the underlying data reflect the factors affecting a particular industry, for example strikes, large contracts, government policies and programs. Since the quality of monthly GDP depends not only on the source data, but also on the quality of such transformation as deflation, seasonal adjustment and benchmarking, monthly GDP estimates are evaluated using both quantitative and non-quantitative assessment methods.

Quality dimensions that can be expressed in quantitative terms are appraised using statistical tools. For example, as revisions usually relate to better data due to higher response rates, studying the frequency and the size of revisions provides important measures of quality. The quality of seasonal adjustment is also appraised by a number of statistical tests, measuring for example how well identifiable the seasonal variation is in the original series and how much residual seasonality remains in the seasonally adjusted series. Test values showing highly identifiable seasonality and the absence of residual seasonality are indicative of good quality seasonal adjustment. Regression analysis is another statistical tool which is frequently used for examining the relationship between the monthly projector and the IO based annual benchmarks.

Non-quantitative assessments are largely subjective evaluations concerning conceptual adequacy and industrial coverage of the monthly source data. Quality indicators of the annual IO benchmarks are based on the underlying survey and on the clarity of the GDP concept. Based on ongoing research, evaluation and quantifying the impact of data gaps, deficiencies or discontinuities on the monthly GDP estimates, adjustments are made when necessary to overcome them.

Chapter 3 Classification schemes

Introduction

This chapter is a short overview of the classification schemes used for GDP by industry. As noted earlier, GDP is a global measure of the total amount of goods and services produced in Canada and one way of measuring it is to measure production of each industry and sum their gross values added. It was also explained that an industry is defined as a collection of producing entities that use similar production processes to produce similar products. To facilitate the collection and compilation of industrial statistics, classifications are required to define which products are similar enough to be considered as the same commodity and which establishments use similar enough production processes to constitute an industry. A commodity classification is a structured list of commodity classes, each mutually exclusive, which jointly exhaust the universe of products. An industrial classification, on the other hand, arranges producers into industries.

Classification of industries

Historically, various versions of the Standard Industrial Classification (**SIC**) served as the industrial classification framework for the GDP by industry series. The first SIC was created in 1948. Naturally, this SIC reflected the industrial structure of the time of its implementation, namely the immediate post-war economy. In the years that followed, Canada's economy experienced considerable technological and other structural changes and with this the 1948 SIC gradually became outdated. Implementing a new SIC, however, always has the disadvantage that in some cases it is necessary to reclassify establishments and such reclassifications create breaks in the historical series. As a compromise between the conflicting goals of reflecting current conditions and maintaining the comparability over the years, an approximately ten year cycle was adopted in Statistics Canada for regularly revising the industrial classification. Thus new versions of the SIC were published in 1960, 1970 and 1980. The 1961-1980 historical segment of the GDP by industry series was published based on the 1970 SIC and the 1981-1996 historical segment was published based on the 1980 SIC. For an extensive description users should refer to *Standard Industrial Classification 1980*, Statistics Canada, Catalogue no. 12-501E, December 1980.

In 2001, the CSNA replaced the 1980 SIC with the North American Industry Classification System (**NAICS**) and currently the industrial classification framework of GDP by industry follows fairly closely the NAICS system. This system was jointly developed by Canada, Mexico and the United States with the intention to provide a common statistical framework for the analysis of the three economies. Commencing with reference year 1997 in Canada and the United States and 1998 in Mexico, NAICS replaced the existing classifications used by the three statistical agencies and thus placed the industrial statistics compiled by the three countries on a comparable basis. For more detail on NAICS see *North American Industry Classification System, Canada 1997*, Statistics Canada, Catalogue no. 12-501-XPE, March 1998.

NAICS defines industries as groups of economic units which are engaged in similar production processes. The basic building block of an industry is the establishment. Establishments are allocated to industries according to their primary activity or output. If the necessary data are available, the most important activity or output is defined as the one which contributes the most to the establishment's value added. Otherwise, the principal activity is determined using other variables such as employment or gross revenue figures. At the establishment

level a distinction is also made in the CSNA whether the establishment belongs to the business or the non-business sector. Those establishments which produce goods and services with the purpose of generating profits are allocated to the business sector; others are assigned to the non-business sector. Most industries comprise establishments entirely belonging to either the business or the non-business sector. A few, however, have establishments in both (for example radio and television broadcasting, education, health).

The lowest level in the industry classification at which GDP by industry estimates are prepared and published is the **worksheet** level. Most worksheet levels correspond to fourth and fifth level industries in the NAICS framework (for example Potash Mines or Newsprint Mills).

Above the worksheet level is the **link** level. The link level was developed with historical continuity in mind, to overcome breaks in the data series associated with revising the industrial classification. As noted earlier, every ten years or so new variants of the SIC were adopted for the historical segment of GDP by industry, incorporating the 1960, 1970 and 1980 version of the SIC. Finally, beginning with the 1997 reference year, monthly data used in the calculation of GDP by industry were converted from an SIC basis to a NAICS basis. Each of these revisions to the industrial classification required the reclassification of some establishments from one industry to another and changes in the composition of industries created breaks in the GDP series. Naturally, such breaks impair the analysis of any particular GDP series over a long period of time. However, the effect of reclassification fell unevenly on individual industries. While estimates of GDP for some industries remained comparable at the worksheet level across the different classifications, for some others, long term comparisons could only be carried out at higher levels of aggregation. The lowest level of industry aggregations which provide continuous GDP series over long periods of time are identified as the link level.

The definition of the link level industries was based on quantitative criteria. If the value added of an industry did not change much due to the reclassification of establishments and value added of the incoming and outgoing establishments were relatively small so that they did not alter the industry's structure, the industry was considered continuous.

It should be noted, that with the 2001 annual revision, link level estimates were released reaching back to 1981 (previously SIC based link levels were published from 1961). It should also be emphasized, that not all link levels are continuous covering the entire span from 1981 to date. Some link levels are continuous between 1981 and 1996 but there is a break between 1996 and 1997. This break was introduced with the reclassification of industries from SIC 1980 to NAICS when the different criteria used by the two classification systems resulted in significant shifts both within and between sectors. NAICS based estimates begin with 1997, thus there are some breaks between that year and 1996.

Most notable among the affected industries is the retail trade industry. According to the NAICS definition, retail trade excludes certain activities which were formerly included by the SIC 1980 classification system, for example motor vehicle repairs and towing, retail bakeries and custom tailoring. On the other hand, establishments selling to both consumers and businesses as well as some activities previously classified elsewhere have been added to retail trade. Figure 7 illustrates the resulting approximately eight percent break between December 1996 and January 1997.

Figure 7



Above the link level in the industrial structure are the major industry groups and industry divisions. **Major groups** represent a cluster of industries which form a recognizable sector of the economy (for example Food Industries or Clothing Industries) whereas an industry **division** represents a broad type of economic activity (for example Mining or Manufacturing). There are also some special aggregations that correspond to certain combinations of specific industries (for example Industrial Production, Goods Producing Industries, Services Producing Industries, Durable Manufacturing Industries, Non-durable Manufacturing Industries, and Information and Communication Technology Sector).

Classification of goods and services

Historically, the first commodity classification to be used in Statistics Canada was the Standard Commodity Classification (SCC). Implemented in 1959 and revised in 1972, this structure of nearly 6000 commodity classes could not, however, be applied uniformly throughout the statistical system as it stood. Different analysis required detailed information on different sets of commodity classes and often the SCC did not provide the desired detail. Separate classifications were therefore required to meet different needs. Some users needed commodities classified on the basis of their physical characteristics (for example, plastics) while others needed them classified on the basis of their demand or supply characteristics (for example, furniture) or on the basis of taxability characteristics. Over the years, therefore, many versions of the SCC were developed, each reflecting a special interest in a certain aspect of economic activity. A version of the SCC was introduced for producing and analysing export statistics, in which some of the commodity classes of the original SCC were adopted without modification, while others were combined or sub-divided. An import commodity classification was also developed, as well as one for the survey of shipments by manufacturers, another for the transportation of commodities, and so on. The SCC served as the standard until 1988 when it was replaced by the Standard Classification of Goods (SCG), with revised editions following in 1992 and 1996. For more in-depth description see *Standard Classification of Goods 1996: based on the Harmonized Commodity Description and Coding*, Statistics Canada, Catalogue no. 12-580 XPE, 1997. Two other product classifications also currently in use at Statistics Canada are the Standard Classification of Transportable Goods and the Standard Classification of Services.

In all variants the basic structure of the SCC was preserved but because of the unique condensations and sub-divisions of the SCC classes, it was often difficult to match descriptions of commodities when moving from one classification scheme to another. This presented a special problem in the context of GDP by industry, derived in the IO system from a great variety of data from a number of sources within Statistics Canada. Many of these surveys gather commodity information at varying levels of detail and employ a variety of classification

systems peculiar to the different aspects of economic activity. The analysis of the interrelationship of commodities and producing units in the economy, however, demands a consistent commodity classification that can be applied to all transactions. Therefore, in order to combine the diverse commodity data into the integrated framework of the IO system, a common commodity classification system was created, one that was simultaneously in accord with the various existing versions of the SCC, and which would describe commodity classes consistently across the various aspects of the economy (such as production, transportation, exports, imports or prices). A structure of approximately 1500 commodity classes, called **Principal Commodity Groups** (PCG), was developed by consolidating the Standard Commodity Classification, the Industry Commodity Classification, the Export Commodity Classification and the Import Commodity Classification. The approximately 700 commodity definitions in the IO tables are derived from the PCG's. As a result, each commodity is allocated consistently across the balanced IO system whether it is looked at as part of a producer's output, an item being transported, an export or import, or a purchase by a final consumer. In the monthly GDP by industry system the PCG's are used extensively in the construction of industry price indexes for the manufacturing sector.

Chapter 4 Constant price GDP by industry

Introduction

The subject of this chapter is the derivation of GDP by industry at constant prices. The description deals with the choice of deflators, the role of the base year and the need for periodically changing it. Forward looking comments at the end of this chapter deal with new developments in the CSNA with respect to the methods of deflation, specifically with the transition from Laspeyres volume indexes and Paasche price indexes, rebased every five years or so, to the chained Fisher method. .

Current versus constant prices

The terms 'current' and 'constant' have special meanings in the context of expressing the dollar value of economic production. The term 'current' in this context refers to the time at which the economic activity took place. Thus 'current period' means the period of observation and does not mean the present time nor the time of compilation.

The value of output is said to be expressed at 'current prices' (denoted as \$C) when prices of products are those prevailing in the period of observation. In other words, both the quantity and the price components of the value series relate to the current period. The term 'constant', on the other hand, refers to a fixed reference period in the past. Such a reference period is called the base year.

The value of output is expressed at 'constant prices' (denoted as \$K) when the quantities are observed in the current period, but the prices used in their valuation are taken from another period in the past. Both current and constant price measures of output assess the value of production in the current period. The difference between the two lies in valuing products at prevailing prices on one hand (current), and at prices which were effective at some point in the past (constant), on the other.

The output of an industry in current prices is the sum of the current values of its products. Current values can be observed directly as they represent the amount of money that exchanges hands when a particular good or service is sold. But current values can also be derived from separate observations on quantities (physical unit) and prices (the value of one physical unit). Obviously, changes in the value of output expressed at current prices may be the consequences of changes in both quantities and prices.

The output of an industry expressed at constant prices is the sum of the constant values of its products. In contrast with the current values of commodities, constant values cannot be observed directly. They can nevertheless be calculated, either by removing price changes from current values or by multiplying current period quantities by the prices of a base year.

Constant price measures of output thus reflect variations only in volume. Quality differences are treated as changes in volume, not in price. Constant dollar measures are therefore suitable for the analysis of changes in the volume of production, without being obscured by price fluctuations.

Base year

Using prices of a base year to measure current production is a representative measurement of the volume of economic activity. However, using different base years will yield different growth rates in the constant price aggregates. The differences in growth depend on the differences between the structure of relative prices in the various base periods.

The effect of using different base years is demonstrated in the following numeric example (Table II). When the calculation of constant price output of two fictitious industries (A and B) is changed from using prices of 1992 to the prices of 1997, the overall decline in 1992 dollars becomes an increase when expressed in 1997 dollars.

Table II Sensitivity to the Choice of the Base Year							
		<i>Base Year = 1992</i>			<i>Base Year = 1997</i>		
		<i>1999</i>	<i>2000</i>	<i>%</i>	<i>1999</i>	<i>2000</i>	<i>%</i>
Industry A							
	Quantity	100	200		100	200	
	Price	10	10		20	20	
	\$K Value	1,000	2,000		2,000	4,000	
Industry B							
	Quantity	150	110		150	110	
	Price	30	30		25	25	
	\$K Value	4500	3300		3750	2750	
Total		5,500	5,300	-3.6%	5,750	6,750	17.4%

New products

Expressing the value of current production at the fixed prices of a period in the past becomes problematic whenever new products appear on the market. Obviously, if a product did not exist in the base period, no observable base year price can be associated with it. Nonetheless, the output of new products must somehow be included in constant price total GDP. The most frequently applied solution to this problem is to compare the price of the new product with that of an existing commodity, which is similar to the new product in most of its characteristics. If the relationship between their prices is stable in the current period, a reasonable base year price can be estimated for the new product based on this relationship.

Occasionally, when new products are so unique that their characteristics are not comparable with any of the existing commodities, comparisons are based on the function of the specific items. Such imputed base year prices, although founded on many assumptions, nevertheless facilitate the inclusion of new products in the constant price measures. The best solution to many pricing problems, however, is simply switching to a new base year. The new base year is always closer to the current period and therefore more closely reflects prevailing technology, products and prices.

Rebasing

Inherent in the construction of constant price GDP aggregates is the assumption that the relative prices of the components of GDP do not change in time. In a dynamic economy, however, relative prices constantly change

due to uneven technological developments in different industries, variations in productivity, shifts in consumer's demand, cycles in economic growth, and so on. The more remote a base year is, the more relative prices may have changed, altering the relative importance of different industries. The representativeness of the constant price GDP by industry aggregates, therefore, gradually diminishes in time.

Current movements in the volume of production will be appropriately reflected in the constant price measure only if the relative prices in the current year are not very different from those in the base year. Therefore, in order to maintain an appropriate measure of GDP, it is necessary from time to time to choose a new base year. The process of updating the base year is called rebasing.

The frequency of rebasing is a compromise between using a more representative reference period and measuring changes in GDP by industry in terms of the prices of the same base year for a reasonable length of time. In Canada, rebasing has traditionally been done at ten year intervals implementing 1961, 1971 and 1981 as base years. Following the implementation of 1981, the 10 year interval had been reduced and 1986 and 1992 served as the next two base years. The most up-to-date measures of monthly GDP are expressed in term of 1997 dollars.

A drawback of changing to a new base year is that it causes a discontinuity in the series if the change is not worked back to all preceding periods. Therefore, the question arises as to how GDP estimates at constant prices for the years preceding the new base year should be treated in order to maintain an unbroken series.

There are two alternative approaches to this problem. One approach recalculates all constant price estimates in terms of the new base year, the other approach eliminates the break by a mechanical scaling process. Each method has its own merits. The primary advantage of recalculating all values is the maintenance of continuity and consistency. However, implementing new base year prices on both sides of the base year may impose technology and values on a time period when they did not even exist. Using new prices also has the disadvantage that the original growth rates of industries will not be preserved, although growth rates will be maintained for specific commodities. Rebasing the historical years by a mechanical scaling process (chaining), on the other hand, preserves the original growth rates. However, the linking method has the disadvantage of causing loss of additivity. This means the sum of the separately linked components will not be equal to their linked aggregates.

For the monthly GDP by industry series this second linking approach is followed and new base year prices are applied from the new base year forward only. For periods prior to the base year, the constant price series at each level of detail is adjusted to the new base year segment by multiplying it by a link factor. The link factor is the ratio in the new base year of GDP evaluated at new prices and at preceding base year prices.

As already noted, it is not possible to preserve the accounting relationship between an aggregate and its components when time series are constructed by linking. The purpose of linking is to eliminate breaks in the time series between consecutive base year periods while preserving the volume movements at each level of aggregation. Original growth rates, however, can only be maintained at the cost of losing additive consistency. The linked GDP by industry estimates for the period prior to 1997 are intended primarily for the long-term analysis of single industries when taken in isolation and discrepancies resulting from loss of additivity should not be taken as possible errors in the accounting system.

Choice of deflation methods

Generally, there are two approaches to estimating monthly GDP at constant prices: (1) valuing quantity data by applying base year unit values and (2) price deflation. In the construction of constant price GDP by industry

both methods are applied. The choice of which technique to use usually depends on data availability and suitability.

For most industries the choice between deflation and quantity valuation does not exist because data availability determines which method to use. But for a few industries, concurrent data on values, quantities and prices are available, thus either one of the two methods can be used. These industries belong mainly in the manufacturing sector, for example manufacturers of pulp and paper, motor vehicles, poultry and dairy products, iron and steel mills. The current choice for these industries is the quantity valuation method, but the suitability of the deflation procedure is periodically evaluated. In a perfect world with reliable and comprehensive data on both values and prices, the method based on price deflation would clearly be the preferred choice. In practice, however, both the value and the price series that are available for these industries are based on monthly sample surveys, compiled from different sources of data. As the quality of price deflation obviously is conditional on the correct matching of values with deflators, the results will be distorted if the price indexes are not consistent with the values. The decision to use the quantity valuation method rather than deflation was made in light of the practical difficulty in dealing with incomplete information on values and prices, but more importantly in light of the fact that comprehensive and more reliable data are readily available on quantities produced. The commodity detail is at such fine breakdown, that the goods within each class can be considered nearly homogeneous. This fine breakdown allows calculating and analysing values at constant prices at a very detailed elementary level. Presently, this approach seems more effective than dividing the total value of output by these industries with a single deflator.

Base year valuation of quantities

This approach involves the summation of current quantities valued at the prices of a base year. The algebraic expression of this method of building a constant price series is:

$$\sum pq_t$$

where q is the quantity and p is the price, t stands for the current and 0 for the base period. The summation covers the entire range of commodities produced by a particular industry.

The following numeric example illustrates the construction of the fixed-weighted Laspeyres type volume measure. Table III contains the basic data for a fictitious industry producing two products A and B. Table IV shows the corresponding Laspeyres volume measures calculated using the fixed prices of a base year (Year 1).

Table III Basic Data: Quantities, Prices and Values in Years 1, 2, 3 and 4												
	Year 1			Year 2			Year 3			Year 4		
	Qty	Price	Value									
	q_1	p_1	p_1q_1	q_2	p_2	p_2q_2	q_3	p_3	p_3q_3	q_4	p_4	p_4q_4
Product A	30	11	330	32	12	384	34	13	442	36	15	540
Product B	20	10	200	22	8	176	25	6	150	26	5	130
Total			530			560			592			670

Table IV Values at Year 1 Prices				
	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
	p_1q_1	p_1q_2	p_1q_3	p_1q_4
Product A	330	352	374	396
Product B	200	220	250	260
Total	530	572	624	656

The assumption inherent in the use of the fixed-weighted Laspeyres volume measure is that relative prices show no changes. Changes in the commodity composition due to changes in the relative quantities will be reflected but variations due to relative price changes will not be reflected in the constant price measure of output. Consequently, distortions may become significant over an extended period of time. However, in a short period of a few years, shifts in product mix, relative prices, technology or the technique of production are not likely to have considerable importance. Presently, base year valuation of current quantities is the preferred method for industries belonging to the goods producing sector. But this method is also used for some of the service producing industries, such as air transport, railway transport and cable television. For these industries the volume of production is derived from quantities of goods or number of persons affected by the particular service.

The quantity of products may simply be the number of items, or their weight, volume or length. These units are normally used to describe quantities of homogeneous products, for example tons of grain, litres of motor gasoline, and so on. In case of a complex commodity, however, the description of the quantity produced is a bundle of attributes and its price relates to a specific range of physical characteristics. For example, the description of a physical unit of a certain type of wood pulp can be as elaborate as: metric ton, measured on an air-dry basis, produced by cooking hardwood chips in chemical liquors, whitened and brightened. In addition to size, colour, material composition, method of production, etc., the physical attributes of a commodity may also include such qualitative features as the geographical location or the purpose of production.

Generally, in an attempt to minimize biases caused by shifts in the commodity mix, the basic unit of output is always defined at as fine a level of detail as possible and its price is chosen to reflect the cost of producing that particular quantity of output as accurately as possible. Commodities with different physical characteristics and products of varying quality are generally taken as different products and are given their own appropriate prices.

An example is contract drilling for the oil and gas industry. Monthly GDP for this industry is projected based on the number of metres drilled. The price of a metre drilled reflects not only the cost of the actual drilling, but also the numerous auxiliary activities that are associated with it, such as hauling equipment, setting up drilling sites, building, repairing and dismantling rigs and so on. The cost of exploratory drilling is normally higher than developmental work, as is drilling in certain locations such as the Northwest Territories, where sometimes entire islands have to be constructed in the sea. This can raise the cost of drilling in the Northwest Territories to a level as much as ten times higher than drilling in Alberta. In order to measure output of the contract drilling industry therefore a distinction is made concerning both the location and the purpose of the drilling activity, and their associated prices vary accordingly.

Price deflation

The alternative method for expressing the value of current production in the prices of a fixed period in the past is called price deflation. This method removes price changes from the current price value of a good or service

simply by dividing the current value by a suitable price index. Generally, industry deflators in the monthly GDP system are composite indexes which describe the price movements for various groups of goods and services produced by a given industry.

Deflation has the advantage of reflecting quality changes, therefore it is the preferred method for industries undergoing rapid changes in their product line. For industries whose output is either not measurable in terms of quantities or for which quantity data are not available, deflation is the only available means for producing constant dollar estimates of GDP. Deflation is therefore widely used in the service producing sector and also for a large number of manufacturing industries for which GDP is estimated based on current values of shipments and inventories.

The majority of industry deflators are weighted aggregations of the Industrial Product Price Indexes (IPPI) of commodities. For example, deflators for the total commodity output of individual manufacturing industries are computed by weighting the Principal Commodity Group (PCG) price indexes by the production values of those PCGs in each industry. The weights are taken from the IO tables. For the period without IO tables, that is the most current 32 to 43 months, the weights remain based on the latest available IO table. The calculation of the aggregate price index I_t which describes the price change for the entire output of an industry is represented by the following algebraic expression:

$$I_t = \frac{\sum_{i=1}^n p_t^i q_t^i}{\sum_{i=1}^n p_0^i q_t^i} = \frac{\sum_{i=1}^n w_t^i}{\sum_{i=1}^n \frac{w_t^i}{I_t^i}}$$

where

$w_t^i = p_t^i q_t^i$ is the current value of commodity i derived from the IO tables,

$I_t^i = p_t^i / p_0^i$ is the price index of commodity i ,

t is the current month,

0 is the base period.

Constant price estimates of output by many service producing industries are calculated by applying weighted aggregations of the various appropriate Consumer Price Indexes (CPI). In some isolated cases such as Radio and Television Broadcasting industry, or Computer and Peripheral Equipment Manufacturing industry, specific price indexes are calculated using such price observations as advertising rates and import prices.

Chain volume measures

As noted previously, valuing current production of goods and services by the fixed weighted Laspeyres formula preserves the representativeness of the constant price industry aggregates only when changes in the relative price structure are not large. If, however, soaring output or accelerating quality changes in some industries are combined with rapidly falling prices, the contribution of these industries to total GDP will be unduly magnified when valued at the fixed prices of a period in the distant past. A case in point is the Information and Communication Technologies (ICT) sector. But high-tech goods were not the only ones contributing to the developing bias in deflated values. Even before the introduction of computers, as early as the 1970's, the economy witnessed several periods of volatility when changes in the prices and quantities of energy products were so large that the use of fixed weighted measures could no longer provide good approximations for real growth over an extended period of time. Consequently, in order to reflect a more current price structure, the

frequency of rebasing increased in the 1980's to every five years, instead of the customary 10. Soon, however, with the rapid developments in the ICT sector since the mid 1980's, periodic rebasing even at five year intervals became insufficient. This led to the search for a new approach to deflation that would produce more accurate measures of growth than the existing fixed weighted constant price estimates.

Presently, developmental work is undertaken to measure year to year changes in the volume of production at the constant prices of the previous year, instead of the fixed prices of a distant year in the past. Growth over longer periods of time will then be obtained by cumulating these annual movements (chainlinking). This research will also examine the possibility of increasing the frequency of rebasing and producing quarterly (or even monthly) chained volume measures of value added at as fine industry detail as data availability and suitability allow. If feasible, the quarterly chained volume measures of value added will take account of changes in relative prices from one quarter to the next. This will be consistent with the expenditure based measures of GDP which is already produced by the CSNA on the basis of a quarterly chain Fisher volume index. The Fisher type index is the geometric mean of the Laspeyres type and the Paasche type volume indexes. The following is a brief description of these three chaining methods.

A Laspeyres type volume index expresses the value of current quantities at the prices of a period in the past. As noted earlier in this chapter, estimates of GDP by industry are fixed-based Laspeyres quantum measures. Such a volume index is of the following form:

$$V_{Laspeyres} = \frac{\sum p_0 q_t}{\sum p_0 q_0}.$$

In the chained version of a Laspeyres type volume index each link is calculated as follows:

$$V_{Laspeyres}^C = \frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}}.$$

The chain Laspeyres volume measures thus express the value of current quantities using the prices of the previous period (year, quarter or month) as weights, instead of the prices of a base year.

It is also possible to compile a Paasche type volume index by valuing quantities of both the current period and the base year at current prices, namely:

$$V_{Paasche} = \frac{\sum p_t q_t}{\sum p_t q_0}.$$

Each link in the Paasche type chain volume index is calculated by using prices of period t in both the current and the preceding periods as follows:

$$V_{Paasche}^C = \frac{\sum p_t q_t}{\sum p_t q_{t-1}}.$$

Finally, the third method is the Fisher type volume index, which is the geometric mean of the Laspeyres and Paasche indexes:

$$V_{Fisher} = \sqrt{V_{Laspeyres} \times V_{Paasche}}$$

and the chained version

$$V_{Fisher}^C = \sqrt{V_{Laspeyres}^C \times V_{Paasche}^C} .$$

It is important to remember that chainlinking (cumulating period-to-period growth) is carried out to avoid breaks in the constant price value added series between consecutive periods. This is necessary to permit long-term analysis of growth and to allow comparisons between non-adjacent periods. However, chainlinking causes loss of additivity and the chainlinked value of an aggregate will not equal the sum of the chainlinked values of its components. This also means that in the context of value added a chained output volume index and a corresponding chained intermediate inputs volume index will not be additively consistent. Therefore, in order to derive value added residually as the balancing item between output and intermediate inputs, it is necessary to calculate a chain index for value added itself.

Each link in the chain volume index for value added can be calculated by using Laspeyres type volume indexes as follows:

$$V_{Laspeyres}^C = \frac{\sum P_{t-1}Q_t - \sum P_{t-1}q_t}{\sum P_{t-1}Q_{t-1} - \sum P_{t-1}q_{t-1}} .$$

The numerator is value added in period t at the prices of period $t-1$. The denominator is value added in period $t-1$.

Each link in the chain volume index for value added can also be calculated by using a Paasche type volume index of the following form:

$$V_{Paasche}^C = \frac{\sum P_tQ_t - \sum p_tq_t}{\sum P_tQ_{t-1} - \sum p_tq_{t-1}} .$$

Finally, the third method to compile a chain volume index for value added uses a Fisher type volume index, that is the geometric mean of the Laspeyres and Paasche indexes.

The following numeric example illustrates the calculation of chain Laspeyres volume measures for the output of a fictitious industry producing two products A and B. Consider the basic data as shown previously in this chapter in Table III and the corresponding fixed-weighted Laspeyres volume measures in Table IV. The calculation of values at current year's and previous year's prices is shown in Table V, the procedure of cumulating growth rates is shown in Table VI and finally, Table VII compares the fixed-weighted Laspeyres volume measure with the chained version.

Table V Values at Current and Previous Year's Prices						
	Year 1	Year 2		Year 3		Year 4
	p_1q_1	p_1q_2	p_2q_2	p_2q_3	p_3q_3	p_3q_4
Product A	330	352	384	408	442	468
Product B	200	220	176	200	150	156
Total	530	572	560	608	592	624

Chaining the Laspeyres volume measures using year 1 prices in year 2, year 2 prices in year 3, and year 3 prices in year 4, is of the following form:

Table VI Chain Laspeyres Volume Measures Connecting Years 1, 2, 3 and 4			
Year 1	Year 2	Year 3	Year 4
$\sum p_1q_1$	$\sum p_1q_2$	$\sum p_1q_2 \times \frac{\sum p_2q_3}{\sum p_2q_2}$	$\sum p_1q_2 \times \frac{\sum p_2q_3}{\sum p_2q_2} \times \frac{\sum p_3q_4}{\sum p_3q_3}$
530	572	$572 \times 608/560$	$572 \times 608/560 \times 624/592$
530	572	621	654

Table VII compares the growth rates in the fixed-weighted and the chained Laspeyres volume measures. As can be observed from this table, there is a divergence between the two series, especially in the growth rate between year 2 and year 3. This difference illustrates the bias in the aggregate fixed-weighted volume measure which is caused by the changing relative importance of its components (Products A and B). As shown by the data given in Table III, quantities of both A and B increase steadily from year 1 to year 4. However, while the price of A rises every year, the price of B declines significantly. The contribution of B to the total in year 3, therefore, is greater when values are expressed at year 1 prices (40%) because the relative price of B was larger in that period. This contribution is considerably reduced (33%) when values are expressed in the prices of year 2. Because the importance of B is smaller in year 3, it has less influence on the growth rate of the total, thus the 9.1% increase in the fixed-weighted volume measure is reduced to 8.6% in the chained version.

Table VII Comparison Between Fixed-Weighted and Chained Laspeyres Volume Measures							
	Year 1	Year 2		Year 3		Year 4	
Fixed-weighted	530	572	7.9%	624	9.1%	656	5.2%
Chained	530	572	7.9%	621	8.6%	654	5.3%

Chained Paasche volume measures can be obtained by adding 1 to each of the price subscripts in Table V and Table VI.

The transition from Laspeyres volume and Paasche price indexes, rebased every five years or so, to the chained index method began at Statistics Canada in 2001. Specifically, in line with the SNA 1993 recommendation, the CSNA adopted the chained Fisher index. Beginning with the May 2001 release, the expenditure based quarterly GDP is calculated based on the Fisher formula, chained quarterly. In order to produce chained Fisher indexes for the output based GDP by industry measures as well, extensive development work is presently undertaken to facilitate the conversion, which is scheduled to be completed by the fall of 2003.

Chapter 5 Statistical adjustments

Introduction

The monthly estimates of GDP by industry are subjected to various statistical adjustments. Users of GDP should be aware of these adjustments, because different adjustment options generally give different results and inconsistencies may occur when comparing series that are adjusted differently. Using a non-technical vocabulary as much as possible, this chapter discusses such statistical adjustments as benchmarking, trading day adjustment and seasonal adjustment. The intention is to explain the principles of these adjustments, without documenting their technical detail. **Benchmarking** adjusts the monthly output measures to match the Input-Output based annual levels of value added. **Trading day adjustment** allows comparisons between one month's output and any other month's on an equalized basis. **Seasonal adjustment** removes repetitive sub-annual fluctuations from the estimates in order to reveal more clearly the underlying trend-cycle movements.

Benchmark adjustment

Among the various statistical adjustments most important is the procedure which brings the monthly GDP indicators to the actual Input-Output based estimates.

For all but the most recent two years, the annual estimates of GDP by industry are derived within the framework of the Input-Output accounts. Sub-annual distributions and monthly estimates in the post- IO years are projections based on indicators.

As noted previously, the measurement of monthly GDP by industry differs fundamentally from the derivation of the annual estimates. The annual values of GDP by industry are estimated normally from annual surveys or censuses, by subtracting intermediate consumption from the output of each industry. The monthly values of GDP by industry, on the other hand, are compiled from a great variety of data sources, particularly monthly surveys. Monthly surveys make observations on samples rather than the universe of establishments and relate only to certain aspects of the establishment's activities. Typically, monthly surveys are not comprehensive and do not collect all the required data that are needed for the calculation of value added. Furthermore, the concepts, definitions and classification schemes used in the various sources of data may also be different from those required for GDP by industry.

As a natural implication of using different data sources and methodologies, the annual Input-Output based GDP values and the yearly totals of the independently produced monthly indicators are not identical. The difference between the two, however, is eliminated by integrating the monthly series into the annual Input-Output based GDP values as soon as the most recent Input-Output tables become available. This 'blending process', called **benchmarking**, yields a monthly GDP by industry series which displays monthly growth rates similar to those of the monthly indicators, and for which the levels are given by the Input-Output based annual values. These annual values are the so called **benchmarks**.

If the differences between the yearly sums of monthly values and the annual benchmarks were constant, the yearly discrepancy could be distributed among the months by simply applying a fixed ratio. This method is called prorating. The discrepancy, however, is not constant year after year, so that prorating would introduce

significant breaks between the months of December and January. To avoid such artificial discontinuities, a procedure called **quadratic minimization** is used to find a series that runs as parallel as possible to the original series but whose annual totals equal the annual benchmark figures. Finding such a series amounts to keeping the monthly differences as close to the original monthly series as the annual adding up constraints allow.

Algebraically, the problem is to minimize:

$$\sum [(x_t - xa_t) - (x_{t-1} - xa_{t-1})]^2$$

subject to:

$$a_i = \sum_{t=1}^{12} xa_t \quad i = 1, \dots, m$$

where

- x_t denotes the original series
- xa_t denotes the adjusted series
- a_i denotes the annual benchmark value in year i .

A variant of the quadratic minimization method diminishes the distortion in the proportional first differences of the original and benchmarked series. In other words, in the above sum of the squared differences between the slopes of the original and benchmarked series each term is weighted by the corresponding original value.

Algebraically, the problem is to minimize:

$$\sum \left[\left(\frac{x_t - xa_t}{x_t} \right) - \left(\frac{x_{t-1} - xa_{t-1}}{x_{t-1}} \right) \right]^2$$

subject to:

$$a_i = \sum_{t=1}^{12} xa_t \quad i = 1, \dots, m.$$

With this variant, the corrections are proportional to the level of each observation. Larger values in the original series undergo larger adjustments than the smaller values. As most GDP by industry series have strong seasonal fluctuations and fast growing trends, the application of the proportional variant is thought to be more appropriate.

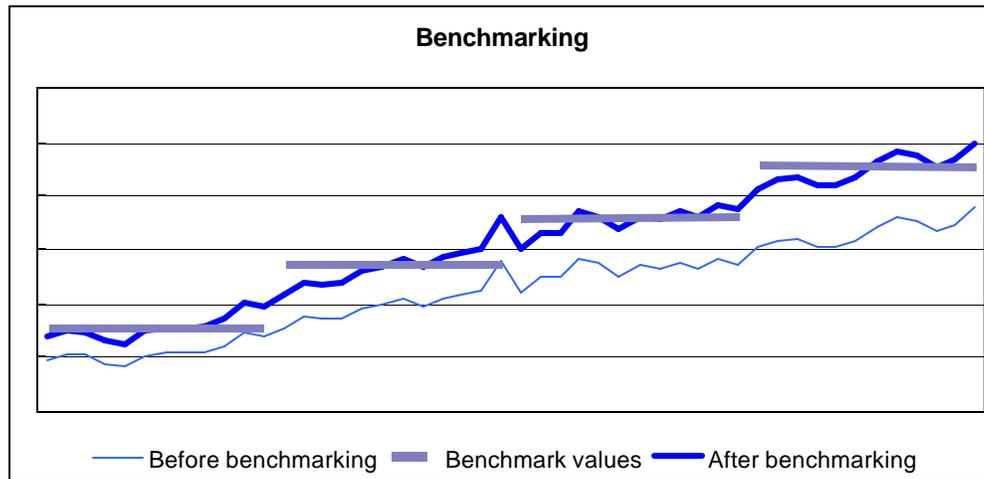
Each year a new preliminary annual benchmark is computed from the Input-Output tables, and the benchmark for the preceding year is finalized. However, as noted previously, the Input-Output tables become available only with a two and a half year lag, therefore benchmarks are not yet available for the most current two and a half year period. To avoid a discontinuity between the years when Input-Output tables are available and the most current period, the series of benchmarks is augmented with projected values.

The projected annual values are calculated by analysing the relationship between the annual and the monthly series in the period when both are available. For the majority of industries the projected annual series moves parallel with the yearly sum of the monthly series. There are some industries, however, which have a recognizable additional growth rate bias. These are identified using a regression method. Occasionally, when the annual differences between the benchmarks and the unadjusted series are very erratic, the projected annual

levels are obtained from related annual data such as shipments, inventories, employment, exports, and so on.

Each year, with the addition of a new benchmark level, the monthly GDP series is benchmark adjusted again. As a consequence, the adjusting ratios, also called benchmark factors, undergo revisions. The revisions affect the entire benchmarking period, including the historical years when neither the annual levels nor the unadjusted monthly estimates were revised. However, these revisions in the more distant years tend to be not significant and can safely be ignored. As it is not desirable to continuously update all monthly GDP values with the addition of each annual benchmark, the benchmark span is restricted to cover only the most recent five and a half years of monthly estimates. In order to avoid a small break between the historical and the newly revised segments of the GDP series, the last month immediately preceding the benchmark span is also included in the minimization process as an endpoint constraint.

Figure 8



Month-to-month fluctuations in GDP by industry

The month-to-month changes in the value added series contain variations which are the consequences of many factors, such as changes in economic conditions, differences in the length of the time periods covered, seasonal effects, and so on. Accordingly, a value added series can be decomposed into four such factors: (1) trend-cycle, (2) irregular, (3) trading day and (4) seasonal components. Once the trend-cycle, irregular, trading day and seasonal components of the monthly GDP series are identified, they can be analysed individually and the monthly growth rates of the GDP series can be explained by the changes in these four components.

For assessing the rate of economic progress of the country, probably the most important element of the month-to-month fluctuations in monthly GDP is the trend-cycle which includes two kinds of changes in productive activity.

Trend

The first kind of change, known as the **trend**, corresponds to a variation which remains relatively stable in terms of general direction over a very long period of time, usually many years. The trend can be visualized as a more or less smooth line reflecting the overall course of production. In some cases the trend steadily moves upward, whereas in others the trend may rise as well as decline.

Cycle

The second kind of change corresponds to an alternating sequence of economic contraction and expansions recurring at certain intervals of variable length. It is called the **business cycle**, or simply the cycle. The main difference between the trend and the cycle is that the trend corresponds to a period which is long in relation to the cycle. Cycles are of two to ten years durations. The trend is of prime concern when attempting to assess the underlying movements over long periods of time but in the analysis of current economic conditions, the focus is on the cycle. Determining the phase of the business cycle at which the economy stands invariably plays an important role in economic decision making.

Trading day effect

An important fraction of the month-to-month changes for many GDP by industry series is simply due to the dissimilarities between calendar months. Since different days of the week often have different economic activity, monthly production may change significantly depending on the number of times each day of the week occurs in a calendar month. Variations of this kind are called **trading day** effect, also known as 'calendar variations' or 'working day variations'.

Seasonal variations

Another important factor of the month-to-month changes are the repetitive, within-year movements which are systematic, relatively stable over several years and which are related to the particular seasons of the year. These are called the **seasonal** variations.

Irregular movements

The last type of variations present in the month-to-month changes in GDP are the **irregular** variations. These movements may be the result of exceptional economic or climatic events, such as strikes, layoffs, awarding or cancelling of large scale contracts, unusual weather conditions, floods, etc. They may also be the result of sampling errors, and inaccuracies originating from erroneous bookkeeping, reporting or calculation. Random fluctuations of this kind are of temporary nature, often reverse themselves, and usually do not accumulate.

The trend-cycle, trading day, seasonal and irregular movements all vary in magnitude from one GDP series to another. In most series fluctuations due to the calendar are much larger than the monthly variation in the trend-cycle and for many series, considerably more important than the seasonal variation.

The assessment of underlying growth is easier for users if they do not have to account for such predictable variations as trading day and seasonal effects in the series. Therefore, these variations are removed from the GDP series through the X11ARIMA (ARIMA: Autoregressive Integrated Moving Average) program.

Trading day adjustment

When value added is calculated from monthly statistics, the estimates naturally correspond to calendar months which vary in length. Usually shorter months tend to account for less production than longer months and in many GDP by industry series a significant fraction of the monthly growth rate is merely the consequence of differences in the numbers of days or in the composition of weekdays between two consecutive months.

To allow comparisons between one month's output and any other month's on an equalized basis, such variations are removed from the monthly GDP by industry series. The procedure which alters the distribution of monthly output to compensate for the different lengths and compositions of months is called trading day adjustment.

Based on the evidence contained in the monthly data, trading day adjustment factors and the associated

diagnostic and quality assessment statistics are estimated via the X11ARIMA program. X11ARIMA isolates two types of trading day variations. The first type is variation between months of equal length. This variation, also referred to as shifts in 'calendar composition' or 'within-month variation', is caused by changes in the number of times each day of the week occurs in each month. The second kind is simply variation in the length of calendar months: 28, 30 or 31 days. The first type is always considered by the X11ARIMA to be part of the trading day effect. Variation in the length of month, on the other hand, can optionally be regarded as part of either the trading day or the seasonal component.

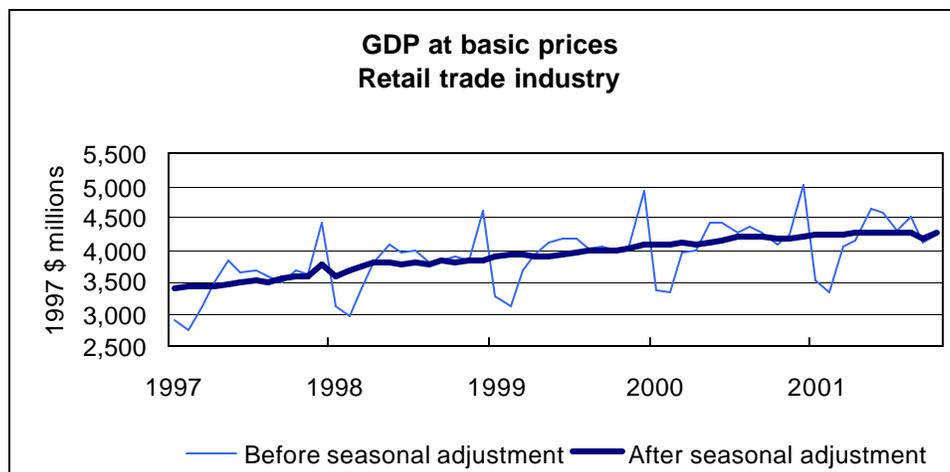
For the GDP by industry series the trading day effect is always defined as changes in the monthly values related to variations in both the length and the composition of the months.

The computation of trading day factors is done once a year when the Input-Output based annual estimates of GDP are worked into the monthly system and for the next twelve months forecast factors are used.

Seasonal adjustment

Like most sub-annual economic time series, the monthly GDP by industry series contain systematic movements with a more or less regular pattern that repeats every year. Such fluctuations are called seasonal variations and are ordinarily associated with climatic or institutional events. Seasonal variations are brought on by non-economic forces and usually cannot be altered by economic policies in a short period of time. Because the main concern of current economic analysis is the timely and accurate recognition of the stage of the current business cycle, the seasonal variations are of little interest. The following example in Figure 9 shows the comparison between seasonally adjusted and unadjusted GDP for the retail trade industry.

Figure 9



Timely and reliable information on the current business cycle can more easily be obtained if seasonal movements are not present. For the convenience of users, therefore, the monthly GDP series are available both in unadjusted and in seasonally adjusted form. Apart from crop production, the seasonal component is removed from all GDP series using the X11ARIMA program. Crop production is an exception, simply because there is no raw monthly series to be seasonally adjusted. The reason for this is practical. As the duration of the production process is longer than the reference period, only a single estimate of crop is compiled for each year. Estimates of monthly value added are then projected from this single annual figure in a rather arbitrary fashion, i.e. by smoothly distributing it across the months using a quadratic minimization technique. For more detail see

Distributing Annual Grain Crop Estimates Across Sub-annual Periods, Gross Domestic Product by Industry, Catalogue no. 15-001, Statistics Canada, June 1989, pp. xiv-xvii.

Seasonal adjustment of the majority of industries is carried out at the worksheet level, but there are some worksheet level industries which are composites themselves. If the various components have markedly different seasonal patterns, the removal of seasonal fluctuations is done on the components. Seasonally adjusted aggregates are then calculated by adding up the seasonally adjusted components.

As noted earlier, an important purpose of seasonal adjustment is to expose the effects of economic events happening in the most recent months. It is very important therefore to produce estimates of GDP for the current period as reliably as possible. This, however, poses special problems.

The X11ARIMA program relies on symmetric moving averages for the observations falling in the middle of the series that is to be seasonally adjusted. However, symmetric moving averages cannot be used for the data at the ends of the series and consequently, the seasonally adjusted estimates for the most recent months are not as accurate as for the central observations. The current seasonally adjusted values therefore must be recalculated as more data are added to the series. The practice of seasonally adjusting repeatedly, however, creates revisions.

There are two approaches to the seasonal adjustment of current values: using either concurrent or forecast seasonal factors. Concurrent seasonal factors are obtained by seasonally adjusting anew each time an observation is added to the series. Forecast seasonal factors, on the other hand, are obtained by seasonally adjusting once a year and generating extrapolated seasonal factors for the next twelve month period. Generally, the total revisions to the seasonal estimates are smaller when using concurrent seasonal factors. But this method revises the seasonally adjusted estimates every month, compared with revising only once a year by using forecast factors.

For the GDP by industry series the following revision policy is applied. With the addition of each new observation, concurrent seasonal factors are calculated from all of the available data. Revised seasonal factors are used in the most current period consisting of up to 18 months, while seasonal factors in the time period preceding this segment of the GDP series remain unchanged. Once a year, at the time of the incorporation of the benchmarks from the Input-Output tables, new revised seasonal factors are incorporated in the earlier years as well. This revision policy ensures that while all significant improvements are included, the number of times a given month gets revised is kept to a minimum.

Although revisions are unavoidable, it is possible to accelerate the process through which the seasonal estimates become final by using ARIMA extrapolations. As time passes, a given month becomes more and more central and the seasonally adjusted estimates undergo smaller and smaller revisions. When the month moves into the interior of the series and is three and a half years from the last available data point, it is adjusted with symmetric moving averages and the seasonal estimate will no longer be revised significantly. The time frame a particular month needs to move to the interior and thus become stable can be significantly shortened by applying the ARIMA extrapolation option of the X11ARIMA program. This option extends the unadjusted series with one or more years of extrapolated data, thus pushing the most current observation into the interior of the time series. This enables the seasonal adjustment process to treat the current period the same way as those months which are in the interior of the series.

Once a year, at the time of the annual benchmarking, an appropriate ARIMA model is selected by the X11ARIMA program for each GDP by industry series. This model is then kept for a year to avoid revisions arising from possibly switching between models.

Each spring the monthly GDP series are also tested to detect the effect of Easter. Easter is a moving holiday which usually falls in April but sometimes occurs in March and often seriously alters the month-to-month changes in GDP. The impact of Easter is tested for the release of the April data and those industries whose activities are significantly affected by Easter are adjusted to remove the associated distortions.

Seasonal adjustment decomposes the time series using either a multiplicative or an additive decomposition model. For most GDP by industry series the seasonal component is separated from the others by the multiplicative decomposition model. The multiplicative option is chosen because seasonal changes in most value added series tend to be proportional to the level of the series. Series whose seasonality moves independently from the trend and those series which contain zero or negative values (for example inventory changes) are adjusted by the additive decomposition model.

If a series is strongly affected by irregular fluctuations, the irregular can significantly distort the seasonal factors. This is due to the fact that the estimation of the seasonal movement is reliable only if it is sufficiently large compared to the irregular movements. Therefore, in order to minimize the impact of strikes and other known irregulars on the seasonal factor, a prior adjustment is made to the GDP series before seasonal adjustment. These adjustments are temporary by nature, their purpose is simply to provide a smoother series for the estimation of the seasonal component, and after seasonal adjustment the effects of the irregulars are reintroduced in the final results. An example is the temporary removal of strike effects. The time span that is considered to be the strike period includes not only the months in which a strike occurs, but quite often the immediately preceding and following periods as well. For example, in anticipation of a strike establishments may boost production levels in the prior months in order to build up their inventories, whereas following a strike, producers may rush to reduce a backlog of unfilled orders. In an attempt to confine the impact of a strike to the strike period only, estimates are made of what the production levels would have been in those months had there been no strike and the series containing these replacement values is seasonally adjusted. Seasonal factors derived from the strike-adjusted series are then used to remove the seasonal effect from the original series. This method ensures that while the irregular movements are still present in the final results, their distorting impact on the seasonal factors is reduced.

Often, however, prior adjustment is not a feasible option. There are many unexplained factors which cause irregular fluctuations in GDP, but cannot be estimated and replaced before seasonally adjusting. Generally, to minimize the effect of irregulars in a highly volatile GDP series, longer seasonal moving averages are chosen for all iterations to calculate the seasonal factor. The seasonal moving averages offered by the X11ARIMA program can span over five years (denoted as 3x3), seven years (denoted as 3x5) or eleven years (denoted as 3x9). The choice of which moving averages to use depends largely on the amount of irregular present in the series. A 3x9 moving average is selected for those GDP series which are dominated by the irregular, while more regular series are adjusted using a shorter moving average. A 3x3 is the optimal choice for the majority of industries. It is particularly preferred for industries undergoing rapid changes. The advantage of using shorter moving averages whenever the relatively small size of the irregular allows it is that they can follow the movement of the trend-cycle more closely. A 3x3 is also the preferred choice when the seasonal component evolves rapidly from year to year and it is beneficial to reduce the impact of the historical data on current period estimates. This consideration is also the rationale for not always using all available estimates in the seasonal adjustment procedure, particularly if there are breaks in the historical estimates.

Finally, because of certain non-linear features of the seasonal adjustment method, the yearly totals of the seasonally adjusted series often do not agree with those of the unadjusted series. To correct for this, all seasonally adjusted GDP series are also adjusted to the yearly totals of the unadjusted series. A detailed description of all the seasonal adjustment options available is published in *The X11ARIMA/88 Seasonal Adjustment Method - Foundations and User's Manual*, by Dagum, E.B., Statistics Canada, June 1992.

Chapter 6 Release of the GDP by industry estimates

Introduction

This chapter describes the format, timing and methods of publishing GDP by industry.

Presentation of the estimates

Monthly estimates

Monthly GDP by industry is recorded at constant prices only. Although estimates are available to the public in both seasonally unadjusted and adjusted form, the publications only contain the seasonally adjusted GDP estimates. The seasonally adjusted GDP estimates are expressed at annual rates, which simply means that each month's GDP level is multiplied by 12.

Although the seasonally unadjusted estimates of GDP by industry do not appear in publications, they are available to the public. For the purpose of presenting monthly GDP on a comparable basis over time and by industry, these estimates are released in a trading day adjusted form. It is important for users to be aware of this, since comparing trading day adjusted monthly GDP with other related series that are not trading day adjusted will give inconsistent results.

Quarterly estimates

Quarterly estimates of GDP by industry are available at constant prices only. These quarterly values are obtained simply by adding the three monthly values falling in each calendar quarter. Similarly to the monthly series, the seasonally adjusted quarterly estimates are also expressed at annual rates, that is each quarter is multiplied by 4.

Annual estimates

In the years for which Input-Output tables are compiled the annual estimates of GDP by industry are published both at current and constant prices. In the most current two years, however, when Input-Output tables are not yet available, annual values of GDP are compiled as yearly totals of the constant dollar monthly series, and therefore are presented in constant dollars only.

Timing of the release

GDP by industry is released to the public on a monthly basis approximately 60 days after the end of the reference period. The release dates are announced in advance for each year by Statistics Canada. A brochure containing these dates along with those for other major economic indicators can be obtained by calling Communications Division 1-613-951-5346, any Statistics Canada regional office or Industry Measures and Analysis Division 1-800-887-4623 or 1-613-951-9161.

At 8:30 AM, Eastern Time on the scheduled dates monthly estimates of GDP are released simultaneously through the **Statistics Canada Daily Bulletin** (Catalogue no. 11-001) and a computerized time series database called Canadian Socio-Economic Information Management System (CANSIM).

Dissemination vehicles

The Daily/CANSIM

The release in The Daily contains the main aggregates and provides highlights of the economic events affecting the estimates. GDP estimates in CANSIM appear in greater industrial detail, both in seasonally adjusted and unadjusted form. They are available historically from January 1981, and may be retrieved from CANSIM. Estimates of GDP for 323 industries and their aggregates are available from January 1997. The period spanning 1981 to 1996 is covered by a more summary level of aggregation, totalling 129 industries and their aggregates. Appendices in monthly GDP by industry publications and CANSIM series directories provide a detailed description of the content of the relevant CANSIM tables.

Publications

The seasonally adjusted monthly, quarterly and annual estimates of Gross Domestic Product by industry are published in **Gross Domestic Product by Industry**, Statistics Canada, Catalogue no. 15-001-XIE, available in electronic format approximately 5 working days after the estimates have been released on the Statistics Canada Internet site at www.statcan.ca. The publication is also available in print through a Print-on-Demand service at Statistics Canada. The printed version can be ordered by phone (Canada and the United States) 1-800-267-6677, by fax (Canada and the United States) 1-877-287-4369, by e-mail order@statcan.ca, or by mail Statistics Canada, Dissemination Division, Circulation Management, 120 Parkdale Avenue, Ottawa, Ontario, K1A 0T6. This publication contains monthly, quarterly and annual estimates of GDP by industry from the base year onward. Most but not all industry detail is included in this publication; however, full detail can be acquired on request. This release contains detailed estimates for 323 industries and their aggregates from January 1997. The period spanning 1981 to 1996 is covered by a more summary level of aggregation, totalling 129 industries and their aggregates. Appendices in monthly GDP by industry publications give a complete list of industries for which estimates of GDP are available.

Revision policy

GDP by industry covers the value of a myriad of goods and services produced in the Canadian economy. It requires a very wide range of input data, which are primarily derived from surveys of Canadian businesses. Given that GDP by industry is the most timely indicator of economic growth, the input data going into the monthly calculation of GDP are often preliminary and are subject to revisions. In addition, the monthly data sources are incomplete in the sense that they do not provide all the necessary information on outputs and intermediate inputs for calculating value added. Estimates of GDP based on the projector system, therefore, are assembled on a set of assumptions, which means that they will be revised when the annual benchmarks become available from the IO system. These annual benchmarks are subject to revisions themselves. Lastly, national accounting conventions and concepts also have to be updated from time to time and accordingly, estimates of monthly GDP are revised periodically as follows.

Monthly revisions

When estimates of GDP by industry are prepared for a current month, several preceding months are revised. The revisions extend back to January of the year, during which the most recent annual revision was made. The two main reasons for the regular monthly revisions are data updates due to more complete response to surveys, and revisions to the seasonal factors. As explained in Chapter 5, seasonally adjusted estimates are less reliable near the ends of the time series than in the interior. Therefore as time passes and a given month works its way back to the interior of a time series, its seasonally adjusted value is revised to produce a more accurate estimate. The revisions are generally random and decrease in time. The largest revision usually occurs with the month of December because with the closing of the calendar year revisions to both the source data and the seasonal factors tend to be more significant than in other months.

Annual revisions

Each year, when the annual Input-Output based estimates are released, the monthly GDP series are normally revised for several years. The main purpose of the annual revision is to incorporate the newly released Input-Output benchmark levels and to capture the revisions to the Input-Output benchmarks in the preceding year. Preceding years in the historical segment are also reopened to incorporate monthly revisions, even though annual benchmarks in these periods are unchanged. In addition to the previously described sources of revisions, the annual revisions also include the effects of:

- ▶ the incorporation of the latest annual benchmark levels;
- ▶ the incorporation of revisions to monthly source data that extend further back in time than would be picked up in the regular monthly revision cycle;
- ▶ updating the trading day adjustments when present;
- ▶ selecting new ARIMA models for the seasonal adjustment;
- ▶ changes in the methods for estimating monthly GDP for specific industries.

Historical revisions

Occasionally, annual revisions may coincide with the introduction of a new base year, the implementation of a new industrial classification or with a historical revision resulting from a modification to the conceptual framework.

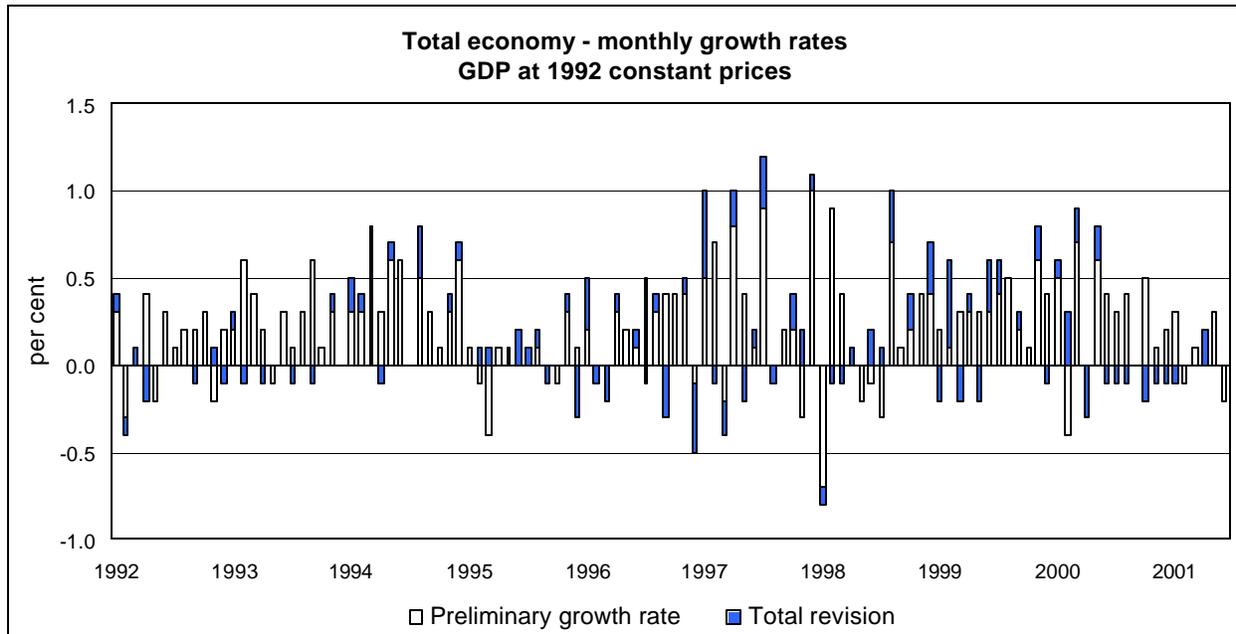
In order to illustrate the impact and the frequency of the revisions through a specific example, the following is a review of the time path of the revisions to total GDP, as published between 1997 and 2001. During this four and a half year period estimates of GDP by industry were published at 1992 constant prices, but the revision pattern affecting these estimates can be taken as typical for any base year segment of the GDP series.

The first 1992 based estimates of GDP covering the January 1992 to October 1997 time span were released in December 1997. In the months and years that followed, these estimates were continually revised with the addition of each new reference month. The series of monthly and annual revisions continued until July 2001, when in the context of a historical revision of the CSNA, 1997 replaced 1992 as the new base year and the original growth rates of the 1992 based series between January 1992 and December 1996 became final.

In order to give a somewhat closer view, the following is a brief study of the size and the importance of the revisions that affected the GDP by industry growth rates between January 1992 and June 2001. During this nine and a half year (or 114 month) period the economy enjoyed a long period of rise, expanding in each year at an average rate of 3 percent. As a result, the level of total GDP in June 2001 stood approximately 30 percent higher than in January 1992. This steady increase was the cumulative effect of a total of 86 monthly increases, with the vast majority of the month-to-month growth rates falling in 0.1 to 0.5 percent range. The upward trend was interrupted by only 21 scattered instances of declines and 7 months of no growth. Preliminary estimates of GDP by industry were first published at the end of 1997 covering the January 1992 - October 1997 period. In the years and months that followed, these estimates underwent a series of revisions. The last revision occurred with the release of June 2001. In the following month 1997 replaced 1992 as the new base year, and the monthly growth rates between 1992 and 1996 became final.

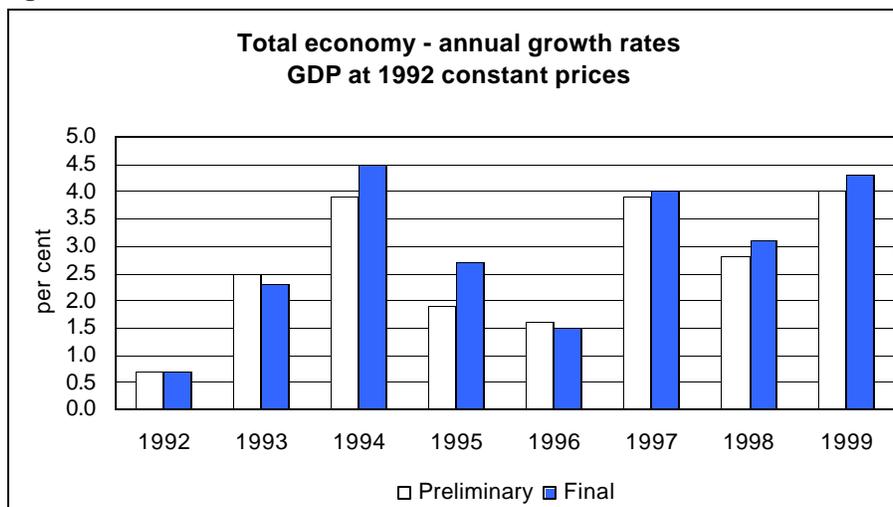
A comparison between the preliminary and the final monthly growth rates shows that the largest differences were 0.5 and -0.5 percent, but 90 percent of the time the aggregate revision affecting any particular month fell in the narrower, -0.2 to 0.2 range. In 80 out of 114 months, either the estimates were not revised at all or the revisions were positive. Figure 10 illustrates the preliminary growth rates together with the size and direction of the total monthly revisions. Total revisions are the differences between the preliminary and the final growth rates.

Figure 10



As can be seen in Figure 11, the size of the annual revisions fell in the -0.2 and 0.8 percent range. The two largest revisions (0.6 and 0.8 percent) occurred in 1994 and 1995, each caused by the incorporation of the IO based benchmark levels, revisions in the other years were between -0.2 and 0.3 percent.

Figure 11



In order to advise users on the scope of the revisions, each publication carries a note immediately following the table of contents, which specifies the revision span for the newly released estimates.

Chapter 7 The history of GDP by industry

Introduction

In appreciation of what has been done in the past, this chapter provides a review of the historical development of monthly GDP by industry. The discussion begins with an historical profile of the Index of Industrial Production, followed by the development of GDP by industry for the entire economy. Concluding this chapter is the chronology of the GDP by industry estimates.

The history of the collection and interpretation of industrial statistics is relatively long in Canada. The first publication containing estimates of output for selected industries was released in 1926. Ever since, monthly measures by industry have been prepared and published on a regular and continuing basis. The concepts and methods evolved over the years, and eventually the scope of the measures was extended to cover all industries in the economy. The following historical summary traces this evolution, from 1926 to the present.

Index of Industrial Production

1926

In 1926, in response to a growing need for information on the state of the Canadian economy, Statistics Canada (then the Dominion Bureau of Statistics) began publishing estimates on a regular monthly basis. The scope of the estimates covered wholesale prices, employment and production in certain industries, construction, transportation, internal and external trade and business failures. Financial statistics, such as deposits and loans, along with information related to investment, such as stock and bond prices and shares traded, were also included. As most of Canada's external trade was carried out with the United States and the United Kingdom, some business statistics for these two countries were presented as well. Provincial statistics on construction contracts awarded, building permits, bank debits, insurance sales, employment and the number of commercial failures were available for five geographic areas: the Maritime Provinces, Quebec, Ontario, the Prairie Provinces and British Columbia. The publication, entitled *Monthly Review of Canadian Business Statistics* and subsequently renamed to *Canadian Statistical Review*, was released to the public in both French and English within a month following the end of the reference period.

A key feature of this publication was a new economic indicator, called the **Index of Physical Volume of Business**. This indicator was a comprehensive measure which covered forestry, mining, construction, manufacturing, trade, exports, imports, car loadings, shares traded and bank debits. The weighted average of a sub-group consisting of forestry, mining, manufacturing and construction was called the **Index of Industrial Production (IIP)** and was considered to be one of the best indicators of current economic trends in Canada. It should be noted that in subsequent years forestry and construction were dropped and utilities added to IIP. The aggregate known today as the Index of Industrial Production comprises mining, manufacturing and utilities.

The following is a summary description of how the components of the Index of Physical Volume of Business were constructed, aggregated and presented in those early years of publishing output measures by industry. Readers wishing to find more detail are referred to the June 1927 issue of the *Monthly Review of Canadian Business Statistics*, Catalogue no. 11-003, Dominion Bureau of Statistics.

The six year period from 1919 to 1924 was selected as a base. In order to determine their weights, the indexes were divided into three general classes: (1) indexes based on commodities produced in the mining industries, (2) indexes based on commodities which were imported, exported or manufactured, and (3) indexes of industries which were not engaged in the production of commodities. The weights were based on values of production for the first class, on value added for the second, and on employment for the third class. For series, which could not be associated with any of the above classes, such as bank debits, weights were assigned according to some model standard indexes prepared by the Federal Reserve Bank in New York.

Current dollar values of contracts awarded, bank debits, imports and exports, were put on a volume basis by deflating with appropriate price indexes. Imports and exports were deflated using wholesale price indexes and the deflator for construction was based on the cost of building, calculated as a weighted average of building material prices and wages. The index for forestry was based on the quantity of newsprint produced and the volume of boards and planks exported. Mining was a weighted average of domestic and export shipments of gold and silver, exports of copper, nickel, zinc and asbestos, and the production of coal. This last was estimated from employment in coal mines. Construction was based on the deflated value of contracts awarded. The weighted index of the following 16 series was used as a measure of the trend in manufacturing: production of flour, sugar, newsprint, iron, steel and automobiles, slaughtering of cattle, sheep and hogs, stocks of butter and cheese, imports of crude rubber, raw cotton, wool and crude petroleum, and exports of boards and planks. Volume indexes for those commodities which were not available on a monthly basis, for example automobiles, were estimated from monthly employment and annual production. Monthly employment in wholesale and retail trade formed the basis of the index for trade. The index of railway car loading was compiled from a weekly report and the index of shares traded was derived from shares sold on the Montreal Stock Exchange.

The indexes were adjusted for seasonal variations where necessary, using arithmetic averages and month-to-month link method introduced by the Harvard Economic Service.

1932

The first major revision of the Index of Industrial Production was published in September 1932. The base period was changed from the six-year span 1919-1924 to the single year 1926. The number of components in mining increased from 7 to 9 and those in manufacturing nearly doubled to 29.

1941

The next major revision was published in February 1941. The five year span 1935-1939 was selected as the base period for valuation. New additions to the range of indicators included production of petroleum, cigars and cigarettes, and imports of silk and rayon.

1947

In the third major revision released in May 1947, owing to the inadequacy of current statistics on the volume of output, the construction industry was dropped from IIP. The number of industries as well as the commodities on which the remaining indexes were based increased considerably to nearly 170 individual series.

1952

The release in 1952 of the first separate publication on IIP entitled *Revised Index of Industrial Production, 1935-1951* (1935-1939=100), Dominion Bureau of Statistics, Reference Paper No. 34 marked another milestone in the evolution of a systematic treatment and presentation of IIP.

One of the main features of this release was the development of annual gross and net levels of production, derived from annual censuses of industry, to be used as benchmarks. Industry weights for mining, manufacturing and electricity and gas were value added weights. Within each sector, these value added weights

were allocated to component industries on the basis of their census value added. Census value added is the gross selling value of production (excluding indirect taxes) less the value of materials, fuel and electricity consumed in the production process. While value added excludes all intermediate inputs, census value added still includes the cost of such business services as insurance, advertising, transportation, communications, etc.

Another feature of the 1952 release was the adoption of the 1948 Standard Industrial Classification (SIC), which was the first SIC to be applied throughout Statistics Canada. In the IIP system most industries were not greatly affected by the new classification, only a few needed to be rearranged to conform with the SIC. One example was manufacturing of synthetic rubber, which was transferred from the rubber industry to the chemical industry.

The monthly indexes were adjusted for calendar variation to equalize the monthly time periods, and benchmarked to the newly developed and more comprehensive annual levels. At this time, however, no attempt was made to remove the influence of seasonal variations. One of the reasons for not seasonally adjusting was the fact that many of the series with strong seasonality, such as fish canning, soft drinks or breweries, became available on a monthly basis only after the end of World War II and the relatively short length of the series did not allow for the proper identification of the seasonal pattern. Furthermore, the seasonal pattern of some other series, for example motor vehicles, changed considerably after the War, which presented the same problem of having too short a time period on which to base the identification of the new seasonal behaviour.

Seasonal adjustment eventually resumed with the release of the February 1956 issue of the *Canadian Statistical Review*, Catalogue no. 11-003, although it was carried out by laborious methods and only at the higher levels of aggregation.

1959

The next revision in 1959 retained the 1948 SIC but used 1949 as reference period. New value added weights were obtained directly by adding factor costs and depreciation allowances for 31 industries in manufacturing, 6 in mining and 2 in electricity and gas industries. In the previous index, only the major division weights (ie. mining, manufacturing and total electricity and gas) were GDP weights. Below this level, major group and industry weights were based on census value added. Continuous industry indexes were presented back to 1935 by carrying the 1949 weight based indexes back to 1946 and by linking the 1935-39 based indexes and the 1949 based indexes in 1946. Another major improvement was the use of the double deflation technique in preparing the annual benchmark levels.

Based upon past trends in the annual benchmark series as well as related current monthly data, productivity adjustments were developed for a sizeable proportion of the manufacturing industries, namely those which were measured with man-hours worked. These adjustments were intended to improve the quality of the man-hour data as indicators of production by correcting for failure to reflect changes in productivity. In the years (since 1946) for which annual benchmark indexes were available productivity adjustment factors were obtained by dividing the benchmark index for each industry by an index of man-hours (this latter was derived by dividing annual census production-worker payroll by average hourly earnings). The resulting annual ratios were projected into the current period and distributed by month, and the resulting ratios were applied to the monthly man-hours in the current period.

Another achievement was the re-introduction of seasonal adjustment on a relatively large scale. With the help of a new technique using the Census Method II program and computers, nearly 100 time series within IIP were seasonally adjusted. The series were prepared for seasonal adjustment in Statistics Canada and forwarded to the Bureau of the Census in Washington, where the seasonal factors were calculated.

1961

As of December 1961, the monthly publication carried the title *Index of Industrial Production*, Dominion Bureau of Statistics, Catalogue no. 61-005.

This concludes the main developments in the history of the Index of Industrial Production. Next, the discussion takes a leap back in time to the immediate post-war years to trace the development of GDP by industry for the entire economy.

After World War II, while refinements to the estimates of IIP were still continually made, attention was also turned to expanding the estimates to cover the entire economy. In 1952, a major project got off the ground to build a comprehensive measure of economic activity. This broader measure was to include IIP as well as all other goods and services producing industries.

By this time, however, another two other approaches to measuring economic production were already in place in Statistics Canada. Annual and quarterly estimates of current price Gross National Product (GNP) and Gross National Expenditure (GNE) were published from the Income and Expenditure Accounts. The publication of constant price annual GNE began in 1952 and progress was being made in the preparation of deflated quarterly estimates.

With this arose the need for a parallel system of comprehensive economic statistics, expressed at both current and constant prices, which would cover the supply side of the economy and which could be used for checking the validity of the deflated quarterly GNE estimates. Subsequently, work on the so-called 'Real Output Project' was undertaken to develop GDP by industry for the entire economy.

GDP by industry for the entire economy**1952**

In 1952 work began on the development of annual and quarterly measures of GDP by industry at constant prices for the remainder of the economy. By the early summer of 1953, the first quarterly estimates of output covering all industries were circulated for internal use in Statistics Canada. In accordance with the concepts used in measuring output for the IIP industries, the estimates were prepared on a domestic basis, production was valued at factor cost using establishment data and the results were presented in index form using 1949 as base period.

Over the next several years it was found that the estimates of GDP by industry and the deflated GNE estimates generally moved in the same direction and at approximately the same pace. Thus GDP by industry became an integral part of the Canadian System of National Accounts and continues to play an important role in the reconciliation of economic statistics ever since. Although initially used as a check on the deflated GNE estimates, the industry indexes were soon found to be useful in their own right. After the major 1959 revision to IIP a concentrated effort was initiated to prepare estimates for publication.

1963

In May 1963, annual and quarterly indexes of Real Domestic Product covering all industries in the economy were released. The annual estimates covered the years from 1935 to 1961 while the quarterly estimates covered the period 1946-61. These measures, expressed in 1949 prices, incorporated the Index of Industrial Production without modification, which thus became an integral part of the broader aggregate.

Using the same concepts as those laid down for IIP, two weight-base periods were used for the annual series: the five year span 1935-39 for the period 1935 to 1946 and the year 1949 from 1946 to 1961. In order to yield continuous time series from 1935 to 1961 on a 1949 reference base, the indexes were linked individually in the year 1946.

The weights were derived from the 1949 estimates of GDP at factor cost published in *The Inter-industry Flow of Goods and Services, Canada, 1949*, and *Supplement to Reference Paper No. 72*, Dominion Bureau of Statistics, Catalogue no. 13-513. These tables - the first Input-Output Tables published in Canada - provided the basic data (factor cost and capital consumption allowances) for about forty individual industries and industry groups. The aggregates were then broken down into further industries using data from a variety of other sources such as data compiled by the Department of National Revenue and Department of Transport, taxation records, company reports, national income accounting worksheets and the 1951 Census of Merchandising and Services. At a certain level of detail, particularly in manufacturing, due to the lack of the required information it was still necessary to distribute GDP at factor cost on the basis of census value added. All in all, estimates of GDP at factor cost were prepared for about 300 industries.

The industry weights conformed closely to the 1949 Input-Output (IO) Tables. Significant differences between the GDP by industry estimates and those shown in the Input-Output tables were confined to three industries and were due to classification differences.

One of them originated in the treatment of repair construction. In the GDP by industry weighting system repair construction on own account was left in the industry doing the repair work, while the Input-Output accounts treated it as part of the construction industry. On the other hand, new investment construction by an establishment's own labour force was not included in the industry to which the establishment was classified. Due to data limitations, it was considered best to measure all new investment construction as part of the construction industry.

The second difference between IO and GDP by industry had to do with the inclusion of non-ferrous metal smelting and refining in manufacturing, whereas non-ferrous metal smelting and refining was grouped with mining in the Input-Output tables.

The third involved manufacturing repair. For purposes of leaving the IIP component intact within the framework of total output, manufacturing repair industries continued to be excluded from manufacturing. Instead they were grouped together as a separate industry under "other goods producing industries".

Indexes of Real Domestic Product by industry have enjoyed a wide circulation among a variety of users. Underlying this broad range of interests was the value of the estimates as timely indicators of economic activity, particularly in a seasonally adjusted form. By complementing the quarterly income and expenditure accounts with a detailed picture of the supply side of the economy and revealing the sources of emerging contractions or expansions, the indexes were considered useful, reliable and timely tools for current economic analysis, forecasting and policy making.

1968

The single most important aspect of the next major revision in 1968 was the introduction of the 1960 SIC. In addition to reflecting a more current economic structure, the 1960 SIC redefined the valuation boundaries of the establishment. Previously the business surveys were only concerned with the main activity of establishments. If, for example, a manufacturing establishment transported and sold its own products to final users, or purchased and resold the products of others, or carried out new investment construction by its own employees, statistics on these secondary activities were not included. To ensure completeness of industry

statistics, a broader definition of activity was introduced which encompassed all revenue-producing activities of establishments of manufacturing industries.

One example is the inclusion of own account new investment construction of establishments to the output of that industry in which a particular establishment is classified. Thus, effective with this revision, the measure for the construction industry was based on only construction contractors and sub-contractors, including any repair construction. Previously construction had been treated on an activity basis and output from the construction industry included both contract and own account construction activity. This decision was later reversed once more in 1986 with the adoption of the Input-Output based annual levels.

The introduction of the total activity concept in the data collection process took several years to implement. Certain industries, most notably those in manufacturing, were still based on statistics covering only the main activity of establishments. The full implementation of the total activity concept was finally completed with the incorporation of the 1961 industry weights in the early 1970's.

In addition to classification changes, the 1968 revision also introduced some conceptual changes. One such change was the elimination of imputed rents on government owned buildings from the Finance, Real Estate and Insurance industry, which were replaced by estimates of depreciation on all government owned assets in the Public Administration and Defence industry, Education, Hospitals and Municipal Waterworks industries.

Other conceptual changes involved the new definition of provincial government liquor board profits as taxes on products, which were therefore excluded from the GDP at factor cost estimates. On the other hand, royalties received by governments, particularly resource royalties, ceased to be considered as taxes. Royalties were instead considered an investment income, as government revenues from resource royalties arise mainly from ownership of property.

The year 1961 was chosen as the reference year, partly because being a decennial census year it provided more comprehensive survey coverage, and partly because the second Input-Output table was being calculated for 1961. This table was heavily used in the derivation of the preliminary 1961 industry weights.

For the period 1961-67, the number of industries and aggregates for which 1961-based quarterly GDP estimates were prepared increased considerably to 86 from the earlier 43. The annual estimates for the 1961-67 period were preliminary and subject to revisions, and were not all based on the Input-Output tables. Comprehensive annual indexes were incorporated as benchmarks only after the completion of the historical revision to the National Income and Expenditure Accounts and the release of the 1961 Input-Output table in 1969.

For the pre-1961 period the industry indexes were linked to the 1961-based system in 1961, thus providing annual, quarterly and monthly indexes on the basis of the 1960 SIC as far back as data permitted. Because the introduction of the new SIC and the implementation of conceptual changes created significant discontinuity in many of the series, some historical industrial detail was lost. Only those industries which were comparable between the 1948 and the 1960 classifications were linked to the 1961-based system.

1970

In the mid-1960's, increasing attention was given to the conversion of the quarterly estimates to monthly estimates. Many quarterly measures were already based on monthly series, most notably the components of the Index of Industrial Production. Outside the scope of IIP, monthly estimates were available for a large portion of the remaining industries such as retail and wholesale trade, transportation and federal government, but not for all, for example construction, agriculture. In some areas, monthly data were available, but only with a lag of several months.

After the publication of the quarterly Real Domestic Product indexes in 1963 work was undertaken to develop conventions and methodologies for the monthly measures. The project of converting the entire RDP by industry to a monthly basis was completed in 1968. From then on, monthly industry indexes were prepared, but only on an experimental basis. By June 1970 the quality of the monthly measures was considered high enough for publication and estimates of monthly RDP by industry were released to the public. Covering the period January 1969 to April 1970, the industrial detail was quite extensive. Monthly indexes were published for over 120 individual series and industry aggregates, including approximately 80 previously published components of the Index of Industrial Production.

1971

In February 1971, a historical revision of RDP by industry was released containing annual, quarterly and monthly estimates for all industries from 1961 to 1969. In this revision the total activity concept of establishments was extended to forestry, mining and manufacturing.

The preliminary 1961 industry weights were replaced by revised weights which reflected the statistical and conceptual changes in the final 1961 IO table. In most cases the revisions did not significantly alter the industrial distribution of GDP in 1961, except for those areas with major definitional changes. The most significant conceptual change affected the public administration industry, for which the definition of government gross fixed capital formation excluded defence outlays. In compliance with the recommendations of the UN 1968 SNA, all defence outlays on fixed assets were included in government current expenditure on goods and services. Consequently, the exclusion of the depreciation on these assets resulted in a reduced weight for the federal administration industry. This was again mostly reversed in November 1997 when SNA 1993 was implemented.

The major statistical change affecting almost every industry was an upward revision to wages and salaries and the incorporation of final annual levels from 1961 to 1969.

A few months later, with the May 1971 issue, the title of the monthly publication officially changed to *Indexes of Real Domestic Product by Industry (Including the Index of Industrial Production)*.

1976

In January 1976, the first issue of *Real Domestic Product by Industry 1971=100*, Catalogue no. 61-213, was released. This annual report presented RDP by industry in 1971 prices from 1971 to 1974 according to the 1970 SIC. Annual benchmark levels beyond 1972 were calculated for those few industries for which annual survey data were available.

1977

In 1977 another long-term goal was achieved. A new table containing annual estimates from 1971 to 1976 expressing RDP by industry in 1971 dollars was added to the publication. In addition, annual output and intermediate input estimates from 1971 to 1974 were included for the manufacturing industries, both in current and constant prices. Previously the output measures were published only as indexes and although the constant dollar equivalents were calculated, these were released only on special request.

1980

In 1980, the monthly publication was renamed to *Gross Domestic Product by Industry*. Current price annual estimates, formerly restricted to manufacturing industries, were expanded to cover all industries. As a result, annual estimates of GDP, output and intermediate input were released for 174 industries and industry aggregates.

The current price annual estimates covered the years 1971 to 1979, while the constant price (1971-based) estimates covered the period 1971-80. For 158 industries and aggregates, the constant price quarterly and monthly estimates of GDP covering the period January 1971 to December 1980 were presented in both seasonally adjusted and unadjusted form.

A quality assessment of both the annual and monthly GDP estimates was also provided at the most detailed level. The rating system, although non-quantitative, nevertheless provided an indication of the overall quality of the estimates by industry.

To assist users in the analysis of GDP estimates, special aggregations of GDP by demand categories had been prepared by allocating each industry's GDP to a demand category according to the major use of its products. These special industry groupings continued to be published in subsequent annual publications until 1986.

1986

The year 1986 marked another major step in the integration of the Canadian System of National Accounts. Since 1986, the various components of the CSNA have been based on the same concepts and definitions. Throughout the CSNA the main statistical aggregates were not only identical, but were also released simultaneously.

As described previously, prior to 1986 annual GDP by industry levels were also compiled independently of the Input-Output based estimates. The two annual series were partly reconciled, but because of the methodological and statistical differences, they were not identical. In the Input-Output framework constant price GDP by industry for the business sector was obtained exclusively by the double deflation technique, whereas outside the Input-Output accounts this technique could not always be applied. Moreover, the detailed commodity balances possible within the Input-Output framework allow a fine-tuning of estimates, not otherwise achievable.

The availability of the Input-Output tables in the present format provided grounds for the statistical integration of the various GDP series and the improved timeliness of the tables made it feasible to use the Input-Output based GDP as annual benchmarks for the monthly GDP beginning with the release of June 1986.

Among the 1986 changes was the introduction of a new system of industry codes, known as the **System of National Accounts industry codes**, which was developed to overcome the special problem of discontinuities in the historical record that are introduced by changes in the SIC. The most important feature of this system of industry codes was the definition of the so-called link levels. The lowest levels of industry aggregations which were continuous across the 1960, 1970 and 1980 SIC's were designated as link levels.

The year 1986 also marked a departure from allocating establishments to industries first and then dividing the economy into commercial and non-commercial sectors. Commencing in 1986, establishments were classified individually as being part of the business or the non-business sector of the economy.

Finally, in 1986 revised estimates of GDP by industry were released in 1981 prices for the period 1961 to 1980. Although most of the revisions stemmed from the replacement of the annual levels by Input-Output based annual benchmarks, there were some conceptual changes as well. The most notable was the restoration of the definition of the construction industry on an activity basis. All own-account new and repair construction by all establishments, independently from their industrial classification, was allocated to the construction industry. As mentioned previously, construction output was formerly measured on an industry basis, which meant that for the years from 1961 to 1984 own-account activity was included in the individual industries concerned, except for electric power and railway transport.

1994

A milestone in the history of GDP by industry was marked with the release of the annual provincial estimates of GDP by industry for the period from 1984 to 1993. After several years of development, the provincial GDP by industry statistics were extended to cover the entire economy. Both current and constant dollar estimates were published for each province and territory as well as for a territory called 'Outside Canada'. These latter estimates relate to economic activities which take place outside the country but nevertheless are considered to be part of domestic production such as various activities performed at Canadian embassies, consulates and military bases.

1997

In 1997 evaluation of monthly GDP was changed from 1986 prices to 1992 prices. At the same time, the monthly estimates of GDP were adjusted to a new set of Input-Output tables which were revised to conform closely with the international standards as described in the System of National Accounts 1993 (SNA 1993).

With this historical revision, FISIM (financial intermediation services indirectly measured), an imputation which prescribes that net interest received be used when measuring the banking industry's contribution to GDP, has been extended to credit unions and trust, mortgage and consumer loan companies.

When conducted by banks, brokerage and mutual fund activities were included in the output by the banking industry. Previous to 1997, banking activities were deconsolidated so that output of banks would only reflect deposit-lending type of activities.

As of 1997, royalty payments on natural resources were defined as a return on natural resources or investment income, and thus royalties became part of the surplus of the extracting industry. This change in the treatment of royalties increased GDP originating in the mining sector and decreased that of the financial sector.

Another change affected the treatment of general exploration expenses as well as geological and geophysical expenses. With the 1997 revision, these expenses became capital expenditure and as a result, inputs in the mining sector decreased while GDP increased.

Beginning with this release, a large portion of lottery corporations' revenue which is channelled back to governments, was treated as a product tax. This revenue previously was considered to be part of the lottery corporations' profit, hence a contribution to GDP. This change obviously lowered GDP stemming from gambling operations.

In 1997, as part of the historical revision of the Canadian System of National Accounts, estimates of monthly GDP by industry were reworked for the 30 year period spanning from January 1961 to December 1991. Much of the revisions to the monthly GDP estimates were due to the revisions to the annual benchmarks. The historical estimates were linked to the 1992 priced estimates introduced with the month of October 1997, and were expressed in 1992 prices.

2001

With the release of GDP by industry in September 2001, revisions to monthly GDP by industry estimates reflect the following major changes.

Beginning with July 2001 as reference month, the newly released GDP by industry estimates have been converted from the Standard Industrial Classification (1980) basis to the North American Industry Classification (NAICS 1997) basis. The implementation of NAICS in the monthly GDP by industry system altered the total number of worksheet level industries (industries at the most detailed level) to a certain extent but not

significantly. In some areas new industry detail emerged, whereas in other areas some SIC based worksheet level industries were combined together. For example, monthly GDP measures were developed for Greenhouse, Nursery and Floriculture Production and the Animal Aquaculture industry. Within the Education industry new monthly estimates were added for Elementary and Secondary Schools as well as for Community Colleges and CEGEPs. On the other hand, notable examples for disappearing industry detail include the Textile and the Clothing manufacturing major groups. While establishments were rearranged extensively from one industry to another, in a few instances entire worksheet level industries had to be relocated in the new classification system. For example, Motor Vehicle Plastic Parts manufacturing became part of the Plastic Products manufacturing major group, a move from the Transportation Equipment major group. The Publishing industry left the manufacturing sector altogether and with this reclassification became a communication service provider instead.

Another major change introduced with the 2001 revision was the treatment of business and government spending on software as a capital expenditure. Formerly, software was treated in the CSNA as an intermediate input that is fully used up in processes of production and only a small portion of business and government expenditure on software was treated as capital investment. With the implementation of this change Canada eliminated one major difference between the CSNA and SNA 1993.

Also beginning with this release, the GDP by industry estimates were presented at 1997 prices. Previously 1992 served as the base year.

Finally, the Input-Output based annual benchmarks were expressed at basic prices, whereas previously GDP by industry was presented at factor cost. To obtain GDP by industry at basic prices, other taxes on production are added to the traditional factor cost measure while other subsidies on production are deducted. In other words, GDP at basic prices is higher than GDP at factor cost by the amount of taxes less subsidies on the factors of production. The switch to valuing GDP at basic prices rather than at factor cost was based on the rationale that value added at basic prices is a better measure of the cost of factors of production. In addition, basic price valuation permits better international comparisons, as most countries present their value added by industry at basic prices.

NAICS based aggregations of historical series from January 1981 to December 1996 were also released. The 1981-1986 segment of the historical series was benchmarked once again to the new Input-Output based annual levels in 1981 prices, the 1986-1992 segment was benchmark adjusted to IO based levels in 1986 prices, and from 1992 to 1997 in 1992 prices. Finally, the entire historical series were linked to the 1997 based estimates. The historical period is covered by a more summary level of aggregation, totalling 100 industries and their 29 aggregates. As noted earlier in chapter 3, some of the link levels are continuous from 1981 only to 1996. Due to the reclassification to NAICS, there are breaks between 1996 and 1997.

Chronology of monthly GDP by industry in Canada

- 1926 ▶ Monthly IIP estimates, first release.
- 1952 ▶ Revised IIP, based on 1948 SIC, 1935-1939=100.
- 1953 ▶ Quarterly GDP by industry available for internal use in Statistics Canada.
- 1959 ▶ Revised IIP, based on 1948 SIC, 1949=100.
- 1963 ▶ Quarterly GDP by industry, first release.
- 1968 ▶ Revised quarterly GDP by industry, based on 1960 SIC, 1961=100.
- 1970 ▶ Monthly GDP by industry, first release.
- 1976 ▶ Revised GDP by industry, based on 1970 SIC, 1971=100.
- 1977 ▶ Release of current and constant dollar annual output, intermediate inputs and value added of selected industries.
- 1980 ▶ Release of annual estimates of GDP by industry at current prices for all industries.
- 1986 ▶ Integration of the Input-Output based annual levels for the monthly GDP measures,
 - ▶ Adoption of SNA codes,
 - ▶ Implementation of 1980 SIC, 1981=100,
 - ▶ Historical revision, 1961-1980, 1981=100.
- 1990 ▶ Revised GDP by industry, 1986=100,
 - ▶ Historical revision, 1961-1985, 1986=100,
- 1994 ▶ Release of current and constant dollar annual provincial GDP by industry, 1984-1993, 1986=100.
- 1997 ▶ Adoption of SNA 1993.
 - ▶ Revised GDP by industry, 1992=100,
 - ▶ Historical revision, 1961-1992, 1992=100.
- 2001 ▶ Adoption of the NAICS industrial classification, conversion to valuation at basic prices rather than at factor cost, capitalization of software,
 - ▶ Revised GDP by industry, 1997=100,
 - ▶ Historical revision, 1981-1996, 1997=100.

Glossary

The definitions in this Glossary are based as closely as possible on the actual wording used in SNA 1993 as published in the handbook entitled 'System of National Accounts, 1993, Glossary', OECD 2000.

Ancillary activity	An ancillary activity is a supporting activity undertaken within an enterprise in order to create the condition within which the principal or secondary activities can be carried out; ancillary activities generally produce services that are commonly found as inputs into almost any kind of productive activity and the value of an individual ancillary activity's output is likely to be small compared with the other activities of the enterprise (for example, cleaning and maintenance of buildings).
Annual rates of GDP	The seasonally adjusted monthly estimates of GDP by industry are published at annual rates. This means that each month's GDP level is multiplied by twelve. Estimates expressed at annual rates are useful for comparisons with previous years even before the current year is completed. GDP by industry estimates at annual rates also permit monthly to quarterly comparisons.
Base year	A reference period in the past that provides prices for valuing current production of goods and services. Values of goods and services at base year prices, said to be at constant prices, inform about the volume of goods and services produced or sold, independently of changes in prices.
Basic price	Basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and any subsidy receivable, on that unit as a consequence of its production or sale; it excludes any transport charges invoiced separately by the producer.
Benchmark	Values which are obtained from higher quality observations and serve as standards for gauging values that are obtained from less reliable sources. For example, annual GDP values derived from comprehensive annual surveys or censuses within the balanced framework of the Input-Output accounts are benchmarks for the monthly GDP indicators which are typically based on observations collected by sample monthly surveys..
Benchmarking	A procedure which adjusts a sub-annual series (usually obtained from less reliable sources, typically sample surveys) so that their annual sums agree with annual benchmark levels (usually derived from more comprehensive sources, typically annual surveys or censuses).

Glossary

Business sector	Establishments which produce goods and services for sale in the market at a price which have significant influence on the amounts that producers are willing to supply or on the amounts purchasers wish to buy. Compare with 'non-business sector'.
Capital	See 'fixed assets'.
Capital consumption	See 'consumption of fixed capital'.
Capital formation	See 'gross capital formation' and 'gross fixed capital formation'.
Census	A census refers to the collection of information about characteristics of interest from all units in a population.
Census value added	Output minus the value of materials, fuel and electricity consumed in the production process. Census value added differs from value added used in the CSNA in that it includes the cost of business services, such as insurance, advertising, transportation, communications, etc.
Chain indexes	Chain indexes are obtained by linking price (or volume) indexes for consecutive periods; the short-term movements which are linked are calculated using weighting patterns appropriate to the period concerned.
Changes in inventories (including goods in process)	Changes in inventories (including work-in-progress) consist of changes in: (a) stocks of outputs that are still held by the units that produced them prior to their being further processed, sold, delivered to other units or used in other ways; and (b) stocks of products acquired from other units that are intended to be used for intermediate consumption or for resale without further processing; they are measured by the value of the entries into inventories less the value of withdrawals and the value of any recurrent losses of goods held in inventories.
Commodity	See 'output'.
Constant prices	Constant prices are obtained by directly factoring changes over time in the values of goods and services into two components reflecting changes in the prices of the goods and services concerned and changes in their volumes (i.e. changes in 'constant price terms'); the term 'at constant prices' commonly refers to series which use a fixed-base Laspeyres formula.
Consumption	Consumption is an activity in which institutional units use up goods or services; consumption can be either intermediate or final.
Consumption of fixed capital	Consumption of fixed capital represents the reduction in the value of the fixed assets used in production during the accounting period resulting from physical deterioration, normal obsolescence or normal accidental damage.
Current	In the context of economic accounting, the term current is used to refer to the time at which the economic activity took place. 'Current period' means the period of observation; it does not mean the present time nor the time of compilation.

Current prices	Values are said to be expressed in 'current prices' (denoted as \$Current or \$C) if the prices used in the valuation of goods and services are those prevailing in the period of observation, that is both the quantity and the price components of the value series relate to the current period. Period-to-period changes in a current dollar series may reflect changes in both quantities and prices.
Deflation	Process of removing price changes from the current values of goods and services and thus expressing the value of current production in the prices of a fixed period in the past. The removal of the price effect may be achieved either by dividing current values by suitable price indexes or by revaluing current quantities in the prices of a base year.
Direct taxes	See 'taxes on income'.
Double deflation	Double deflation is a method whereby gross value added is measured at constant prices by subtracting intermediate consumption at constant prices from output at constant prices.
Durable goods	Goods which can be used on multiple occasions and which have an expected lifetime of considerably more than one year, assuming a normal or average rate of physical usage. Compare with non-durable goods.
Durable manufacturing sector	The durable manufacturing sector includes manufacturers of durable goods, such as wood products, furniture and fixtures, primary metals, machinery and equipment, transportation equipment, electrical and electrical products, non-metallic mineral products, and miscellaneous manufacturing products.
Dwelling	Dwellings are buildings that are used entirely or primarily as residences, including any associated structures, such as garages, and all permanent fixtures, customarily installed in residences; movable structures, such as caravans, used as principal residences or households are included.
Easter adjustment	Removal of distortions from time series that are caused by Easter.
Economic production	Economic production is an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services.
Economically insignificant prices	Prices are said to be economically insignificant when they have no significant influence on the amounts producers are willing to supply and on the amounts purchasers wish to buy. Compare with economically significant prices.
Economically significant prices	Prices are said to be economically significant when they have a significant influence on the amounts producers are willing to supply and on the amounts purchasers wish to buy. Compare with economically insignificant prices.

Glossary

Elemental Commodity Groups ECG	Elemental Commodity Groups are the most finely detailed categories of output for which separate price movement measures are defined. In most cases an elemental commodity group corresponds to a Principal Commodity Group (PCG). In some cases the Principal Commodity Groups are subdivided into ECGs in order to obtain a higher level of detail.
Employees	All persons drawing pay for services rendered or for paid absences, and for whom the employer is required to complete a Revenue Canada T-4 Supplementary Form. The employee concept comprises full-time and part-time employees (those who regularly work fewer hours than the standard work week of the establishment) as well as working owners, directors, partners and other officers of incorporated business. Owners or partners of unincorporated businesses and professional practices, the self employed, unpaid family workers, persons outside Canada, military personnel, and all workers for whom a T-4 is not required are excluded. Also excluded are persons who did not receive any pay from the employer for the entire survey reference period such as persons on strike, on unpaid holidays, receiving remuneration from an insurance policy, on Workmen's compensation or related funds, etc. However, employees paid by the employer for a part of the reference period, and unemployed or on strike for the rest, are counted as employed.
Employment	Employment is a measure of the number of individuals who work within a given industry. In other words employment refers to the number of persons drawing pay for services rendered or for paid absences, regardless whether employed on a full time, part-time or on a temporary basis.
Enterprise	An enterprise is an institutional unit in its capacity as a producer of goods and services; an enterprise may be a corporation, a quasi-corporation, a non-profit institution, or an unincorporated enterprise.
Entrepreneurship	The control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs.
Establishment	An establishment is the most homogeneous unit of production for which the business maintains accounting records from which it is possible to assemble all the data elements required to compile the full structure of the gross value of production (total sales or shipments, and inventories), the cost of materials and services, and labour and capital used in production.
Excise duties	Excise duties consist of special taxes levied on specific kinds of goods, typically alcoholic beverages, tobacco and fuels: they may be imposed at any stage of production or distribution and are usually assessed by reference to the weight or strength or quantity of the product.
Exports	Exports consist of sales, barter, or gifts or grants, of goods and services from residents to non-residents.
Extrapolation	Projecting estimates beyond the last available observation.
Final consumption	Final consumption consists of goods and services used up by individual households or the community to satisfy their individual or collective needs or wants.

Fisher price index	A Fisher price index is the geometric mean of the Laspeyres and Paasche price indexes.
Fisher volume index	A Fisher volume index is the geometric mean of the Laspeyres and Paasche volume indexes.
Fixed assets	Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly or continuously in other processes of production for more than one year.
GDP - expenditure based	Expenditure based GDP is total final expenditures at purchasers' prices (including the f.o.b. value of exports of goods and services less the f.o.b. value of imports of goods and services).
GDP - income based	Income based GDP is compensation of employees, plus taxes less subsidies on production and imports, plus gross mixed income, plus gross operating surplus.
GDP - output based	See 'GDP by industry'.
GDP at basic prices	GDP at basic prices is GDP at market prices minus taxes less subsidies on products. GDP at basic prices is also equal to the traditional value at factor cost plus taxes less subsidies on the factors of production (labour and capital).
GDP at factor cost	GDP at factor cost equals to the sum of wages and salaries, supplementary labour income, mixed income and other operating surplus.
GDP at market prices	GDP at market prices equals GDP at basic prices plus taxes less subsidies on products. It is also equal to expenditure based GDP.
GDP by industry	GDP of an industry (also referred to as value added) equals output by the industry minus the value of intermediate inputs that were purchased from other industries, domestic or foreign. Value added is a measure of how much an industry has contributed to the value of its output over and above the value of intermediate inputs. GDP by industry for the economy as a whole is the sum of values added by all industries resident in Canada.
Government current expenditure on goods and services	All current expenditure on goods and services by the government sector, including wages and salaries of government employees and purchases of non-capital goods and services. Also included is an imputation for the capital consumption of government fixed assets.
Gross	The term gross (used as in Gross Domestic Product) refers to values before deducting consumption of fixed capital.
Gross capital formation	Gross capital formation is measured by the total value of the gross fixed capital formation, changes in inventories and acquisitions less disposal of valuables for a unit or sector.
Gross fixed capital formation	Gross fixed capital formation is measured by the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain additions to the value of non-produced assets (such as subsoil assets or major improvements in the quantity, quality or productivity of land) realized by the productive activity of institutional units.

Glossary

Hedonic method	The hedonic method is a regression technique used to estimate the prices of qualities or models that are not available on the market in particular periods, but whose prices in those periods are needed in order to be able to construct price relatives; it is based on the hypothesis that the prices of different models on sale on the market at the same time are functions of certain measurable characteristics such as size, weight, power, speed, etc and so regression methods can be used to estimate by how much the price varies in relation to each of the characteristics.
Household	A household is a small group of persons who share the same living accommodation, who pool some, or all of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food.
Illegal production	Illegal production is the production of goods and services whose sale, distribution or possession is forbidden by law, and production activities which are usually legal but become illegal when carried out by unauthorized producers.
Implicit price indexes	Price indexes that are a by-product of the deflation procedure and are obtained by dividing the value series (measured at current prices) by the volume series (measured at constant prices).
Imports of commodities	Imports of goods and services consist of purchases, barter, or receipts of gifts or grants, of goods and services by residents from non-residents.
Index number	A number showing the variation of, for example, prices or wages as compared with a chosen base period. The base period is often represented by 100. The index acts as a statistical yardstick which is expressed in terms of percentages. Thus, an index number of 146 would indicate that the current period is 46% higher than in the base period.
Industrial classification	An industrial classification provides definitions that are needed to determine which establishments are similar enough to constitute an industry.
Industrial Price Indexes IPI	Industrial Price Indexes (IPI) are index numbers which describe the price movements of the various groups of goods and services produced by a given industry.
Industrial Production	A group of industries comprising mining, manufacturing, electric power generation, gas distribution and other utilities.
Industry	An industry is a group of establishments engaged in the same or a similar kind of economic activity.
Industry Product Price Index IPPI	Price indexes covering commodities which are the output of domestic manufacturers. They include products made wholly or partly from Canadian labour and materials; they cover all sales to other Canadian businesses, individuals, governments or to exports. They do not include manufactured goods that are imported except for those imported and resold by Canadian manufacturers.

Institutional unit	An institutional unit is an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities.
Interest	Interest is the amount that the debtor becomes liable to pay to the creditor over a given period of time without reducing the amount of principal outstanding, under the terms of the financial instrument agreed between them.
Intermediate consumption	Intermediate consumption consists of the value of the goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital; the goods or services may be either transformed or used up by the production process.
Interpolation	Estimating values between known observations.
Inventories	Inventories consist of stocks of outputs that are still held by the units that produced them prior to their being further processed, sold or delivered to other units or used in other ways, and stocks of products acquired from other units that are intended to be used for intermediate consumption or for resale without further processing.
Inventories held	The sum of the value of raw materials, goods in process and finished products on the books of manufacturers. At any one time this value may be higher than the total value of manufacturers' investment in materials, labour and overhead expense because payment for it has already been received by the manufacturer. The value of inventory held but not owned is measured by the value of progress payments received. Compare with inventories owned.
Inventories of finished products	Consist of outputs that are considered by their producers to be in a state in which they are normally supplied to others, even though such goods may subsequently be used as intermediate inputs into processes of production by others. Estimates of finished goods inventories include those in transit in Canada and on consignment in Canada. Excluded are inventories for which Form B13, 'Customs Canada, Export Entry', has been completed, as well as imports in bonded customs warehouses. Inventory of finished products is one component of capital formation which is in turn one element of final demand. Compare with inventories of goods in process and inventories of raw materials.
Inventories of goods in process	Inventories of goods in process consist of goods that are partially processed by the producer, that is output which has not reached the state in which it is normally sold to consumers. Compare with inventories of finished products and inventories of raw materials.

Glossary

Inventories of raw materials	Include fuel, materials, supplies and components held by a producer which were acquired from other producers for the purpose of intermediate consumption and have not yet been charged out to processing. Raw materials include only goods that are entirely used up when they are fed into the production process. Goods that are used repeatedly or continuously in production over a long period of time are classified as fixed capital. Excluded are materials and supplies owned and held abroad (i.e. purchases that have not cleared customs) and goods that are intended for resale in the same condition as purchased. Compare with inventories of goods in process and inventories of finished products.
Inventories owned	The value of manufacturers' investment in inventory of raw materials, goods in process and finished products. To arrive at the value of inventory owned the overall value of inventory held must be reduced by the value of progress payments received. These progress payments are significant in the manufacture of such items as heavy machinery, ships, locomotives, steel structures and aircraft.
Inventory valuation adjustment	In periods of changing prices gains and losses in inventory accounts may reflect changes in both quantities held and prices. Holding gains and losses on inventories are present in corporation profits before taxes and other income aggregates, and must be removed in order to measure current production. In order to remove the impact of price changes, the opening and closing stocks are revalued. The change in stocks so valued is called the value of physical change in inventories. The difference between the value of physical change and the change in book value is called inventory valuation adjustment.
Labour Force Survey LFS	Monthly household survey of individuals which provides demographic data on the employed and the unemployed, such as age, sex, family relationship, marital status, occupation and industry as well as data on the characteristics and past work experience of those not currently in the labour force. Compare with Survey of Employment, Payroll and Hours SEPH.
Labour income	Earnings received by employees in the form of wages, salaries and supplementary labour income such as employer's contributions to pension funds, employee welfare funds, the Unemployment Insurance Fund and Workmen's Compensation Funds.
Labour input	Labour input into the production of goods and services is a measure of total hours worked by persons employed. Total hours worked are also weighted by employee compensation per hour in order to reflect changes in the composition of the labour force.
Laspeyres price index	A Laspeyres price index is a weighted arithmetic average of price relatives using the values of the earlier period as weights.
Laspeyres volume index	A Laspeyres volume index is a weighted arithmetic average of quantity relatives using the values of the earlier period as weights.

Link level industry	The lowest level of industry aggregations which provides continuous GDP series over longer periods of time extending across different versions of the industrial classification.
Linking	Also called chaining. Linking is a process of connecting two or more segments of a time series. For example, segments of a GDP by industry series which relate to different base years. A continuous series is achieved by adjusting each base year segment to the next via multiplying by a correction factor (link). The correction factor is the ratio between GDP in the new base year valued at new and old base year prices.
Margins	The additional cost elements that make up the difference between modified basic prices and purchasers' prices are called margins. Seven margins are distinguished in the Input-Output Accounts: retail margins, wholesale margins, tax margins, transport margins, gas margins, storage margins, and pipeline margins.
Market prices	Market prices for transactions are the amounts of money willing buyers pay to acquire something from willing sellers.
Material inputs	Material inputs include fuel, materials, supplies and components which were consumed in a production process. This category includes only goods that are entirely used up when they are fed into the production process. Goods that are used repeatedly or continuously in production over a long period of time are classified as fixed capital.
Modified basic price	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. 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 SNA 1993. The modified basic price in Canada is the subsidized price whereas in SNA 1993 it is the actual price plus subsidy.
Monthly Survey of Manufacturing	Survey gathering statistics on shipments, inventories, unfilled orders and new orders of manufacturing establishments. The published monthly estimates are projections of annual census of manufactures values based on returns from a stratified systematic sample of establishments.
Net	The term 'net' (used as in Net Domestic Product) is a common means of referring to values after deducting consumption of fixed capital.
Net domestic product NDP	Net domestic product, NDP, is obtained by deducting the consumption of fixed capital from gross domestic product.
Net income of non-farm unincorporated business, including rent	Earnings of unincorporated proprietors from their own businesses, except farm operators. The net income of businesses such as unincorporated retailers and consultants, and of independent professional practitioners such as doctors, dentists, lawyers and engineers is included, as is the net rental income of persons (but not corporations). Net rental income covers paid and imputed rents, after expenses, from the ownership of residential property and net paid rents from the ownership of non-residential property.

Glossary

Non-business sector	Comprises establishments which provide most of their output to others free of charge or at prices which do not have a significant influence on the amounts that producers are willing to supply or on the amounts purchasers wish to buy. Compare with business sector.
Non-durable goods	Non-durable goods are goods which are used up entirely in less than a year, assuming normal or average rate of physical usage.
Non-durable manufacturing	Manufacturers of non-durable goods. Includes manufacturers of food, beverages, tobacco products, rubber products, plastic products, leather and allied products, primary textile and textile products, clothing, paper and allied products, printing, publishing and allied products, refined petroleum and coal products, chemicals and chemical products.
Non-manufacturing activities	Many manufacturing establishments engage in non-manufacturing activities in addition to their manufacturing activities. These include merchandising of goods purchased for resale without further processing, the carrying out of construction with their own labour force for their own use, production, major repair or improvement of machinery and equipment by own labour force for own use, lease or rental of machinery and equipment manufactured by own labour force, operating cafeterias and lunch counters, laboratories, etc.
Non-sampling errors	Non-sampling errors are statistical errors which are not related to sampling and may occur in a survey operation for many reasons. Examples for non-sampling errors are non-response, coverage and classification errors, differences in the interpretation of questions, incorrect information from respondents, mistakes in recording, coding and processing of data, etc.
North American Industry Classification System NAICS	The North American Industry Classification System (NAICS) is an industrial classification system used to group producers into industries on the basis of similarities in their production processes. Developed jointly in 1997 by Canada, Mexico and the United States, NAICS provides a common framework of classification which places industrial statistics compiled by the three countries on a comparable basis.
Operating surplus	The operating surplus measures the surplus or deficit accruing from production before taking account of any interest, rent or similar charges payable on financial or tangible non-produced assets borrowed or rented by the enterprise, or any interest, rent or similar receipts receivable on financial or tangible non-produced assets owned by the enterprise.
Output	Output consists of those goods and services that are produced within an establishment that become available for use outside that establishment, plus any goods and services produced for own final use.
Output produced for own final use	Output produced for own final use consists of goods or services that are retained for their own final use by the owners of the enterprises in which they are produced.
Paasche price index	A Paasche price index is the harmonic average of price relatives using the values of the later period as weights.

Paasche volume index	A Paasche volume index is the harmonic average of volume relatives using the values of the later period as weights.
Payroll taxes	Payroll taxes consist of taxes payable by enterprises assessed either as a proportion of the wages and salaries paid or as a fixed amount per person employed.
Population	The population (also referred to as the universe) is the aggregate or collection of units to which the survey results apply. In this sense, it refers not only to people but can also be a collection of households, establishments, schools, hospitals, etc.
Price	The price of a good or service is the value of one unit of that good or service.
Price deflation	Price deflation is a method for expressing the value of goods and services in the prices of a fixed period in the past. This method removes price changes from the current value of a good or service by dividing it by a suitable price index.
Price index	A price index reflects an average of the proportionate changes in the prices of a specified set of goods and services between two periods of time.
Price relative	A price relative is the ratio of the price of a specific product in one period to the price of the same product in some other period.
Principal activity	The principal activity of a producer is the activity whose value added exceeds that of any other activity carried out within the same unit (the output of the principal activity must consist of goods or services that are capable of being delivered to other units even though they may be used for own consumption or own capital formation).
Principal Commodity Groups PCG	A structure of approximately 1500 commodity classes, developed in order to provide consistent description of commodities across the various aspects of the economy such as production, transportation, exports, imports or prices. The PCG classification achieves this by consolidating the various commodity classifications of Statistics Canada, such as the Standard Commodity Classification, the Industry Commodity Classification, the Export Commodity Classification and the Import Commodity Classification.
Production boundary	The boundary of production includes (a) the production of all individual or collective goods or services that are supplied to units other than their producers, or intended to be supplied, including the production of goods or services used up in the process of producing such goods or services; (b) the own-account production of all goods that are retained by their producers for their own final consumption or gross capital formation; (c) the own-account production of housing services by owner-occupiers and of domestic and personal services produced by employing paid domestic staff.
Products	Products, also called goods and service, are the result of production. They are exchanged and used for various purposes: as inputs in the production of other goods and services, as final consumption or for investment.
Profit	The excess of revenues over expenses of producers.

Glossary

Progress payments	In some industries the process of production takes a long time to complete. For example, the manufacture of such items as heavy machinery, ships, locomotives, steel structures and aircraft requires an extensive period for completion. In such cases the contract of sale is often settled in advance and the transfer of ownership occurs in stages as work proceeds. Reimbursements manufacturers receive for work done on incomplete contracts are called progress payments. The value of such payments is measurable by the difference between inventories held and inventories owned.
Purchaser's price	The purchaser's price is the amount paid by the purchaser, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and the place required by the purchaser; the purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.
Quadratic minimization	A method of adjusting the level of a monthly GDP series so that its yearly sums match the annual benchmarks in such a way that the month-to-month movements of the original series are preserved as much as possible. In other words, quadratic minimization is a method which finds a series that runs as parallel with the original as permitted by the annual constraints. This is achieved by taking the discrepancies between the slopes (first differences) of the original and the unknown adjusted series, summing the squares of these differences and then finding the unknown series for which this sum is minimal. Squared differences are taken to ensure that terms with opposite signs do not cancel one another.
Quantity	The quantity of a homogeneous product may be expressed by the number of items, weight, length or volume. For a complex commodity, the description of the quantity may be a bundle of attributes, which in addition to such characteristics as colour, size, material composition, method of production, etc., may also include such qualitative features as the geographical location or purpose of production. Commodities with different physical characteristics and products of different quality are generally taken as different products.
Quantity relative	A quantity relative is the ratio of the quantity of a specific product in one period to the quantity of the same product in some other period.
Real Domestic Product by industry	GDP by industry at constant prices.
Rebasing	Rebasing is the process of updating the base period.
Reference period	In connection with price or volume indexes, the reference period means the period to which the indexes relate; it is typically set equal to 100 and it does not necessarily coincide with the 'base' period that provides the weights for the indexes.
Resident	An institutional unit is resident in a country when it has a centre of economic interest in the economic territory of that country.

Salaried employees	Class of employees as reported by the Survey of Employment, Payroll and Hours whose basic pay is a fixed amount for a period of at least one week.
Sampling errors	Sampling errors occur because observations are made only on a sample rather than on the entire population. Estimates based on a sample differ from the figures that would have been obtained if a complete census of the population had been taken using the same questionnaires, instructions, interviewers and processing techniques. The difference between an estimate calculated by a sample and the result which would have been achieved with a census is called the sampling error.
Seasonal adjustment	The process of removing systematic movements from economic time series which are repetitive, relatively stable over several years and which are related to the particular seasons of the year.
Secondary activity	A secondary activity is an activity carried out within a single producer in addition to the principal activity and whose output, like that of the principal activity, must be suitable for delivery outside the producer unit.
Shipment of goods purchased for resale	Value of shipments of goods purchased and resold in the same condition. Also included is the value of goods purchased in bulk which remain unchanged when resold, except for cutting and packaging.
Shipments of goods of own manufacture	These manufacturing activity figures represent the value of shipments of goods produced by the reporting establishment on its own account, except shipments to warehouses that are part of the same accounting entity and goods on consignment. In addition to normal sales, these figures include transfers to other establishments in the same company, shipments from warehouses that are part of the same establishment, sales of goods shipped earlier on consignment, all shipments for which an export permit is prepared, revenue for custom and repair work done, charges for installation where they are part of sales, and the capitalized value of any goods manufactured by this establishment that have been built for subsequent rental. For manufacturers who receive payments for partially completed products, the value of shipments of goods of own manufacture is modified to include progress payments.
Standard Industrial Classification SIC	A system for classifying all establishments in the economy to the most appropriate industries on the basis of their principal output. Four versions of standard industrial classifications (SIC) have been used in Canada, dated: 1948, 1960, 1970, and 1980. In 2001 the CSNA replaced the 1980 SIC with the North American Industry Classification (NAICS).
Statistical error	In a statistical sense, 'error' is used to denote the difference between an occurring (or calculated) value and its true (or expected) value.
Stratification	A process of subdividing the population into relatively homogeneous groups called strata. Stratified sampling consists of independently selecting samples from each of these strata. The main advantage of stratified sampling is the increased reliability of the estimators of the characteristic under study.

Glossary

Subsidies	Subsidies are current unrequited payments that government units, including non-resident government units, make to enterprises on the basis of the levels of their production activities or the quantities or values of the goods or services which they produce, sell or import.
Subsidies on production - other	Other subsidies on production consist of subsidies, except subsidies on products, which resident enterprises may receive as a consequence of engaging in production (i.e. subsidies on payroll or workforce or subsidies to reduce pollution).
Subsidies on products - other	Other subsidies on products (other than export or import subsidies) consist of subsidies on goods or services produced as the outputs of resident enterprises that become payable as a result of the production, sale, transfer, leasing or delivery of those goods or services, or as a result of their use for own consumption or own capital formation.
Subsidy on a product	A subsidy on a product is a subsidy payable per unit of a good or service produced, either as a specific amount of money per unit of quantity of a good or service or as a specified percentage of the price per unit; it may also be calculated as the difference between a specified target price and the market price actually paid by a buyer.
Supplementary labour income	Payments made by employers for the future benefit of their employees such as employers' contributions to employee welfare and pension funds and unemployment insurance.
Survey of Employment, Payrolls and Hours SEPH	A monthly establishment based sample survey, designed to measure the levels and month-to-month changes of payroll employment (number of employees), paid hours and earnings. These measures are compiled by industry and are classified by geographic location. Compare with Labour Force Survey.
System of National Accounts SNA	The System of National Accounts (SNA) consists of a coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules. In its broad outline, the Canadian System of National Accounts (CSNA) bears a close relationship to the international standard as described in the United Nations publication: System of National Accounts 1993.
Taxes	Taxes are compulsory payments made by institutional units to governments. The government provides nothing in return to the individual unit making the payment, although funds raised in taxes may be used by governments to provide goods and services to other units, individually, or collectively, or to the community as a whole.
Taxes on income	Taxes on income consist of taxes on incomes, profits and capital gains.

Taxes on production and imports	Taxes on production and imports consist of taxes payable on goods and services when they are produced, delivered, sold, transferred or other wise disposed of by their producers plus taxes and duties on imports that become payable when goods enter the economic territory by crossing the frontier or when services are delivered to resident units by non-resident units; they also include other taxes on production, which consist mainly of taxes on the ownership or use of land, buildings or other assets used in production or on the labour employed, or compensation of employees paid.
Taxes on production - other	Other taxes on production (also known as taxes on the factors of production) consist of taxes other than those incurred directly as a result of engaging in production; they mainly consist of current taxes on the labour or capital employed in the enterprise, such as payroll taxes or current taxes on vehicles or buildings.
Taxes on products	Taxes on products are taxes that are payable per unit of some good or service. A tax on a product usually becomes payable when it is produced, sold or imported, but it may also become payable in other circumstances, such as when a good is exported, leased, transferred, delivered, or used for own consumption or own capital formation.
Total economy	The total economy consists of all the institutional units which are resident in the economic territory of a country.
Trade margin	A trade margin is the difference between the actual or imputed price realized on a good purchased for resale (either wholesale or retail) and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of.
Trading day adjustment	A smoothing procedure which alters the distribution of monthly output to reflect changes in production that would occur if all months contained the same number and same type of working days.
Transaction	A transaction is an economic flow that is an interaction between institutional units by mutual agreement or an action within an institutional unit that it is analytically useful to treat like a transaction, often because the unit is operating in two different capacities.
Transfer	A transfer is a transaction in which one institutional unit provides a good, service or asset to another unit without receiving from the latter any good, service or asset in return as counterpart.
Transport margin	A transport margin consists of those transport charges paid separately by the purchaser in taking delivery of the goods at the required time and place.
Trend	Variation in a monthly economic time series which remains relatively stable in terms of general direction over a long period of time. The trend informs about the overall course of production.

Glossary

Underground economy	The underground economy consists of activities which may be both productive in an economic sense and also quite legal (provided certain standards or regulations are complied with) but which are deliberately concealed from public authorities usually to avoid the payment of taxes or to avoid meeting certain standards or administrative requirements.
Unfilled orders	Orders received but not yet shipped, excluding orders for goods purchased for resale. Unfilled orders represent a backlog or stock of orders which will generate future shipments, assuming that orders are not cancelled. In cases where progress payments have been received by manufacturers, the reported value of unfilled orders is reduced by the balance of progress payments on hand at the end of the accounting period. Values of unfilled orders are obtained from data reported to the Monthly Survey of Manufacturing.
Unincorporated enterprise	An unincorporated enterprise is a producer unit which is not incorporated as a legal entity separate from the owner (household, government or foreign resident); the fixed and other assets used in unincorporated enterprises do not belong to the enterprise but to their owners, the enterprises as such cannot engage in transactions with other economic units nor can they enter into contractual relationships with other units nor incur liabilities on their own behalf; in addition, their owners are personally liable, without limit, for any debts or obligations incurred in the course of production.
Unit value	See 'price'.
Valuation methods at constant prices	Constant price values of goods and services are calculated either by removing price changes from current values (price deflation) or by valuing current period quantities using the prices of a base year (base year valuation of quantities). Compare with valuation methods at current prices.
Valuation methods at current prices	Current values of a good or services is the amount of money exchanging hands when the particular good or service is sold. Current values can be either observed directly or alternatively, since the value of a commodity is equal to its quantity multiplied by a price, current values can be derived from separate observations on quantities and prices. Compare with valuation methods at constant prices.
Value	Value at the level of a single, homogeneous good or service is equal to the price per unit of quantity multiplied by the number of quantity units of that good or service; in contrast to price, value is independent from the choice of quantity unit.
Value added - gross	Gross value added is the value of output less the value of intermediate consumption; it is a measure of the contribution to GDP made by an individual producer, industry or sector.
Value added - net	Net value added is the value of output less the values of both intermediate consumption and consumption of fixed capital.

Value added tax VAT	A value added tax (VAT) is a tax on products collected in stages by enterprises; it is a wide-ranging tax usually designed to cover most or all goods and services but producers are obliged to pay to government only the difference between the VAT on their sale and the VAT on their purchases for intermediate consumption or capital formation, while VAT is not usually charged on sales to non-residents (i.e. exports).
VAT - deductible	Deductible VAT is the VAT payable on purchases of goods or services intended for intermediate consumption, gross fixed capital formation or for resale which a producer is permitted to deduct from his own VAT liability to the government in respect of VAT invoiced to his customers.
VAT - invoiced	Invoiced VAT is the VAT payable on the sales of a producer; it is shown separately on the invoice which the producer presents to the purchaser.
VAT - non-deductible	Non-deductible VAT is VAT payable by the purchaser which is not deductible from his own VAT liability, if any.
Volume index	A volume index is most commonly presented as a weighted average of the proportionate changes in the quantities of a specified set of goods or service between two periods of time.
Wages and salaries	All earnings from employment of Canadian residents paid for work performed, whether in cash or in kind, and before deduction of income taxes and contributions to pension funds, unemployment insurance and other social insurance schemes. Also includes military pay and allowances, commission, tips and bonuses, directors' fees and taxable allowances, such as cost-of-living allowances and allowances in respect of holidays and sick leave. Excludes mandatory and non-mandatory employer contributions on behalf of employees to social insurance plans, which are treated as supplementary labour income.
Working level industry	The lowest level of industry aggregations for which GDP estimates are compiled directly from the source data.

Bibliography

This bibliography contains references as well as general readings on topics related to Gross Domestic Product by industry.

Australian Bureau of Statistics

"Introduction of chain volume measures", Australian Bureau of Statistics, OECD Meeting of National Accounts Experts, Château de la Muette, Paris, 22-25 September 1998, STD/NA(98)6.

Box, G.E.P., and Jenkins, G.M. (1970)

"Time series analysis forecasting and control", San Francisco: Holden Day, 1970.

Bryant, C.G.E and Daniel, D.L. (1989)

"The effects of rebasing on the estimates of gross domestic product", Economic Trends, January 1989, pp. 118-127.

Bureau of Economic Analysis, Department of Commerce USA

"U.S. national income and product accounts: annual and quarterly chain measures of quantity and prices", OECD Meeting of National Accounts Experts, Château de la Muette, Paris, 22-25 September 1998, STD/NA(98)27.

Burns, A. F., Mitchell, W. C. (1946)

"Measuring business cycles", National Bureau of Economic Research, New York 1946.

Chandler, W. (1993)

"The value of household work in Canada, 1992", Statistics Canada, Catalogue no. 13-001, Fourth Quarter 1993.

Chandler, W., Gray, T., Jackson, C. (1995)

"The boundaries of economic activity: an application of 1993 SNA principles", paper prepared for the ECE/INSTRAW Joint Work Session on Statistics of Women, Geneva, March 1995.

Cholette, P. A. (1978)

"A comparison and assessment of various adjustment methods of sub-annual series to yearly benchmarks", Time Series Research and Analysis Division, Statistics Canada, March 1978.

Cholette, P. A. (1984)

"Adjusting sub-annual series to yearly benchmarks", Survey Methodology, Vol. 10, pp. 35-49.

Clift, B., Wells, S. (1990)

"The reliability of the canadian national accounts estimates", Canadian Economic Observer, February 1990.

Dagum, E. B. (1978)

"The meaning and the economic significance of seasonality", Canadian Statistical Review, June 1978, pp. xiii-xvii.

Dagum, E. B. (1988)

"The X11ARIMA/88 seasonal adjustment method, foundations and user's manual", Time Series Research and Analysis Division, Statistics Canada.

Dagum, E. B. (1982)

"Revisions of seasonally adjusted data due to filter changes", Business and Economics Statistics Section Proceedings of the American Statistical Association, 1982.

- Dagum, E. B. , Huot, G. and Morry, M. (1988)
"Seasonal adjustment in the 80's: some problems and solutions", Canadian Journal of Statistics, Vol 16, pp. 109-126.
- Dagum, E. B., Lanier, N. (1987)
"Revisions of trend-cycle estimators of moving average seasonal adjustment methods", Journal of Business and Economic Statistics, April 1987, Vol.5, No.2, pp 177-189.
- Denton, F. T. (1971)
"Adjustment of monthly or quarterly series to annual totals: an approach based on quadratic minimization", Journal of the American Statistical Association, Vol. 66, No. 333, pp. 99-102.
- Ehemann, C., Katz, A.J. and Moulton, B.R. (2000)
"How the chain-additivity issue is treated in the U.S. economic accounts", Bureau of Economic Analysis, Department of Commerce, OECD Meeting of National Accounts Experts, Château de la Muette, Paris, 26-29 September 2000, STD/NA(2000)25.
- Elhawary-Rivet, N. (1987)
"A comparison of two benchmarking methods", Working Paper, Statistics Canada, May 1987.
- Elhawary-Rivet, N. (1989)
"Benchmarking monthly data to annual and bi-annual benchmarks", Working Paper, Statistics Canada, September 1989, (revised September 1990).
- Emery, B. J, Garston, G. J. (1969)
"The measurement of constant price aggregates in Canada", The Review of Income and Wealth, Series 15, No. 1, March 1969, pp. 1-32.
- Eurostat
"Handbook on price and volume measures in national accounts", September 2001.
- Ferland, J. M. (1986)
"A price index for truck transport in the Canadian Input-Output accounts", The Input-Output structure of the Canadian economy in constant prices, 1986, Statistics Canada, Catalogue no. 15-202 Annual
- Garston, G. J. , Worton, D. A. (1968)
"Problems in the estimation of industry output in current and constant dollars in Canada", The Industrial Composition of Income and Product, Studies in Income and Wealth, Volume 32, National Bureau of Economic Research, New York.
- Geehan, G. (1978)
"Measuring the real output and productivity of savings and credit institutions", Canadian Journal of Economics, Volume 11, November 1978, pp. 669-679.
- Gervais, R.G. (1994)
"The size of the underground economy in Canada", Statistics Canada, Catalogue no. 13-603E, No. 2, June 1994.
- Harris, C. (1989)
"Seasonal adjustment: what it does and doesn't do", Canadian Economic Observer, April 1989.
- Hawrylyshyn, O. (1974)
"A review of recent proposals for modifying and extending the measure of GNP", Statistics Canada, Catalogue no. 13-558, 1974.
- Hawrylyshyn, O. (1976)
"The value of household services: a survey of empirical estimates", Review of Income and Wealth, volume 22, June 1976, pp 101-131.
- Hawrylyshyn, O. (1978)
"Estimating the value of household work in Canada: 1971", Statistics Canada, Catalogue no. 13-566, June 1978.

Bibliography

- Hillinger, C. (1999)
"On chained price and quantity measures that are additively consistent", SEMECON, University of Munich, December 1999.
- Hillinger, C. (2000)
"Consistent aggregation and chaining of price and quantity", University of Munich, Germany, OECD Meeting of National Accounts Experts, Château de la Muette, Paris, 26-29 September 2000, STD/NA(2000)23.
- Hirshhorn, R. and Greehan, R. (1977)
"Measuring the real output of the life insurance industry", Review of Economics and Statistics, Volume 59, No. 2, May, 1977, pp. 211-219.
- Inter-Secretariat Working Group on National Accounts, Commission of the European Communities-Eurostat, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank (1993)
"System of National Accounts 1993", Brussels/Luxembourg, New York, Paris, Washington, D.C., 1993.
- Jackson, C. (1992)
"The value of household work in Canada, 1986", Statistics Canada, Catalogue no. 13-001, First Quarter 1992.
- Jackson, C. (1993)
"Trends in the value of household work in Canada, 1961-1986", paper presented at the annual meeting of the Canadian Economics Association, Carleton University, Ottawa, June 1993.
- Jackson, C., Chandler, W. (1995)
"Households' unpaid work: measurement and valuation", Statistics Canada, Catalogue no. 13-603E, No. 3, December 1995.
- Janssen, R. and Oomens, P. (2000)
"Quarterly chain series", Statistics Netherlands, OECD Meeting of National Accounts Experts, Château de la Muette, Paris, 22-25 September 1998, STD/NA(98)7.
- Jones, C.M., Garston, G.J. and Ansmits, A.E. (1978)
"Quantity and price indexes for construction", Review of Income and Wealth, Volume 24, September 1978, pp. 257-281.
- Kemp, K., and Smith, P. (1988)
"A technical note on Laspeyres, Paasche and chain price indexes in the Income and Expenditure Accounts", National Income and Expenditure Accounts, Statistics Canada, Catalogue no. 13-001, fourth quarter 1988, pp xxi-xxxii.
- Kendrick, J.W. (1972)
"Economic accounts and their uses", New York: McGraw-Hill, 1972.
- Lal, K. (1982)
"Gross Domestic Product", Canadian Statistical Review, Statistics Canada, Catalogue no. 11-003E, April 1982.
- Lal, K. (1990)
"Services industries in the business sector of the Canadian economy", Review of Income and Wealth, Series 36, March 1990, pp. 83-94.
- Lal, K. (1994)
"The 1993 International System of National Accounts, Collected articles of Kishori Lal", Statistics Canada, STC 2521, May 1994.
- Lal, K. (1998)
"The 1997 historical revision of the Canadian System of National Accounts, Record of Changes in Classification of Sectors and Transactions, Concepts and Methodology", Ottawa, Statistics Canada, 1998.

- Lal, K. (1998)
"Remaining differences between the 1997 Canadian System of National Accounts and the 1993 International System of National Accounts", Ottawa, Statistics Canada, 1998.
- Lal, K. (2001)
"The 2001 revision of the System of National Accounts. Record of revisited issues", Ottawa, Statistics Canada, 2001.
- Landefeld, J. S., and Parker, R. P. (1995)
"Preview of the comprehensive revision of the national income and product accounts: BEA's new featured measures of output and prices", Survey of Current Business, July 1995, pp. 31-38.
- Landefeld, J. S., and Parker, R. P., (1997)
"BEA's chain indexes, time series, and measures of long-term economic growth", Survey of Current Business, May 1997, pp. 58-68.
- Lefrançois, B. (1994)
"Forecasting quarterly GDP", Unpublished document, Industry Measures and Analysis Division, Statistics Canada.
- Lefrançois, B., Rhoades, D. and Sager, L. (1999)
"Une nouvelle mesure de la fiabilité du PIB", In Comptabilité nationale. Nouvelle frontières. Archambault, E. and Boëda, M. (eds). Economica. Paris: France pp. 415-438.
- Lothian, J. and Morry, M. (1977)
"The problem of aggregation: direct or indirect seasonal adjustment", Research Paper, Statistics Canada.
- Maresca, S. (2000)
"The chain index for GDP volume measures: the Italian experience", Department of National Accounts and Economic Analysis, ISTAT, OECD Meeting of National Accounts Experts, Château de la Muette, Paris, 26-29 September 2000, STD/NA(2000)11.
- McLennan, W. (1998)
"Introduction of chain volume measures in the Australian national accounts", Information Paper, Australian Bureau of Statistics, March 1998.
- Miller, N. (2001)
"A guide to deflating the Input-Output accounts, Sources and methods", Statistics Canada, Catalogue no. 15F0077GIE, 2001.
- Morry, M. (1976)
"Direct versus indirect adjustment of aggregate series", Research Paper, Statistics Canada.
- Morry, M. and Tamasi, S. (1980)
"Guidelines for the seasonal adjustment quality assessment of short series", Research Paper, Statistics Canada.
- Pold, H. (1987)
"Employment estimates from the Labour Force Survey and the Survey of Employment, Payrolls and Hours", Employment, Earnings and Hours, Statistics Canada, Catalogue no. 72-002 Monthly, April 1987.
- Rhoades, D. W. (1987)
"A procedure for minimal distortion of one time series to within tolerance of another", Unpublished document, Industry Measures and Analysis Division, Statistics Canada.
- Ruggles, N. D. (1984)
"Recent developments in international standards for national accounting", Presentation for Statistics Canada, November 1984.
- Ruggles, R. (1984)
"The role of national accounts in the statistical system", Presentation for Statistics Canada, November 1984.

Bibliography

Saulnier, M. (1990)

"Real Gross Domestic Product: sensitivity to the choice of base year", Canadian Economic Observer, Statistics Canada, Catalogue 11-010, May 1990, pp. 3.1-3.19.

Schiopu-Kratina, I., Srinath, K. P. (1986)

"The methodology of the Survey of Employment, Payroll and Hours", Working Paper No. BSMD-86-010E, Methodology Branch, Business Survey Methods Division, Statistics Canada.

Shiskin, J. (1957)

"Electronic computers and business indicators", Occasional Paper 57, National Bureau of Economic Research, Inc.

Shiskin, J., Young, A. H. and Musgrave, J. C. (1967)

"The X-11 variant of Census Method II seasonal adjustment", Technical Paper No. 15, Bureau of the Census, U. S. Department of Commerce.

Statistics Canada

_____, "Gross Domestic Product by industry", Catalogue no. 15-001, monthly.

_____, "Gross Domestic Product by industry (1992=100) 1961-1992", Catalogue no. 15-512, occasional, September 1998.

_____, "Gross Domestic Product by industry (1986=100) 1961-1985", Catalogue no. 15-512, occasional, January 1991.

_____, "Gross Domestic Product by industry (1981=100) 1961-1980", Catalogue no. 15-512, July 1987.

_____, "Provincial Gross Domestic Product by industry 1984 - 1993", Catalogue no. 15-203, annual.

_____, "The monthly review of Canadian business statistics", Catalogue no. 11-003.

_____, "Revised Index of Industrial Production, 1935-1951", Reference Paper No. 34, 1952.

_____, "Revised Index of Industrial Production 1935-1957", Catalogue no. 61-502.

_____, "Indexes of Real Domestic Product by industry (1961 Base)", Catalogue no. 61-506, July 1968.

_____, "Indexes of Real Domestic Product by industry 1961-1969/ 1961=100", Catalogue no. 51-510, February 1971.

_____, "Indexes of Real Domestic Product by industry of origin 1935-61", Catalogue no. 61-505, May 1963.

_____, "Real Domestic Product by Industry", Catalogue no. 61-213, Annual, first issue January 1976.

_____, "Index of Industrial Production", Catalogue no. 61-005, monthly, first issue December 1961.

_____, "Real Domestic Product by industry, 1961-1971 (1961=100)", Catalogue no. 61-516.

_____, "Distributing annual grain crop estimates across sub-annual periods", Gross Domestic Product by Industry, Catalogue no. 15-001, monthly, June 1989, pp. xiv-xvii.

_____, "The Input-Output structure of the Canadian economy", Catalogue no. 15-201, annual.

_____, "The Input Output structure of the Canadian economy in constant prices", Catalogue no. 15-202, annual.

_____, "The Input-Output structure of the Canadian economy, 1961-1981", Catalogue no. 15-510, occasional.

_____, "Service industries in the Canadian Input-Output accounts (current prices), Sources of data and methods of estimation", Catalogue no. 15-601E, No. 2, occasional.

_____, "The Input-Output structure of the Canadian economy in constant prices, 1961-1981", Catalogue no. 15-511, occasional.

_____, "Standard Industrial Classification", Catalogue no. 12-501E.

_____, "Standard Commodity Classification manual, Vol-I-The Classification, Revised 1972", September 1972.

_____, "Standard Classification of Goods, 1988 (Based on the Harmonized Commodity Description and Coding System)", Catalogue no. 12-580E, November 1988.

-
- _____, "Industrial Product Price Indexes 1981=100 Concepts and methods", Catalogue no. 62-556 Occasional, March 1986.
- _____, "A user guide to the Canadian System of National Accounts", Catalogue no. 13-589, November 1989.
- _____, "Guide to the Income and Expenditure accounts", Catalogue no. 13-603E, No. 1 - occasional.
- _____, "National Income and Expenditure accounts", Volume 3, Catalogue no. 13-549E, September 1975, occasional.
- _____, "Concepts and definitions of the Census of Manufacturers", Catalogue no. 31-528.
- _____, "Estimates of labour income", Catalogue no. 72-005.
- _____, "North American Industry Classification System", 1997, Catalogue no. 12-501-XPE.

Statistics New Zealand

- "Chain volume measures in the New Zealand National Accounts", October 1998.

Taillon, J. (1990)

- "Monthly Gross Domestic Product by industry: Quality assessment", Gross Domestic Product by Industry, Statistics Canada, June 1990, pp. 112-143.

Trewin, D. (2000)

- "Australian System of National accounts, Concepts, sources and methods", Australian Bureau of Statistics, December 2000.

Triplett, J.E. (1992)

- "Economic theory and BEA's alternative quantity and price indexes", Survey of Current Business, April 1992, pp. 49-52.

United Kingdom, Central Statistical Office (1976)

- "The measurement of changes in production", London, March 1976.

United Nations

- _____, "A System of National Accounts", Studies in Methods, Series F, No. 2. Rev. 3. Statistical Office, Department of International Economic and Social Affairs, New York, 1968.
- _____, "Guidelines on principles of a system of price and quantity statistics", Statistical Papers, Series M, No. 59, Statistical Office, Department of International Economic and Social Affairs, New York, 1977.
- _____, "Manual on national accounts at constant prices", Statistical Papers, Series M, No. 64. Statistical Office, Department of International Economic and Social Affairs, New York, 1979.
- _____, "Manual on producers' price indices for industrial goods", Statistical Papers, Series M, No. 66. Statistical Office, Department of International Economic and Social Affairs, New York, 1979.
- _____, "International recommendations for industrial statistics", Statistical Papers, Series M, No. 48, Rev. I. Statistical Office, Department of International Economic and Social Affairs, New York, 1983.
- _____, "System of National Accounts 1993", Brussels/Luxembourg : Commission of the European Communities - EUROSTAT ; New York : International Monetary Fund ; Paris: Organization for Economic C-operation and Development ; Washington, D.C. : United Nations Department for Economic and Social Information and Policy Analysis, Statistical Division : Economic Commission for Europe : Economic and Social Commission for Asia and the Pacific : Economic Commission for Latin America and the Caribbean : Economic Commission for Africa : Economic and Social Commission for Western Asia : World Bank, 1993.

Whelan, K. (2000)

- "A guide to the use of chain aggregated NIPA data", Division of Research and Statistics, Federal Reserve Board, June 2000.

Bibliography

Young, A. H. (1965)

"Estimating trading day variation in monthly economic time series", Technical Paper 12, Washington D. C.: U. S. Bureau of Census.

Young, A. H. (1992)

"Alternative measures of change in real output and prices", Survey of Current Business, April 1992, pp. 32-48.

Young, A. H. (1993)

"Alternative measures of change in real output and prices, quarterly estimates for 1959-92", Survey of Current Business, March 1993, pp. 31-41.

Index

A

Additive seasonal adjustment	41
Annual GDP by industry	35
Annual revisions	44
ARIMA	38

B

Base year	26-28
Basic prices	12, 17
Benchmark adjustment	35
Benchmarks	35
Business cycle	38
Business sector	15, 16

C

Calendar variations	38
Chain volume measures	31
Chained Fisher volume index	13
Chaining	13, 28
Classification schemes	22
Commodity accounts	15
Commodity classification	22
Constant prices	12, 26, 42
Current prices	26, 47
Currently weighted Paasche index	13

D

Deflation	13, 29
Deflator	29, 47
Direct deflation	18
Division level industry	24
Domestic	11
Double deflation	17

E

Economically insignificant prices	16, 17
Economically significant prices	15
Establishment	9, 22, 49
Expenditure based GDP	7, 13, 14

F

Factor incomes	12
Factors of production	7, 12
Fisher type volume index	32
Fixed weighted Laspeyres index	13, 31

Index

G

Goods	9, 11
Goods producing industries	24
Gross output	7

H

Historical revisions	44
Housework	10

I

Income based GDP	7, 12
Industrial classification	22
Industrial Product Price Indexes	31
Industry	9
Industry accounts	15
Input-Output tables	15, 17
Intermediate inputs	10, 17

L

Labour input	19
Laspeyres volume indexes	26, 29
Link level industry	23

M

Major groups	24
Market prices	12
Modified basic prices	16
Monthly GDP by industry,	35
Monthly revisions	43
Monthly values of GDP by industry	42
Moving averages	40
Multiplicative seasonal adjustment	41

N

NAICS	22
Net output	18
New products	27
Non-business sector	15, 17
North American Industry Classification System	22

O

Output	7
Output based GDP	7, 12, 14
Output indicator	20

P

Paasche price indexes	26
Paasche type volume indexes	32
Price deflation	30
Price index	18, 29
Prices	26
Primary activity	9
Primary inputs	12
Principal Commodity Groups	25, 31
Prior adjustment	41

Production	9, 11, 18
Proxy indicator	19
Purchasers' prices	17
Q	
Quadratic minimization	36
Quality of GDP estimates	21
Quantities	26
Quarterly values of GDP by industry	42
R	
Rebasing	27, 28
Relative prices	27
Revisions	21, 40
S	
Seasonal adjustment	21, 39
Secondary activity	9
Services	9, 11
Services producing industries	24
SIC	22
Special aggregations	24
Standard Commodity Classification	24
Standard Industrial Classification	22
System of National Accounts	7
T	
Taxes and subsidies	7, 12, 13, 17
Trading day adjustment	38
Trend	37
U	
Unit values	28
V	
Value added	10
Volume of production	28
W	
Worksheet level industry	23
X	
X11ARIMA	38, 39