CATALOGUE No.
61-502
OCCASIONAL

CANADA

REVISED INDEX OF INDUSTRIAL PRODUCTION

1935 - 1957

(1949 = 100)

Reference Paper

DOMINION BUREAU OF STATISTICS
Research and Development Division
Business Statistics Section

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NOTE

This reprint of Catalogue No. 61-502 does not include Appendix D, Monthly Industry and Commodity Indexes.

The data contained in Appendix D have been superseded by the series published in the May, 1966 and May, 1967 issues of the annual Supplement to the Monthly Index of Industrial Production, Catalogue No. 61-005.

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Reference Paper
(Formerly No. 34, Revised)

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FOREWORD

The Dominion Bureau of Statistics has been publishing a monthly index of industrial production since the early 1920's. Important revisions in this index have been made over the years to improve its reliability and usefulness as a major indicator of economic activity. The last revision of the index, together with a description of concepts, sources and methods was published early in 1953 in D.B.S. Reference Paper No. 34 and covered the period 1935-1951.

This report presents the results of the latest revision in the Index of Industrial Production and covers the period 1935 to 1957. The new index is expressed in terms of 1949 = 100 and this change in the reference base from that of the previous index (1935-1939 = 100) makes for a striking difference in the level of the revised series. In 1957, the index on the new base is in the 150's compared with a level in the 280's on the old 1935-1939 base, so that a change of one point in the new index is equivalent percentage-wise to a change of nearly two points in the old series.

As in the previous revision, the emphasis in the new index was placed on constructing annual bench-mark indexes for all industries from comprehensive data derived from the annual censuses of mining, manufacturing and electric power utilities. In the old series, annual bench-mark levels were computed from 1935 to 1947; in the present revision these were extended to 1953 for all industries and to 1955 for some of the more important industries represented by man-hours in the monthly index. Except for a limited number of revisions, the 1935-1946 bench-mark indexes were incorporated in the new index without change, but were arithmetically converted to the 1949 base and linked in 1946 to the bench-marks for the later period. As in the old series bench-mark indexes of the **volume of net output** (census value added in constant dollars) were developed for as many industries as possible and detailed census of industry data on production, materials, fuel and electricity were carefully analysed for this purpose. The bench-mark indexes were extended forward to the current period by means of available monthly information on production, shipments, materials or man-hours. It is planned to revise the annual levels for the current period in the light of census data as they become available.

Although the trend of the old index was similar to that of the revised series the level was progressively falling behind, largely as a result of the use of unadjusted man-hours to represent output in a sizeable proportion of manufacturing industries. In the new index, special adjustments were developed for these industries, whereby changes in output per reported man-hour are estimated for the current period on the basis of past trends in the bench-mark indexes and related current information.

Another feature of the new index is the introduction of new seasonal adjustment factors. The seasonal factors for nearly 100 individual series were calculated in Washington on the Bureau of the Census electronic computer according to the Univac Method II programme and represent an important advance over the laborious hand method heretofore used for major industry groups only.

The annual and monthly indexes contained in this report supersede the volume of production indexes currently appearing in the "Canadian Statistical Review". The indexes will be published henceforth on the revised basis only. The February, 1959 issue of the "Canadian Statistical Review" will contain the new indexes up to the last available month.

This publication describes the techniques of production index number construction. Although not as elaborate as the last reference paper in certain aspects of the work, the principal methods, together with recent innovations are fully discussed to provide in a single document a complete description of the concepts and methods used in compiling the annual and monthly indexes. The report is divided into two parts and a number of appendices. Part I reviews the concepts and methods used in the construction of the indexes and discusses the major problems encountered and how they were handled. Part II contains a brief analysis of production trends over the period covered by the index. A comparison of the revised index with the old series together with an appraisal of the new index are also presented in this section. These two parts are followed by a series of appendices comprising tables of annual and monthly indexes (both unadjusted and seasonally adjusted) and descriptive material.

The present volume was prepared in the Business Statistics Section of the Research and Development Division of the Dominion Bureau of Statistics. Throughout the project helpful advice was given by various divisions of the D.B.S. In particular, the co-operation and assistance of the Industry and Merchandising Division, the Labour Division, the Prices Division and the National Income and Special Projects Sections of the Research and Development Division are gratefully acknowledged.

WALTER E. DUFFETT,
Dominion Statistician.

SYMBOLS

The interpretation of the symbols used throughout this publication is as follows:

.. not available.

p projected on monthly data or subject to revision.

* net index projected using gross bench-mark indexes.

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Concepts and Methods

1. Introduction

The new Index of Industrial Production forms part of the D.B.S. programme of periodically reviewing and re-issuing important statistical series. The monthly index presented herein has been completely revised, with a view to improving its usefulness as one of the main current indicators of business activity. The industries covered by the Canadian Index of Industrial Production, viz., Mining, Manufacturing and Electric and Gas Utilities, accounted for nearly one-third of the total value of all goods and services produced in Canada in 1949. While the index is based on the industrial divisions of the economy that are particularly sensitive to short-term influences, it also reflects variations in overall economic activity. For example, the output of mines and factories is closely associated with that of transport and trade although the latter is mainly concerned with the distribution of commodities. The barometric nature of the industrial sector covered by the index enhances its value as an indicator of short-term movements. It is also useful in the interpretation of long-term economic developments.

The last revision of the index was published early in 1953. In view of the long period required for development and compilation in a project of this size, it was not possible at that time to acquire the basic data necessary to establish a proper post-war base period, and the index remained in terms of 1935-1939=100. But the need for a more up-to-date base period became increasingly evident. The relative importance of the industrial components of the index had changed materially since the pre-war period; differences in price movements in the last 20 years, combined with considerable variations in volume of output among industries, required that early attention be given to changing the weight-base of the index. In addition, users were finding it cumbersome to examine figures relating to such a remote period and many were actually converting the index to a more recent year. In line with the Bureau's present policy of using 1949 as the base year for most of the major indexes, the new production index was compiled in terms of 1949=100.

Another important factor was the need for adjustment to more recent bench-marks. (The term bench-mark is used to indicate annual index levels based on comprehensive Census of Industry data). The last revision of the index incorporated annual Census of Industry data up to 1947 for most industries and up to 1949 and 1950 for some of the more doubtful components. These bench-mark levels were projected on the basis of available monthly series of commodity production, materials, deflated values or man-hours. Although the trend of the old index was similar to that of the revised series the level was progressively falling behind, largely as a result of the use of unadjusted man-hours as indicators of output for a substantial proportion of manufacturing industries. New Census of Industry bench-marks were developed for the period 1946-1953 for all components; bench-mark indexes were extended to 1955 for the more important industries measured by man-hours in the monthly index. In addition, special adjustments were developed for industries represented by man-hours in the current index involving the projection of changes in output per reported man-hour into the current period. This projection is based upon an analysis of past trends in the bench-mark series and on related current data.

As in the old index, the largest possible number of industry bench-mark indexes were compiled in terms of "net output" (that is, constant dollar outputs less constant dollar inputs of materials, fuel and electricity). These net indexes represent 42 per cent of the total weights in the bench-mark series. A number of new monthly production series were incorporated, raising the proportion of manufacturing industries represented by output data in the new monthly index to 46 per cent.

A main feature of the revised index is the introduction of new seasonal adjustment factors which incorporate the latest methods developed by various experts in this field. For purposes of seasonal adjustment the index was divided into 96 components. These component indexes were prepared for seasonal adjustment at the D.B.S. and then forwarded to the Bureau of the Census in Washington for calculation on an electronic computer. These new seasonal adjustments represent a considerable saving and a marked advance over the laborious hand method, heretofore used for major industry groups only.

The principal features of the revision outlined above are discussed more fully in following sections of the report.

2. Scope and Classification

The Statistical Office of the United Nations recommends that member nations include in their indexes of industrial production the following divisions of the International Standard Industrial Classification: mining and quarrying, manufacturing, construction and, within the public utilities division, the major groups of electricity and gas. Because of the difficulty of obtaining satisfactory monthly data on total volume of construction, the coverage of the Canadian index is limited to mining, manufacturing and electricity and gas. If a suitable monthly indicator for construction can be developed, the question of broadening the scope of the index will be reconsidered.

The framework of the revised index, which is based on the D.B.S. Standard Industrial Classification (S.I.C.) is substantially the same as that of the old index, with two major exceptions. In the

Dairy Products Industry, the pasteurization and bottling of milk and cream by reporting dairies were included as manufacturing activity, in line with the proposed revision of the S.I.C.; this activity had been excluded from the previous index. The other major change was the treatment of the electricity and gas sector. In the old index, this sector was represented by electric power and manufactured gas, and the volume indicators for these components did not reflect changes in their pattern of distribution. Although the distribution of gas and electricity cannot be separated, in practice, from their production, arbitrary adjustments were made in the old index in order to measure output at the production site. This made the series invariant to changes in the nature of service provided to consumers. According to the S.I.C., electric and gas utilities comprise the production and distribution of electric power and manufactured gas and the distribution of natural gas (the production of natural gas wells is classified to mining). The revised index for this sector follows the S.I.C. definition; it shows a sharper increase throughout the period covered than the previous index based on the production concept only (see Part II). These changes in the treatment of dairy products and electric and gas utilities were extended back to 1935.

The annual census of manufactures, from which the bench-mark indexes for the manufacturing industries were computed, covers practically all manufacturing establishments but excludes work in the home. In the S.I.C., industries are defined to cover all activities carried out by reporting establishments which are classified according to their principal activity. The census of manufactures, however, relates essentially to manufacturing activity in that it is designed to exclude from the principal statistics non-manufacturing operations that may be carried out by reporting establishments, such as construction by own labour force, direct sales to consumers through attached retail outlets, transportation by own motorized fleets, etc. Establishments can, in general, report information on the physical movement of goods from manufacturing plants. However, the accounting records of reporting establishments do not always permit the segregation of manufacturing activity from other allied functions in the valuation of output, so that non-manufacturing operations may be indirectly reflected in the reported data. For instance, accounting records may be so designed as to provide unit value data only at some distributing outlet apart from the plant, and figures on value of shipments would therefore contain some transportation and handling costs not directly associated with plant activity. Where such accounting problems are known to exist, adjustments are made to the reported data. The problem of defining an "establishment" or "reporting unit" for statistical purposes is at present under review and will have an important bearing on the implementation of the revised S.I.C.

Although repair work performed in connection with a service trade, such as boot and shoe repairs, automobile repairs, etc., is included as part of the manufacturing industry in the present S.I.C. framework the census of manufactures generally excludes establishments engaged in this activity. The census, however, covers repairs carried on under essentially industrial conditions, such as ship and locomotive repairs, so that only industrial-type repairs are included in the index.

The coverage of the Mining Industry for purposes of the index is restricted to the production of minerals and excludes Prospecting and Contract Drilling which are classified to Mining in the S.I.C. Electric and Gas Utilities are part of the major division "Public Utility Operation" in the present S.I.C.; water and sanitary services which also form part of this division are not covered in the index.

In order to facilitate analysis of the series, the manufacturing industries, as in the past, were grouped under two broad headings: non-durable manufacturing and durable manufacturing. Generally speaking, the basis for this grouping is the length of time the products represented by the industries will normally survive. The demand for consumer goods such as foods, clothing, tobacco, etc., which ordinarily are used up within a relatively short time after purchase, is not so susceptible to sudden changes as are durable goods such as automobiles, electric appliances and heavy equipment whose purchase can be more readily postponed or accelerated according to the inclination and resources of the buyer. Although all materials purchased by producers for further processing can be said to be non-durable, the markets for these materials follow closely those of the final products into which they are made, so that it is preferable to assign them to the same category of durability as the finished goods.

In assigning industries to the broad groupings of durable goods and non-durable goods, it is only practicable to classify at the major group level (2-digit industries in the S.I.C.). This means that certain 3-digit industries, classified as durable, more properly belong in the alternative category and vice versa. While the groupings are thus only approximate, they have proved useful in economic analysis. The classification of the major groups in the new index is the same as in the previous index with one exception: the "Miscellaneous Manufacturing" group, assigned to durables in the old index, is now classified to non-durables.

Classification according to economic use, e.g., consumer goods and capital goods, involves more difficulty since many intermediate commodities have alternative uses. No such classification was attempted in the project outlined here. It is planned, however, to develop a current index of consumer durable goods; the recent inauguration of monthly surveys of small appliances production makes the compilation of such a series feasible. This special index would be constructed in a different manner than the present industrial indexes in that the components would be commodities instead of industries and they would be combined according to their gross values instead of their net values.

Although this index would not form an integral part of the main index, it would be very useful in economic analysis as a supplementary series.

The primary data used in the index to measure changes in the volume of production in each industry are principally in the form of commodity statistics. The annual bench-mark indexes are compiled from census of industry data for which the basic reporting unit is the establishment. In the annual census, establishments are coded to industries according to their major product, material or type of process; the same commodity may be a major product in one industry and a minor product in another. Commodities of the same type can therefore appear under more than one industry heading. Monthly surveys, unlike annual surveys, are compiled on a commodity basis and provide total data on the products covered, irrespective of the industries in which the producing establishments are classified. For example, margarine is produced in quantity by establishments classified to the meat packing, process cheese and miscellaneous foods industries. Thus in the annual census surveys, margarine appears as a product in the three industries and is included in the bench-mark index for each of these industries. However, in the monthly survey on margarine, all the establishment returns are summed to provide total output of the product and this total cannot be used to represent margarine production in any one of the three industries involved in its manufacture. For purposes of the monthly production index, therefore, total margarine production is subdivided into three components, each assigned to its proper industry according to the establishment classification used in the annual census. This procedure is used only when the quantities are large enough to affect significantly the monthly indexes of more than one industry. Where the bulk of a particular commodity is produced in a single industry, even though relatively small amounts are made as secondary products in other industries, the total is used in the monthly index to represent the industry which produces the largest share.

3. Definition and Relation to National Accounts

In its more popularly accepted form, the term "production" is generally used in relation to the finished product; a manufacturer of wool cloth for instance, is said to be engaged in the "production" of wool cloth, and this is true in the sense that wool cloth is the "end product" of that particular manufacturer. However, when it comes to measuring the "production" of the wool cloth industry and combining its output with that of other industries, it is the contribution to total production or "value added" by each productive unit that is relevant. In 1956, the wool cloth industry and the hosiery industry each manufactured goods with a factory selling value of about $63,000,000. From the point of view of "gross value of production" both industries are on an equal basis. However, wool cloth manufacturers used up $37,000,000 of purchased materials, fuel and electricity, while hosiery establishments consumed only $26,000,000 of such materials. The "value added" of the hosiery industry (value of products less value of materials, fuel and electricity used) is therefore considerably greater than that of the wool cloth industry, and its relative importance in terms of contribution to manufacturing "work done" is correspondingly higher. In other words, the figures indicate that the hosiery producers applied relatively more "processing" to their raw materials than did the wool cloth manufacturers. This is further borne out by the amounts of salaries and wages paid out by the two industries; employee earnings in the hosiery industry totalled $22 million while those in the wool cloth industry were only $18 million.

Moreover, a large proportion of wool cloth establishments are "intermediate" producers in that a large proportion of their output is purchased by clothing manufacturers for further processing; the wool cloth so consumed reappears at a later stage in the form of suits, coats, etc. Therefore, if industries are summed on the basis of "gross value of production" the combined total contains a large amount of duplication; on the other hand, if the summation is based on "value added" most of the double counting is eliminated (see below). Thus when combining industry indexes of output, each component should be so "weighted" in the compilation as to reflect its net contribution to the total.

The concept of "value added" is generally associated with mining and manufacturing industry statistics and has been used for many years in the presentation of data derived from the annual census surveys of these industries. (Statistics are available, however, to measure the concept completely or in part for a number of other industries). While it is possible to derive quantitative industry measures of "value added" from data collected in annual census surveys a considerable time lag can develop before the statistics are assembled, processed and compiled in the desired form. Moreover, the data required for "value-added" measurement are not available on a monthly basis. Thus the measurement of the "value-added" concept is restricted to bench-mark indexes and is also used in the development of the "weighting" system which measures the relative importance of each component industry in the base period. All of the monthly production indexes are "gross" indexes interpolated between or linked to "value-added" bench-marks; when these indexes are aggregated by means of "value added" base weights the result approximates total "value added" in volume terms to the extent that the volume of "value added" per unit of gross output has not changed over the period measured. This assumption of invariability in the short run, in volume of unit "value added" at the total level, appears reasonably sound.

The concept of "value added" described above consists of subtracting the value of commodity materials, fuel and electricity consumed in the production process from the gross value of output. While this concept, which will henceforth be referred to as "census value added" is appropriate to achieve a measure of consistency and eliminate

duplication within the sectors covered, it is not entirely suitable for purposes of aggregating all industries in the economy; it still contains the cost of such services as insurance, advertising, communications, etc., which originate in industries outside the commodity-producing sector. Data on business costs by industry are not, at present, obtainable. Thus, in producing global "industry" estimates of output, whereby commodity and service industries are combined into a national aggregate, a more refined "net" concept is required.

The production approach used in the Index of Industrial Production is now being applied to all the other commodity and service industries in the economy with the object of eventually publishing on a regular basis an overall series of total production by industry. It was therefore considered desirable to develop a comprehensive weighting system that would serve the needs of both the present index and the global series as well. In this way the industrial production index would be an integral part of the overall index, and the weighted components of the index directly additive to the weighted indexes for the other commodity and service industries when they are completed.

The present revision of the index incorporates two weighting systems; one is based on the pre-war period 1935-1939, and is applied to the series from 1935 to 1946; the other is based on 1949 and is used for the period since 1946. For the 1935-1939 system, National Accounts industry data (adjusted for classification differences) were supplemented by a special 1936 survey of manufacturing expenses carried out for the Rowell-Sirois Commission.[1] Weights for 1949 were based on data developed for purposes of the 1949 Inter-Industry Flow Table.[2] (See Section 7)

In developing estimates of overall physical output of goods and services by industry, the objective is to measure the concept of Gross Domestic Product at Factor Cost.[3] In National Accounts terminology, this is equal to Gross National Product at Market Prices less indirect taxes, plus subsidies and adjusted for interest and dividends paid to and received from non-residents. When measuring production from an industry approach, what is being measured is output by industries **located in** Canada, not the output of factors of production **resident** in Canada; hence **domestic** product rather than **national** product. Gross domestic product equals gross national product minus factor shares (chiefly interest and dividends) received by Canadian residents from foreign countries plus factor shares (again, chiefly interest and dividends) paid by Canadians to residents of foreign countries.

In measuring the contribution of each industry to gross domestic product, it is recognized that the objective is to show the allocation of total resources used in the process of production. However, certain industries such as tobacco products and alcoholic beverages have traditionally been subject to much heavier sales and excise taxes than most other industries and an industry weighting system based on values that included these taxes would distort the relative contribution of industry factors of production. To a lesser extent this is also true of subsidies. Moreover, it is preferable that the industry weights be made invariant to any changes in indirect taxes, particularly in view of the fact that the weighting system is changed only periodically. Hence, the concept of factor cost rather than market prices is used. Gross domestic product at factor cost equals gross domestic product at market prices minus indirect taxes plus subsidies. It should be noted that the rationale of using factor cost to represent resources used in an industry depends upon an assumption of competitive conditions. If monopoly elements influence either market prices or factor payments, then the relation between the factor payments and output is distorted.

The inclusion of capital consumption allowances makes the concept of Domestic Product "gross"; if these allowances are subtracted the product is said to be "net" since it is measured after the deduction of output necessary to replace capital used up during a given period by wear, tear, obsolescence, etc. For general purposes the gross measure is the more significant since it incorporates all the resources used in each industry in the process of production. Moreover, statistical difficulties involved in the separate measurement of capital consumption allowances by industry make it more feasible to restrict the industry estimates to the gross concept rather than attempt to measure net product originating in each industry.[4] Gross domestic product at factor cost equals net domestic product at factor cost plus capital consumption allowances and miscellaneous valuation adjustments.

The measurement of "Gross Domestic Product at Factor Cost" (henceforth referred to in this report as G.D.P.) could be obtained via the "census value added" approach if such costs as advertising, insurance, repairs, communications, etc., purchased from other businesses could be deducted from the census value added of each industry (the latter already excludes major indirect taxes such as sales and excise taxes). The residual would then consist (after adjustment for other indirect taxes and sub-

[1] The Royal Commission on Dominion Provincial Relations, 1937-1940.

[2] Published in D.B.S. Reference Paper No. 72 "The Inter-Industry Flow of Goods and Services, Canada, 1949".

[3] For a more complete discussion of this concept, see Section D of "National Accounts-Income and Expenditure, 1926-1956", D.B.S.

[4] The terms "gross" and "net" in National Accounts terminology have a different meaning than when used in connection with Census of Industry data. The terms "net output" and "net value" are often used to denote "census value added" which is "net" in the sense that the value of materials, fuel and electricity is deducted from the value of output. This removes inter-industry duplication of these items but the measure still contains such costs as insurance, advertising, etc., which also originate in other industries. To arrive at "Gross Domestic Product" these additional costs have to be deducted.

sidies) of factor incomes and capital consumption allowances (primary inputs) and would represent G.D.P. originating in each industry.

As this approach is not feasible at present, the alternative is to sum directly, for each industry, the incomes of the various factors of production plus capital consumption allowances. This was the approach adopted in the development of the data used as the basis for the major categories of the weighting system for the indexes of overall real output. It should be noted here that it is not at present practicable to attempt to measure the year-to-year volume movements of the factor incomes since no statistical measures have as yet been developed to express such factors as profits and depreciation in quantitative terms. The sum of the factor costs plus depreciation for each industry is used to determine the net relative importance of that industry in a year or period of years chosen as an appropriate base period. These "weights" or G.D.P. estimates in the base period are then projected by means of physical production series in order to obtain G.D.P. in constant dollars for all industries in the economy or for significant groups of industries. These constant dollar series (or indexes) are so compiled that the relationship between the various primary inputs in each industry is kept constant. That is to say that profits per unit of output, wages and salaries per unit of output, depreciation per unit of output, etc., for each industry are held constant at base period rates. In actuality these rates are continually changing, with the result that a comparison between a measure of physical production and a measure of any or all factor incomes and depreciation (expressed in some meaningful quantitative terms) would reveal changes in "productivity" over time. The most popular and, at present, practicable of these comparisons is that of labour input and physical production whereby changes in output per man-hour are measured over a period of years. For a fuller discussion on this subject see section 16.

The concept of product originating in each industry excludes non-operating revenues (revenues not arising from the production of goods and services). Therefore, interest and dividends received by an industry are not included in the gross domestic product originating in that industry. They represent payments to factors of production in the domestic industries making these payments (interest and dividends originating from foreign sources are excluded entirely from domestic product). The adjustment is achieved by deducting interest received from interest paid (dividends received by Canadian companies from other domestic companies are already excluded from profits as derived, for National Accounts purposes, from compilations made by the Department of National Revenue) leaving only the net interest (paid less received) in the G.D.P. originating in the industry.

In the National Accounts industrial distribution tables, rents are treated as operating revenue and shown as income originating in the industry which owns the property. In the real output series, in order to keep industrial output free of investment income, non-residential rents were set up as a "dummy" industry within the real estate group which receives all rents and purchases all inputs associated with the rental of buildings. For example, if a chemical manufacturer invests in a building and in turn rents it to a department store, the net rental income is allocated not to the chemical industry but to the real estate industry.

In deriving data on the incomes of the various factors of production and capital consumption allowances for each industry, it must be recognized that certain financial items such as profits do not lend themselves easily to an industry classification when the reporting unit is the establishment. No difficulties arise in the case of single establishment firms. Many firms, however, operate several establishments that can be coded to different industries according to the nature of their principal products or types of activity. For instance, many major pulp and paper companies operate large wood cutting establishments which, according to the S.I.C., are classified to the forestry industry while the pulp and paper mills themselves are manufacturing establishments. While such factor incomes as salaries and wages can be primarily recorded by establishments and thus allocated, if necessary, to different industries, other items such as corporation profits, other investment income and capital consumption allowances generally apply to a firm's total operations, and any allocation of these factors between establishments of the same firm must, of necessity, be rather arbitrary. Estimates of factor incomes and depreciation were developed for about 50 industry categories of the S.I.C. for purposes of the 1949 Inter-Industry Flow Table and contained adjustments to transfer financial items from a company to an establishment basis for firms crossing industrial lines. These adjustments are not incorporated, at present, in the industrial distribution tables of the National Accounts publications.

In adopting the data from the 1949 Inter-Industry Flow Table for purposes of the real output weighting system certain adjustments were applied to conform more closely with the nature of the statistics available for the measurement of production and to meet the analytical needs of users of the indexes. Because of the close integration of the non-ferrous metal smelting and refining industry with the metal-mining industry, the two industries were combined under mining in the input-output table. For purposes of the production index, G.D.P. - originating weights were estimated separately for the two industries and non-ferrous smelting and refining was classified to manufacturing in accordance with the S.I.C. While, in the Inter-Industry Flow Table, all construction activity (including new construction and repairs by establishments with their own labour force) was classified to the construction industry, in the real output weighting system production arising from own account repairs (based on the industrial distribution of own account repair salaries and wages) was left with the industries originating the work, as part of

their contribution to G.D.P. No data are available to measure this type of production on a current basis, and it is assumed that the amount of such repair activity will maintain a constant relationship with the industries' major activity over the period covered by the index. Other minor classification adjustments were applied to the Inter-Industry Flow Table's G.D.P. figures to accommodate the production data used in the index. Adjustments were also made in the light of the changes being effected in the revised National Accounts tables; these concerned mostly industries outside the scope of the production index. The Inter-Industry Flow Table already contained adjustments to the industrial breakdown of profits to remove from profits any unrealized gains or losses on inventories which occurred (in 1949) as a result of compiling inventories at book value. To be consistent with the valuation of production, inventories should be valued by multiplying the physical change by weighted average prices during the year. The difference between this computation and the reported book value figures is called the "inventory valuation adjustment"; this adjustment has now been incorporated in the revised National Accounts released in 1958.

Thus the aggregate of G.D.P. which forms the basis of the overall real output 1949 weighting system is slightly different from the corresponding G.D.P. total published in the revised National Accounts and fractionally different from the G.D.P. aggregate derived from the Inter-Industry Flow Table contained in D.B.S. Reference Paper No. 72. The Inter-Industry Flow Table is being amended to correspond with the revised National Accounts G.D.P. aggregate. Real output weights will be revised accordingly by the time the overall real output series is ready for publication. These changes have relatively little effect on the sectors covered by the Index of Industrial Production, and for practical purposes, the present weighting system for the index represents an integral part of the overall 1949 system.

4. Change of Reference Base Period

The new 1949 reference base makes for a striking change in the index. On the base of 1935 - 1939 = 100, the old index stood at about 200 in 1949; the effect of expressing it in terms of the more recent base was thus to reduce the level by one-half in 1949. In 1957, the index on the new base is in the 150's compared with a level in the 280's on the old pre-war base, so that a change of 1 point in the new index is equivalent percentage-wise to a change of nearly 2 points in the old index.

At the time of the last revision, published in 1953, annual bench-mark indexes were computed for the period 1935 - 1947 for all industries on the base 1935 - 1939 = 100. The present revision incorporates annual bench-marks for the period 1946 - 1953 for all industries on the new base 1949 = 100. Certain revisions were made to the 1935 - 1947 annual indexes as a result of the availability of more recent data and of changes in classification. The weighting system of the indexes for this earlier period was also revised at the industry group level. In order, however, to maintain continuity of the series throughout the period from 1935 to the present, each annual industry and group index for the years 1935 - 1946 was re-expressed in terms of 1949 = 100. This was done by projecting back from 1946 each new annual index (base 1949 = 100) on the basis of the year-to-year percentage changes in the old bench-marks based on 1935 - 1939 weights. This linking procedure was applied separately at each level of detail so that in effect the indexes for each industry, sub-group, group, major division and total embody the effects of two weighting systems. Prior to 1946, industries and sub-groups thus linked cannot be re-weighted to give their linked totals. Monthly indexes throughout the 1935-1946 period were re-expressed in terms of 1949 = 100 (at the group level only) by interpolating the old monthly indexes for these groups between the converted bench-marks.

5. Formulae Used

The formulae used in the Index of Industrial Production are of the base-weighted Laspeyres type. In constructing individual industry indexes using annual Census of Industry survey results the form adopted was that of a relative of aggregates in which unit values at the plant during the period chosen as the weight-base were used to fix the relative importance of each item. The algebraic expression is $\frac{\Sigma q_1 \, p_o}{\Sigma q_o \, p_o}$ where q_1 and q_o represent the physical volume of a commodity in a given period and in the weight-base period respectively and p_o represents the value per unit of each commodity in the weight-base period. Much use is also made of this formula in the monthly computations where commodities are combined into industries.

In combining individual industry indexes into major groups and sub-groups, the form adopted both for the annual and monthly indexes was that of an arithmetic average of relatives in which G.D.P. originating in the weight-base period was used to represent the relative importance of each industry. This formula is $\frac{\Sigma \left[W \frac{q_1}{q_o} \right]}{\Sigma W}$ where W represents G.D.P. originating in each industry in the weight-base period expressed as a percentage of total G.D.P. $\left[\text{or } \frac{q_o \, p_o}{\Sigma q_o \, p_o} \right]$ and $\frac{q_1}{q_o}$ represents the index of production in each industry.

It is readily apparent that the two formulae shown above are arithmetically identical. However, the average of relatives form offers considerable advantage in computation and in the adaptability of the components for purposes of interpretation and analysis. The figures show the exact contribution of each industry component series in terms of points to the total index and can be easily combined into any desired composite. Point contribution studies are of special importance in the interpretation and analysis of current monthly data both on a raw and seasonally-adjusted basis.

In the construction of "net volume of output" or "value-added" indexes the formula is as follows:

$$\frac{\Sigma Q_1 P_o - \Sigma q_1 p_o}{\Sigma Q_o P_o - \Sigma q_o p_o}$$

in which Q and P stand for the quantities and unit values of products and q and p stand for the quantities and unit values of materials, fuel and electricity consumed in the production process. (See Table IV for a sample of worksheet procedures). The resulting "net" aggregates of both numerator and denominator have, of course, the same base-weight characteristics as each of the components.

There are other formulae that can be used in the construction of production indexes. The current-weighted Paasche-type index in which unit G.D.P. or unit values in any given year are assigned as weights reflects the relative importance of the components in the "current" year. Thus, a different set of weights enters into every comparison, and theoretically, the formula is good only for comparison between the current year and another year chosen as the base. This formula in its relative of aggregates form is $\frac{\Sigma q_1 p_1}{\Sigma q_o p_1}$ and in its average of relatives form is $\frac{1}{\frac{\Sigma\left[W \frac{q_o}{q_1}\right]}{\Sigma W}}$ in which W = G.D.P. originating in each industry in the current year expressed as a percentage of total G.D.P. and $\frac{q_o}{q_1}$ is the reciprocal of the index of production for each industry or for each product.

In the Laspeyres formula, the use of fixed weights throughout a period of years in effect maintains the industrial structure which existed in the weight-base period. It may be argued that such a structure almost immediately becomes out of date, as the relationship of individual products within industries or of individual industries within broader groups is constantly shifting. However, these shifts are usually due mostly to increases or decreases in the actual quantities of goods produced and the index, of course, fully reflects changes in the volume of output. But the assumption inherent in the use of the Laspeyres-type formula is that values added or values per unit of output show no change, or change in the same proportion. That relative changes in unit values do occur is readily admitted, and it is also probable that the distortion caused by these changes could assume some significance over an extended period of years. The Paasche-type formula is based on a current weight structure but involves an excessive amount of work and tends to distort comparisons between years other than the base and weight years. Changes due to variations in unit values or values added are likely to be of little importance over a short term of years, and there is little doubt that the Laspeyres formula is the more practical and the more easily understood for current series of industrial production. Although subject to a certain statistical distortion it is a simple concept which permits comparisons between any years of the period covered.

6. Weights and Base Period

For mathematical consistency and ease of interpretation, it is desirable that the reference-base and weight-base periods coincide. However, when the Laspeyres index covers an extended period of time (in this case more than two decades), a single weighting structure becomes increasingly less appropriate as the time period between comparisons becomes greater. This is due to the fact that relative prices tend to diverge more and more as the remoteness from the comparison base increases. In addition it becomes more difficult to account properly for new products and for changes in the classification framework. (See also Section 9, p. 21).

TABLE I. Non-ferrous Metal Smelting and Refining Industry

(Effect of 1935-1939 and 1949 weights)

Product	1935-1939 unit value weights			1949 unit value weights		
	1946	1947	Change	1946	1947	Change
	('000 1935-39 dollars)		%	('000 1949 dollars)		%
Refined nickel	39,280	46,868	+19.3	52,353	62,466	+19.3
Other nickel	10,671	14,175	+32.8	22,083	29,335	+32.8
Refined gold	13,972	11,206	-19.8	14,291	11,461	-19.8
Refined copper	32,435	39,265	+21.1	66,801	80,868	+21.1
Lead	10,933	10,686	- 2.3	52,375	51,192	- 2.3
Zinc	12,649	11,725	- 7.3	49,491	45,877	- 7.3
Aluminum	68,793	105,985	+54.1	58,235	89,720	+54.1
Platinum	4,601	3,573	-22.3	9,182	7,131	-22.3
Palladium	3,172	2,977	- 6.1	5,348	5,019	- 6.1
All other products	13,898	12,865	- 7.4	19,534	18,234	- 6.7
Total	**210,404**	**259,325**	**+23.2**	**349,693**	**401,303**	**+14.8**
Total less aluminum	141,611	153,340	+ 8.2	291,458	311,583	+ 6.9

Differences in price movements in the last twenty years, combined with considerable variations in volume of output as between industries over the same period, resulted in significant shifts in the relative importance of the industrial components of the index. In the old index for instance, unit values (average 1935-1939) used to establish the relative importance of gold and aluminum production were greatly out of line with the general post-war price structure. The price of gold remained unchanged

after 1935 and that of aluminum was actually lower over most of the period than it was just before the war while the prices of most other major commodities rose steeply following the relaxation of controls in the immediate post-war period. The result was that these two important products were considerably overweighted for purposes of post-war comparisons. If their production had generally paralleled those of the industries to which they are classified, no serious distortion would have occurred in the industry movements. Such however, was not the case. The increase in aluminum output in the post-war period greatly exceeded that of other refined metals. This, combined with the high relative weight of aluminum, contributed to an overstatement of the post-war growth of the smelting and refining industry in terms of the post-war price structure. Table I illustrates the actual effects of the 1935-1939 and 1949 weighting structures on the change in the volume of output of the industry between 1946 and 1947. The increase in terms of 1935-1939 fixed prices was 23 per cent while in terms of the 1949 weight structure it was only 15 per cent. Most of this difference was due to the long-term change in the price of aluminum relative to the other products of the industry. In the case of gold, output showed little change in the post-war period while production of other metals rose appreciably. In 1949 the prices of other metals had risen considerably compared with 1935-1939 while that of gold remained pegged throughout the period. Thus, had 1949 weights been used in the old metals index, the large increase in production in the non-gold items since 1947 would have had a heavier weight in the aggregate series and the index of metal mining would have risen more than it actually did. Effects of shifts in the weighting structure of other selected industries are shown in Table II, where the percentage change between 1946 and 1947 using the two weight bases is given. It will be noted that differences are generally not large and that there are offsetting movements.

TABLE II. Effect of 1935-1939 and 1949 Weights on Volume Indexes, 1946-1947

(Selected industries and industry groups)

Industry group	Percentage change: 1947 compared with 1946	
	1935-39 weights	1949 weights
Meat products	−10.3	−10.6
Dairy products	+ 8.9	+ 5.5
Canning and preserving	− 7.4	− 9.5
Tobacco products	+ 3.1	+ 3.1
Rubber products	+46.0	+42.3
Men's, women's and children's factory clothing	− 4.1	− 4.5
Saw and planing mills	+14.7	+16.3
Primary iron and steel	+29.8	+31.0
Non-ferrous smelting and refining	+23.2	+14.8

Aluminum is an exceptional case, but it illustrates clearly a characteristic of base-weighted production indexes. Rapid gains in output of new or expanding industries are usually accompanied by declines in relative prices or relative "values added" per unit or output. This often causes an upward bias in Laspeyres-type indexes when these are viewed in the light of results based on a more up-to-date weighting pattern. In the present case it was not feasible to compare the effects of changing weights at the commodity level on long-term comparisons; further testing on longer periods would be desirable, time and resources permitting. Table II shows the effects on comparisons between two adjacent years, the data having been compiled as a result of having a one-year overlap between the series based on 1935-1939 weights and those based on 1949 weights. On balance, differences were negligible. The percentage changes between the two years in the total Index of Industrial Production computed on both weight bases were practically identical, although results were affected somewhat by changes in the treatment of the data used to compute the indexes in the more recent period; the industries chosen for the Table II comparisons were among those that were compiled according to the same method in both periods.

Although the new index is presented in terms of 1949 = 100 throughout the period covered, it was compiled on the basis of two separate weighting systems. It was decided to retain the 1935-1939 weight structure for the period 1935 to 1946 as the pre-war price pattern appeared more appropriate up to the time when price controls were relaxed. The wholesale price index rose more during the three years 1946 to 1949 than it did during the seven years between 1939 and 1946. In such a sudden upward movement, price relationships are likely to diverge from their previous pattern which, in this case, had been influenced by fairly rigid war-time controls. Accordingly, the price structure of 1949 was judged more appropriate to the post-war period and the 1949 weighting pattern was used for the period 1947 to date. The indexes on the 1949 base were calculated back to 1946 and linked in that year to the indexes on the 1935-1939 base as outlined in the preceding section. Hardly any distortion in the year of overlap at the Industrial Production and Manufacturing levels resulted from this procedure, although considerable differences developed in the case of certain components; these, however, were mostly offsetting.

The incorporation of a dual weighting system in an index expressed in terms of a single reference base results in some statistical distortion. While the indexes from 1946 to the present are mathematically consistent in that individual indexes weighted with the 1949 weights will sum at all levels to the group indexes and the total (the weight base and the reference base coincide for this period), the same consistency is not characteristic of the 1935-1946 period where the indexes are in terms of 1949 = 100 while the weights are based on the average of the period 1935-1939. For current comparisons, the

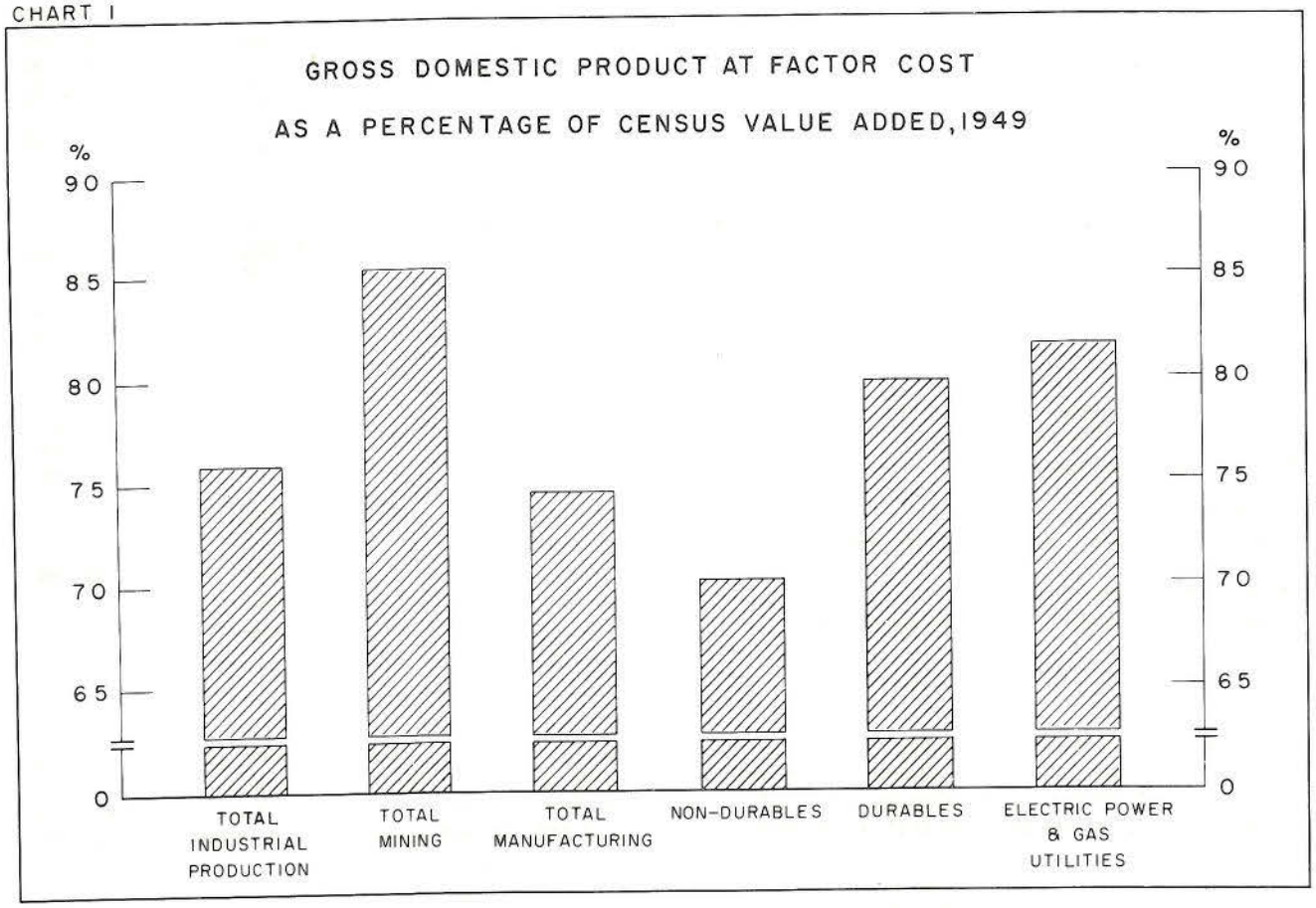
new post-war weighting system had several advantages. It permitted the proper incorporation of important new products such as uranium, television sets and primary plastics. It also reflects more accurately for purposes of current analysis the relative importance of such fast-growing industries as petroleum and iron ore mining and aluminum refining. In addition, it made possible alterations in the classification system of the index in line with recent changes in the presentation of the basic industrial statistics. It is planned to review the weighting structure in a few years time when the data from the 1961 industrial and decennial censuses become available.

7. The Industry Weighting System

As indicated earlier, G.D.P. forms the basis of the weighting systems of the revised index. In the old index, only the major division weights (for total mining, total manufacturing and total electricity and gas) in 1935-1939 were based on National Accounts industry data adjusted for differences in classification; below this level, major group and industry weights were based on "census value added". In the present revision, the G.D.P. weight concept in the 1935-1939 structure was extended to the 17 major groups in manufacturing. This was accomplished by exploiting the 1936 data on purchased services by manufacturing industries contained in a special study for the Rowell-Sirois Commission by Donald C. MacGregor and published in the Review of Economics and Statistics, XXVIII (May, 1945). The procedure consisted of subtracting the appropriate estimated service costs by industry groups as indicated in the study from the corresponding industry group "value-added" data to arrive at a G.D.P. figure for each group. The 1936 study was based on a sample survey of companies and was rather incomplete in certain areas. Furthermore the results for 1936 were assumed to be representative of the 1935-1939 period. Admittedly the derived G.D.P. figures are only approximate but they appear reasonable in the light of more complete data available for 1949 and are believed to represent the desired concept at this level more accurately than the "value-added" data. Below the S.I.C. 2-digit level, the G.D.P. group weights were distributed by industries on the basis of "value added".

The 1949 weighting system is derived from the industry data developed for the 1949 Inter-Industry Flow Table. It was possible to obtain G.D.P. valuations for 31 manufacturing classifications, 6 mining industries and 2 electricity and gas components. As outlined in a previous section, these figures were derived directly by adding the factor costs and depreciation allowances for each industry group. Below the level of G.D.P. detail obtainable from the Input-Output study, industry weights were distributed according to "value added". Thus the amount of industry G.D.P. detail is greater in the 1949 system than in the 1935-1939 structure and it must be presumed that the group and aggregate indexes from 1946 to date are more precise on this count than the corresponding series for previous years.

CHART I



Differences between G.D.P. and "value-added" weights are illustrated in Chart I. In each case, of course, G.D.P. values are smaller because they exclude the cost of purchased services, but there are considerable variations in the degree of difference. The ratio of G.D.P. to "value added" ranges from 70 per cent in non-durable manufacturing to 85 per cent in mining; the cost of services in the latter industry is relatively less than in manufacturing where such items as advertising, travelling expenses and communications would be preponderantly heavier. At the more detailed level, the range of differences is even larger; for instance, metal mining has a ratio of 94 per cent while groups such as tobacco, rubber and chemical products show ratios of between 60 and 65 per cent. Some of these differences arise from the use of imperfect statistical data. In the case of mining for instance, the close integration of base-metal mining activity with the smelting and refining operations (classified to manufacturing) makes it very difficult to determine a proper valuation for the metal mining industry; most of the ore extracted is not marketed but transferred to smelters of companies operating both mines and smelting and refining facilities. Thus the determination of "value added" can be only approximate. The same problem is involved in the allocation of profits between the two industries and affects the accuracy of the G.D.P. breakdown. It is interesting to note however, that differences between the two types of weights have only a negligible effect on the total manufacturing index. When the manufacturing groups are combined at the level for which both types of weights are available, the results are very similar; over the period 1946-1956 the largest difference was in 1953 when the two series diverged by less than one per cent.

TABLE III. Gross Domestic Product at Factor Cost Weights, 1935-1939 and 1949
Main Industry Groups

Industry group	Percentage of total G.D.P.		Percentage of G.D.P. for all industries covered by the Index of Industrial Production
	1935-1939	1949	1949
Mining	5.265	3.223	10.066
Metals	[1]	1.911	5.968
Fuels	[1]	0.909	2.839
Non-metals	[1]	0.266	0.831
Quarrying and sand pits	[1]	0.137	0.428
Manufacturing industries	23.952	27.160	84.827
Non-durable manufacturing	14.780	14.644	45.737
Foods and beverages	4.455	3.789	11.834
Tobacco and tobacco products	0.412	0.247	0.771
Rubber products	0.671	0.427	1.334
Leather products	0.585	0.505	1.577
Textile products	1.435	1.612	5.035
Clothing	1.769	1.789	5.587
Paper products	2.048	2.631	8.217
Printing, publishing and allied trades	1.433	1.265	3.951
Products of petroleum and coal	0.402	0.509	1.590
Chemicals and allied products	1.252	1.350	4.216
Miscellaneous manufacturing	0.318	0.520	1.624
Durable manufacturing	9.172	12.516	39.090
Wood products	1.503	2.094	6.540
Iron and steel products	2.759	4.000	12.493
Transportation equipment	1.567	2.634	8.227
Non-ferrous metal products	1.962	1.591	4.969
Electrical apparatus and supplies	0.741	1.409	4.401
Non-metallic mineral products	0.640	0.788	2.461
Electric power and gas utilities	2.366	1.635	5.107
Electric power utilities	[1]	1.471	4.595
Gas utilities	[1]	0.164	0.512
Total of industries included in the Index of Industrial Production	31.583	32.018	100.000
Total of industries not included	68.417	67.982	—
Total Gross Domestic Product at Factor Cost	100.000	100.000	—

[1] Breakdown of G.D.P. not available.

Table III presents the actual weighting ratios in the two weight bases. The industries covered by the Index of Industrial Production account for a little less than one-third of G.D.P. It is interesting to note that this proportion changed little between 1935-1939 and 1949. There occurred some significant internal shifts, however. Durable manufacturing, in total, gained appreciably in relative importance,

from 9 per cent of total G.D.P. in 1935-1939 to 12.5 per cent in 1949; this was at the expense of mining, which dropped from 5 per cent to 3 per cent, and of electric and gas utilities whose ratio also declined; the proportion of non-durable manufacturing remained practically unchanged at 15 per cent of the total. These weight shifts are due almost entirely to the relative changes in the volume of output. The old index of non-durable manufacturing (1935-1939 = 100) stood at 198 in 1949, very close to the figure of 200 for total industrial production, while durable manufacturing rose to an index figure of 246. By contrast, both mining and electricity and gas showed increases considerably below that of the total index; the index for mining was only 132 in 1949 and for electricity and gas 176. This is equivalent to saying that at the major division level the implicit weights in the old index in 1949 were quite close to the calculated weights and that changes in relative prices, which actually determine the suitability of the weighting system, were mostly offsetting.

8. Commodity Weights

Within industries, commodities are summed on the basis of unit selling values in the base period. In multi-product industries it is not possible statistically to attempt to derive directly G.D.P. or even "value-added" figures for individual products. In those industries for which bench-mark "net" indexes were computed the effect of "value-added" weights is obtained residually in that the volume of materials, fuel and electricity is subtracted in total from the volume of production. It would be preferable of course, to use G.D.P. weights at all levels of the computation. From the evidence provided by Chart I it might be reasoned that there is danger of sizeable error in the use of "gross" or "value-added" weights for the compilation of indexes at the industry level. This however, is not necessarily true. In regard to any differences in movement between the volume of "gross" and "value added" or "net" indexes is concerned, these are not large (at least for the industries where it was possible to construct the two types of indexes) and tend to be offsetting at the aggregate level (See Appendix C). As far as the lack of adjustment for purchased services is concerned, the assumption that they are proportional to the gross or "value-added" valuations at the commodity level may not be unjustified when applied to products made in the same industry or allied industries where the general processing, distribution and marketing characteristics tend to be similar for the majority of products.

9. General Problems and Limitations[1]

(a) Changes in Quality

A characteristic deficiency of production indexes is their failure to reflect changes in quality. Many manufactured products, over the years, have been improved as a result of continuing research and invention. A 1957 radio receiving set, for instance, has a wider range, a clearer, smoother tone and generally is a better instrument than it was in 1925 when radios were first produced in Canada. Similarly, automobiles have improved considerably in design and performance over the years. To the extent that these trends have developed, the production index will have a downward bias, as there appears to be no satisfactory statistical procedure to reflect these intrinsic changes in quality.

(b) Commodity Detail

Another problem closely allied to that of quality is the lack of sufficient detail in many Census of Industry classifications. Commodities are often combined into broad classes such as refrigerators, men's suits, etc., despite the fact that many different types, sizes and qualities of these goods are produced. It would be quite impossible, of course, to collect quantity data on every specification pertaining to the great mass of commodities turned out by manufacturing concerns. No problem would exist if it could be assumed that the relative proportions, within such classes of goods, of different types, sizes, etc., remained constant over the period covered by the index. However, consumers' tastes and habits change over the years, and manufacturers are governed accordingly. Indexes based on groups of products would ignore these variations. If, for instance, the proportion of the smaller type of domestic refrigerators has risen over the period, then the quality of the group "refrigerators" may be said to have declined. The best approach to solving this problem is through the use of appropriate price indexes. Changes in specifications are reflected in value totals; if such a total is deflated by a price index based on a definite specification of the item in question, the resulting aggregate will reveal the true change in physical output. The assumption implicit in this procedure is that prices of all types of the product move in the same way. This assumption is recognized to be more valid than that based on the fixed composition of commodity classes. The difficulty is to obtain appropriate price indexes based on sufficient detail. Most existing price indexes fail to take account of the more complex products of industry, and are based on prices at the wholesale or retail level thus reflecting variations in the rate of mark-up at these levels. It should be noted however, that the D.B.S. is now developing a set of price series at the manufacturing level, based on the S.I.C. and that more use of the deflation approach in the development of production indexes will be possible in the future.

In the bench-mark indexes, where it was apparent that inaccuracies would have resulted from incorporating too broad classifications, quantities were ignored and recorded values were deflated with proper price or unit value data, when these were available. For the majority of industries however, there was sufficient industrial census detail to support the assumption that no serious error in the overall index resulted from the above mentioned difficulty. This does not preclude the desirability of improving present commodity data in census of

[1] No description of problems associated with war production is given in this report. For an account of how data problems were handled during the war period, consult the D.B.S. Reference Paper, No. 34 "Revised Index of Industrial Production, 1935-1951", pages 24, 26, and 27.

industry returns. The indexes for several industries would have been more accurate if more detailed breakdowns had been available. In several industries, finer breakdowns of commodities were introduced from time to time during the period covered by the index. Advantage was taken of those improvements in census schedules in the construction of the index, even though it meant changing the weight-base within those particular industries and linking the subsequent levels to those of the previous period. The discontinuity introduced by this procedure is likely to be less serious than that of continuing to base the indexes on the movements of heterogeneous groups of commodities, especially in periods where there occurred significant shifts in the nature of the components of these groups.

(c) Changes in Coverage—Bench-mark Indexes

A limitation common to most indexes of physical output is the lack of complete coverage either for individual industries or for groups of industries. Except in rare cases, industrial census returns do not cover all of the products of an industry. Some of these commodities either cannot be measured quantitatively or, taken singly, are of such minor importance that no separate information is requested. These are usually included in a "miscellaneous" section and values only are recorded. The use of prices or unit values again presents itself as a solution to the problem. If prices or appropriate unit values are available for the major proportion of the products of an industry, it can be reasonably assumed that prices of the remaining products move approximately in the same way. Thus, by deflating the value of the unrepresented products with price data derived from recorded commodities, the effect of total coverage is obtained. It is generally agreed that this procedure is more valid than to assume that changes in the volume of reported commodities represent changes in the volume of all commodities. The proportion of represented commodities is often subject to wide variations because of the introduction of new products or sharp changes in the output of particular existing items.

It is a characteristic of the fixed-weight formula used that only by dividing the given value of production by a currently-weighted (Paasche) price index will the desired base-weighted aggregate ($Q_1 P_0$) be obtained. The algebraic operation is as follows:

$$\Sigma Q_1 P_1 \div \frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1} = \Sigma Q_1 P_0, \text{ in which } \Sigma Q_1 P_1$$

represents the total current value of production of any given industry and $\frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1}$ represents the Paasche-type price index of all the commodities or of a representative number of commodities in the same industry. In the actual construction of the indexes, a short-cut method, the so-called "coverage-adjustment" technique, was used. This consists of dividing the aggregate in constant prices of the represented products of an industry by the ratio of the current value of represented products to the total current value of the industry (See Table IV for a sample of the worksheet procedure described here). This has the same effect as dividing the total current value by a Paasche-type unit-value index based on the represented commodities, as follows:

$$\Sigma Q_1' P_0' \div \frac{\Sigma Q_1' P_1'}{\Sigma Q_1 P_1} = \Sigma Q_1 P_1 \div \frac{\Sigma Q_1' P_1'}{\Sigma Q_1' P_0'} \text{ in which}$$

$\Sigma Q_1' P_0'$ represents the aggregate in constant prices of the represented products of the industry, $\Sigma Q_1' P_1'$ the current value of the represented products, $\Sigma Q_1 P_1$ the total current value of the industry and $\frac{\Sigma Q_1' P_1'}{\Sigma Q_1' P_0'}$ the Paasche-type unit value index of the represented products of the industry. (This is illustrated in Table IV).

The decision was taken however, not to use the "coverage adjustment" procedure when, in general, the proportion of represented products was less than 50 per cent of the total value of production in any particular industry. In such circumstances, the assumption inherent in the use of prices becomes increasingly subject to error. The measurement of "materials used" deserves special mention in this connection. In the construction of "net volume" indexes, and for certain industries where quantity data on products were deficient or not available, it was necessary to measure the volume of materials used, and consequently, to adjust for unrepresented materials. As these materials originate in many different industries, in other sectors of production and in imports, they are subject to varying economic forces. The assumption that a fifty per cent representation is sufficient to measure price movements in these cases can be highly questionable. Generally, a much higher coverage is required, depending on the nature and origin of the unrepresented commodities. Fortunately the annual indexes presented herein were based, in the majority of cases, on a high coverage. No serious discrepancies, therefore, are likely to have occurred from the use of the "coverage adjustment".

In certain cases, where it was observed that the changes in the unit value of an important product diverged markedly from the price movements of most other products in the same industry, the product was removed from the coverage adjustment and re-added separately after the remainder of the industry was deflated with the implicit price index of the more representative items.

(d) Adjustments for Changes in Inventories—Bench-mark Indexes

In 1952, the Census of Manufactures, in recognition of the fact that business records can provide data more readily on values of shipments than on values of production, changed the annual questionnaires on products to a shipments basis (most monthly commodity surveys however, continue to provide data on commodities produced). For certain industries both quantities of commodity production and quantities of shipments, together with value of shipments are requested. In these cases, for purposes of bench-mark indexes, value of production for each commodity and for the total in each year is derived

by valuing production on the basis of the unit value of shipments. In all other cases the value of production for each industry is obtained in total by adjusting the value of factory shipments for changes in the book value of plant inventories of finished goods and goods in process. The question on year-end inventories was added to the census in 1954; for 1952 and 1953 data on inventories were obtained from the monthly survey of manufacturing inventories and shipments. Since 1950 the latter survey has provided information on inventories of goods in process; except for a few industries, it had never before been possible to adjust the production totals for changes in stocks of goods in process.

In the computation of most of the industry indexes, the derived value of production control totals were deflated with a unit value index based on reported quantities and values of shipments (see section on coverage adjustment). The inventory change is thus deflated, in effect, with an average annual unit value index of shipments. Ideally, the book value of inventory changes should be deflated with a price index that relates specifically to the commodities involved and that takes account of turnover periods and bookkeeping methods. Although this type of data is used in the National Accounts for the deflation of inventory change by industry, it is not at present available in sufficient detail for purposes of the production indexes. Further research and developmental work is required in this area to improve the measures of output. The method used could affect the accuracy of the indexes in periods of sharp price movements where inventory changes are large relative to shipments. Such industries however, are few in number; the majority are those where large progress payments present special complications both from a reporting and deflation point of view. In years where results appeared to be seriously distorted because of this problem other estimates of production, based on materials used or labour input, were substituted.

(e) Variations in Business Fiscal Years—Benchmark Indexes

The great majority of Canadian manufacturing firms report annual statistics to the Bureau on a calendar-year basis. The operations of the remaining establishments are recorded on various other bases, but as long as the reports relate consistently to the same twelve-month period from year to year, the danger of double-counting is eliminated. No attempt was made to adjust for possible "timing" discrepancies which may have arisen from the use of these data.

(f) New Products

It often occurs that the prices of new products are relatively high during the initial period of production and gradually decline as demand and markets expand and mass production techniques are introduced. If the weights of such products in an industry are based on the initial high prices, an upward bias will develop in the index when output of the new products rises faster than that of the other products in the industry. As noted earlier this bias is characteristic of Laspeyres-type indexes and is generally not serious enough to warrant special treatment between base period changes. It sometimes happens however, that serious distortion is caused by incorporating a new product in the index at the base period price when output is expanding sharply and prices declining at a rapid rate. A striking example of this problem was when antibiotic drugs began being produced in large quantities in the post-war period. In the space of nine years reported physical output had expanded more than 15 times while the total value of the drugs in the last year was actually less than half that of the first year. It would have been unrealistic to apply the 1949 unit values to the quantities of penicillin and streptomycin throughout the period; the index of the drugs industry would have shown an artificially high rate of growth because of the very large relative weight of the new products. In order to dampen this movement the two items were compiled separately from the remainder of the industry; their unit values in 1955 were used as weights for the reported quantities and the resulting constant dollar total was re-added to that of the rest of the industry (which was compiled on the basis of 1949 weights). Although this approach is not consistent in terms of the accepted base-period framework, it is more realistic in terms of the current situation; the size of the distortion in this case warranted a special adjustment.

Normally, the introduction of new products does not call for this type of approach, as the effect is not usually so pronounced. When important new products appear in the compilation and the quantities of output are available, the unit values are projected back to the base period on the basis of the change in the unit values of the other products in the same industry. If no quantities are reported, the new items are automatically processed through the coverage adjustment so that, in effect, their values are deflated to base period prices with a unit value index based on reported commodities.

These procedures serve to improve the accuracy and analytical usefulness of the series in the more current period and to offset some of the deficiencies of base-weighted series.

(g) Mineral Production

In the mining sector, because of the lack of sufficient data on materials consumed, no indexes of "net" output were constructed. In the metals section, production was defined as the "metal content" of the ore treated or exported. The coverage was practically 100 per cent in all sectors of the industry. While in the old index, all metals were treated as one industry because of the difficulty at that time of breaking down the data into industry components, the data were available in 1949 to separate the group into four industries, viz., gold from auriferous quartz and placer mines, iron ore, uranium and other metals. The latter includes all base metal mines in which the ore contains a variety of minerals no one of which can be classified as a

separate industry. In 1949, G.D.P. weights were available only for gold mining and the remainder of the metals group in total; the breakdown of the latter into the other three separate components was based on "value added". This industry breakdown of the metals group was used only after 1946; sufficient data were not available to provide corresponding detail in the 1935-1939 weighting system.

Operations in the fuel, non-metal and quarrying divisions of the mining industry are more homogeneous and each sub-industry was assigned a separate weight; the G.D.P. weights for each division were broken down on the basis of "value added" except in the case of coal mining for which a separate G.D.P. figure was available.

The treatment of the natural gas mining industry deserves special mention. Because of differences in development costs, proximity of markets and available supplies, natural gas produced in Ontario has a much higher price than in the Prairie Provinces. Although the products extracted in both regions are intrinsically the same, their relative importance on a value basis is quite different, and, for purposes of the index, they were treated as separate commodities. Otherwise the very rapid increase in Prairie gas production in recent years would have resulted in an upward bias in the index (the well-head price of gas on the Prairies is the lowest of any region). A complicating factor is that it is difficult to separate the mining activity from the distribution activity, as, in most cases, the valuation of the gas can only be accurately determined at the point of distribution. The distribution of natural gas is classified to electric and gas utilities as per the S.I.C. so that it was necessary to estimate prices at the "well-head" in each region to establish gas production weights in the mining sector. As noted earlier, in the case of electric power and manufactured gas, both production and distribution are classified to the utilities industry in accordance with the S.I.C.

(h) Incorporation of Newfoundland Data

In the previous index, the introduction of Newfoundland data in 1949 was so handled that it did not change, in that year, the levels of the industries affected (mostly iron ore, base metals, pulp and paper and fish processing); as the data for the tenth province appeared in the statistics, the series including Newfoundland were linked to those excluding Newfoundland in the month of overlap, so that changes in that province's output were reflected in the index only in succeeding months.

In the new index, it was decided to treat Newfoundland's production as an addition to Canadian output in 1949, in line with other major Bureau series. Because of this change, the level of the new index is about 1 per cent higher since 1949 than it would have been had the old method been retained.

10. Indicators – Bench-mark Indexes

(a) Net Output[1]

The ideal measure of output for each industry is the volume of G.D.P. originating. As explained in a previous section, it is not, at present, possible to develop such series perfectly, although special efforts were made to construct annual indicators representing the nearest approximation to the G.D.P. concept. The indicator that comes nearest to measuring this concept is the volume of "net" output or of "value added".

(1) Characteristics

There are a number of factors which influence the level of "net" output (total products less input of materials and fuel) as distinct from that of gross or total output. Vertical integration of the manufacturing process, which occurs more often in industries turning out highly processed goods, is an important influence. A firm producing cotton cloth, for instance, may decide to make its own yarn from the raw fibre, instead of buying it from yarn manufacturers. The measurement of cloth output alone will not reveal this increased fabrication. Again, a beet sugar manufacturer may install machinery that permits him to extract a greater proportion of sugar per pound of beets. Although the index based on sugar production will reflect an increase in output, it will understate the increase in net output since inadequate account is taken of the proportionate gain in processing.

Experience so far indicates that the most important factor concerns changes in "product mix" in that an industry making a variety of products shifts some of its output to goods requiring a higher or lower degree of fabrication. During the war, for instance, in the meat-packing industry, the production of canned and cured meats increased greatly relative to that of fresh meats which require less processing. As a result, the volume index based on the "net" concept rose appreciably more during this period than the "gross" index. The opposite movement occurred in the immediate post-war period when foreign demand for canned and cured meats dropped to a more normal level.

It should be noted in this connection that the degree of divergence between net and gross output depends frequently on the degree of homogeneity of the industries measured. All other things being equal, the "net" output index of a one-product industry will move parallel to its index of gross output. The more diversified the production of an industry, the more sensitive the net output index is to the influence of product mix. This is particularly true of those industries with a high input-output ratio (i.e. those in which materials account for a large proportion of the value of products, such as meat-packing, dairy products and flour and feed mills) where even slight changes in the composition of production have a considerable effect on the "net" measure.

[1] See footnote 4 page 12.

(2) Measurement

The data required to measure the volume of "net" output consist of both the quantities and values of products, materials used and fuel and electricity consumed. The Census of Manufactures collects the required statistics for a considerable number of industries and these data were fully exploited in the development of the annual indexes of manufacturing production. The method used is similar to that adopted by Dr. R.C. Geary and Solomon Fabricant in their research in this field.[1] It consists of subtracting from the volume aggregates of production (quantities valued at base-year prices) the volume aggregates of materials, fuel and electricity. (See Section 5). This procedure eliminates duplication in that double-counting arising from the transfer of commodities between establishments in the same industry is cancelled out.

(3) Problems

It was not possible to construct measures of "net" output for all manufacturing industries. The output of many industries is not measurable in physical units, and the data for some others were not found suitable. A high degree of accuracy in the data reported is necessary, especially for industries with a high input-output ratio; the net aggregate is very sensitive to even small errors in either products or materials. Accordingly, the data were subjected to a careful scrutiny; where the "net" output index diverged markedly from the "gross" indicator, and the movement could not be reasonably explained (for instance by changes in "product mix" or integration).[2] The original establishment census returns were examined and advice sought from D.B.S. specialists in various industries. Often it was apparent that the data had been erroneously reported and it was possible to apply proper adjustments. In some cases special correspondence with major producers helped to correct important inconsistencies. When serious doubts as to the suitability of the data for purposes of the "net" indexes could not be eliminated, alternative indicators, such as "gross" indexes, were substituted.

A special procedure had to be developed for the measurement of containers and wrapping materials. In the majority of industries, these materials are not reported in physical units and only values are available. Containers constitute an important share of the total value of materials in some industries and it appeared questionable to assume that their prices moved in conformity with those of other materials. Accordingly the value of containers and similar materials was not subjected to the "coverage adjustment"; rather, the base period value was projected on the basis of the volume of "gross" output and the resulting aggregate was added back to the constant dollar aggregate of the other materials. Admittedly, shifts in the content of production may bring about corresponding changes in the types and quantities of containers and wrapping materials used, but for those industries in which the cost of these materials was an important factor, shifts in types of products manufactured were not large. In any case, the "net" indexes do not reflect any changes in the amount of containers and wrapping materials relative to products manufactured.

A further problem arises in a net output index when changes in the nature or quantity of raw materials are not reflected in the measurement of the resulting products. This difficulty is tied in with that of quality and insufficient detail in the tabulation of manufactured commodities. It is conceivable that changes in quality could be reflected in the volume of materials but not in the volume of output. For instance, plastics are displacing wood and other conventional materials in the manufacture of a growing number of commodities. While this change will affect the level of the volume of materials, no compensating factor will be recorded in the measurement of the products, unless an additional breakdown of commodities by types of materials used in their fabrication is available in census returns. This often is not practicable. In industries where distortions of this sort were observed, net output computations were not attempted.

(b) Gross Output

For those industries where data problems prevented the construction of "net" indicators, the first alternative was the measurement of "gross" output. When this indicator is used, however, certain considerations must be kept in mind. One difficulty, of course, concerns changes in the amount of processing applied to raw materials. Where the "gross" indicator was actually used to represent work done, care was taken to check carefully for any changes in processing, and it was possible in several instances to make adjustments, either by changing the relative importance of a particular product which differed considerably in work-content or by subdividing the industry into groups of firms producing commodities requiring roughly the same amount of fabrication. These separate groups were then individually weighted with their respective values added, thus obtaining a result which more closely approximated net output. Another problem which arose in a few industries was that of changes in the amount of duplication. Wherever there appeared evidence that the products of some firms were subsequently used as materials by other firms in the same industry, the data were examined for any signs of disturbance in the normal flow of the commodities affected. In the industries most seriously affected by the duplication problem, such as wire products, primary iron and steel, fertilizers, etc., it was possible to construct "net output" aggregates, and the problem was solved automatically.

It should be noted here that in the case of several industries for which data on materials were not considered sufficiently reliable to be used in the compilation of "net" indexes, the materials data nevertheless proved useful in analyzing the

[1] See Appendix A for references.

[2] For a more complete analysis of differences between gross and net indicators and of the effect of changes in product mix on the indicators of certain industries see the D.B.S. Reference Paper No. 34, pages 13-15.

"gross" series and in making them more accurate and representative of the "net" concept; it was possible in several cases to detect discrepancies arising from changes in the amount of duplication or processing or from incorrect reporting and to apply compensating adjustments to the "gross" data.

(c) Materials Used

When production data were not available or proved deficient another alternative indicator of net output was the volume of materials consumed. In most cases, data on materials are less representative of net output than data on products, and except where one or two materials constitute the bulk of materials used, they should be used as sparingly as possible. The same care, of course, had to be exercised, as in the case of products, in checking for changes in the amount of processing. In some cases, when several materials were involved, it was necessary to make adjustments for basic changes in the nature of materials used; during World War II for instance, because of shortages or shipping difficulties, producers in a few industries had to resort to substitutes. If changes in the amount of fabrication, in the degree of integration or in the composition of production result in changes in the ratio of net output to gross output, the index based on final products will always be closer to net output than an index based on materials.

(d) Values Adjusted for Price Changes

Another type of indicator used in the index is value of production or materials deflated directly by an index of prices or of "cost of production". This approach was used more extensively for the 1946-1953 bench-marks than for the 1935-1946 indexes. It was used in most industries for which quantity data on products or materials or both were not obtainable or proved unsuitable. Basically, the volume indexes derived from this method have the same limitations as "gross" or materials indexes. An additional difficulty is in obtaining adequate deflators. In a few cases existing price indexes were considered suitable to deflate industry values; examples are the printing and publishing group, where wholesale prices for the major materials items were used in developing deflators for the value of materials, and the heavy electrical machinery industry, where recently-developed special manufacturers' price series were used to deflate values of motors and other heavy electrical items. In most cases, however, the industries involved were those for which output and product prices are difficult to define in unit terms and where the coverage of quantum data on materials is not sufficiently large to develop a volume of materials index (examples are industrial machinery and railway rolling stock). For such industries, "cost of production" indexes were constructed by combining unit value indexes of available materials items with average hourly earnings of production workers according to the relative importance of each factor in the base period as determined by total value of materials and total wages. The resulting index was then used to deflate the total value of production in each industry. The production indexes derived from this "cost" deflation approach are among the least satisfactory; the deflators make no allowance for changes in profit margins nor for costs other than labour and materials. Furthermore, the materials for which unit values could be compiled did not account for a large proportion of total materials used and are not necessarily representative of the total in all cases. Fortunately the industry production series developed from this method account for only 8.6 per cent of the overall index, although they are concentrated in the durables group. The development by the Prices Division of the D.B.S. of special manufacturers' price indexes classified on an industry basis, soon to be completed, will provide much more accurate price information for use in conjunction with industry values of production and more extensive use of the deflation approach will be possible in future revisions.

(e) Man-hours

For a few industries, the only available means of approximating volume of output was through man-hours worked. One advantage of labour series is that they relate fairly closely to actual work done. The main disadvantage is that they do not reflect any changes in productivity (output per man-hour). The problem is further complicated in that it is not possible to measure directly changes in productivity without the very data on physical output which necessitated the use of man-hours in the first place. A solution is to apply to unadjusted man-hour series productivity changes in related industries where information exists to calculate such changes. In the present revision of the index an average output per man-hour ratio based on a group of metal-working industries was applied to the man-hours of the aircraft and parts industry for the post-war period. In other industries where man-hours were the only available data, no adjustment for productivity changes was attempted; however, these industries are relatively small and account for only a minor proportion of the total index in the post-war period. Greater use of man-hour statistics to represent output was necessary during the war period when industrial designs and manufacturing processes were greatly altered in some industries to meet the needs and specifications of the national defence programme.

In the monthly index, man-hours are used to represent "work done" in a large number of industries. In this case the use of unadjusted man-hours to represent production over several years could lead to a serious downward bias in the overall index due to the failure to take account of the growth in productivity. An attempt is made in the current revision to anticipate changes in output per man-hour in the period subsequent to the last bench-marks. A discussion of the methods used in estimating output per man-hour ratios for use in the current series is given in the section describing the construction of the monthly index.

11. Coverage by Types of Indicator—Bench-mark Indexes

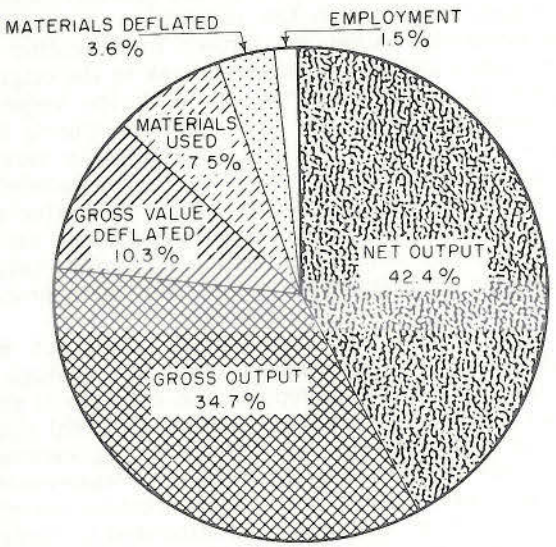
As indicated in Chart II it was possible to derive "net" output indexes for industries representing 44 per cent of the 1949 weights for manufacturing. Gross output indicators account for 29

CHART II

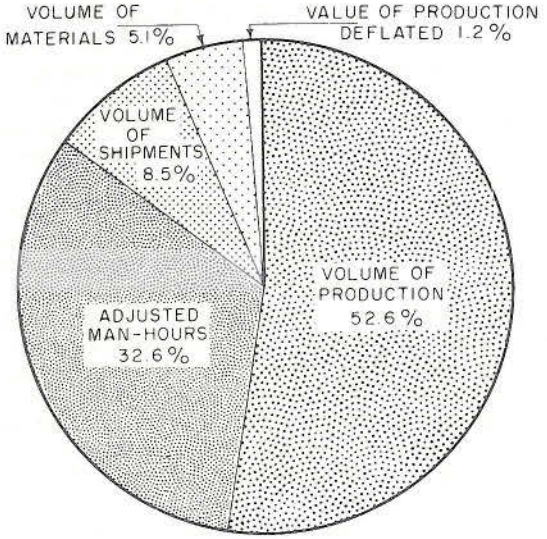
TYPES OF INDICATORS SHOWING PERCENTAGE SHARE OF GROSS DOMESTIC PRODUCT ORIGINATING, IN 1949

INDEX OF INDUSTRIAL PRODUCTION

BENCH-MARK INDEXES

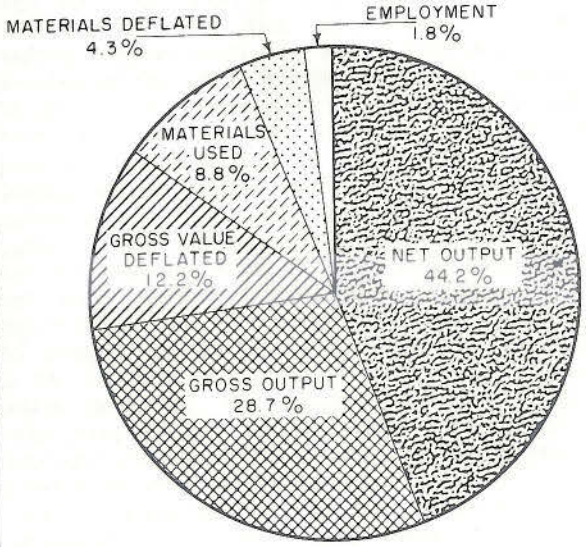


MONTHLY INDEX

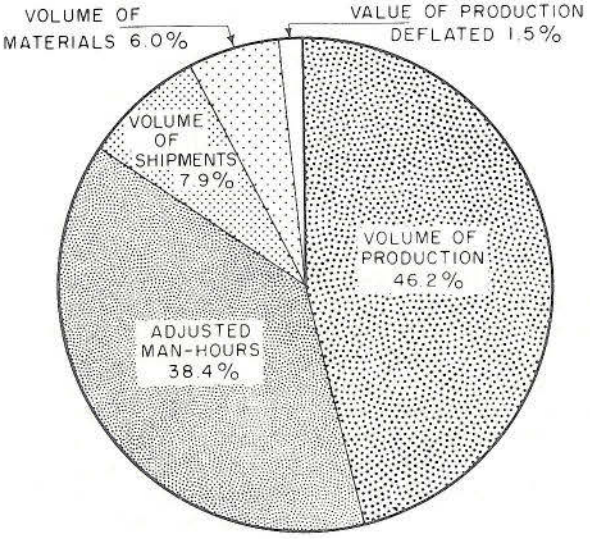


INDEX OF MANUFACTURING PRODUCTION

BENCH-MARK INDEXES



MONTHLY INDEX



per cent of the weights, volume of materials for 9 per cent, values adjusted for price changes for 16 per cent and man-hours for 2 per cent. These percentages apply to the bench-marks for the recent period and the major difference between these proportions and those of the 1935 - 1946 period is the marked decline in the use of man-hours in the post-war period and the corresponding increase in the use of the deflation method.

12. Computation and Analysis—Bench-mark Indexes

Practically all of the data used in the construction of the annual or bench-mark indexes were obtained from Census of Industry files. The first step was the tabulation, for each year of the period covered, of the quantities and value of products, materials, fuel and electricity, the value of the opening and closing inventories of finished goods and goods-in-process, the number of wage-earners or production workers and total wages received by them. In other words, all available information that could be of help in measuring as accurately as possible the volume of output for each industry was transcribed onto worksheets preparatory to computation and analysis. Census values of production, shipments and inventories exclude manufacturers' sales taxes and other excise duties[1] but include cost of containers when these are not returnable. Goods purchased for resale without further fabrication are omitted. Before the worksheets were handed out for computation, the tabulated material was given a preliminary examination in order to discard any obviously defective data or items which lacked continuity or had been affected by changes in classification. It was at this stage that it was possible to determine where changes in the weight-base within certain industries would materially improve the coverage and accuracy of the indexes.

The next step was the actual computational work. The total value for each item in the base period was divided by the total corresponding quantity, giving a fixed unit value for the item. The quantity in each year of the period covered by the index was multiplied by this fixed unit value. After each item in the industry had been treated in this way, a sum was taken, for each year, of the values at constant prices. At the same time, the values at current prices of the same items were also summed. The division of the latter figure by the total current value of the industry in each year gave the percentage of coverage. The sum of the values at constant prices of the covered items was then divided by this coverage ratio. As explained in a preceding section this has the same effect as dividing the total current value of the industry by a Paasche-type unit value index based on represented items. The resulting "blown up" aggregate in each year was then divided by the aggregate in the base year to derive the physical volume index. This procedure was applied to the products, materials and fuel and electricity of the industries for which these data were available. A sample of the work-sheet procedure is presented in Table IV.

After all relevant series were assembled, the data were subjected to a careful analysis. Priority was given to the preparation of a volume aggregate of net output for as many industries as possible. The information on production and materials was thoroughly examined for consistency and comparability. The analysis was facilitated by having the results displayed over a period of years. Marked discrepancies between the movements of products and materials called for further investigation. In many cases this meant referring back to the original returns of individual firms to check the accuracy and consistency of the data reported. During this phase of the work, Bureau specialists in various industries were often consulted. Their knowledge of the history and background of the industries and firms, of changes in methods of manufacture and of the reliability of the information collected, helped greatly in deciding on the best line of approach.

The number of wage-earners employed was available on an annual basis for each of the industries included in the census reports. An estimate of man-hours was also obtained by dividing the total wage-bill in each industry by average hourly earnings. Any wide gap between the number of wage-earners or man-hours worked and the production estimate which could not reasonably be attributed to changes in productivity, directed attention to possible discrepancies requiring close scrutiny and adjustment.

13. Revisions in Existing Bench-mark Indexes

The bench-mark indexes developed at the time of the last revision, based on 1935 - 1939 = 100, and covering the period 1935 - 1946, were, for the most part, incorporated in the new index without further adjustment. The great majority of the annual indexes for this period were simply re-expressed in terms of 1949 = 100 and linked in 1946 at each individual level of detail to the new annual indexes. Among the few important revisions applied to the annual series in the 1935 - 1946 period were the inclusion of milk and cream pasteurization and bottling, hitherto classified to retail trade and now covered in the output of manufacturing dairies. Also, the net indexes of the tobacco products and brewing industries were revised to reflect the removal of indirect taxes from the value of products. As a result of further analysis, the "net" indicators in the old index (1935 - 1947) for the woollen yarn, miscellaneous woollen goods, carpets, mats and rugs and cordage, rope and twine industries were considered to be inaccurate and the corresponding "gross" indexes were substituted in the new compilation. The basis of valuation of petroleum products was also changed in the 1935 - 1939 base period in the light of more recent data; this affected the weight of the industry and also the relative importance of individual products within the industry. In the

[1] Customs import duties are included in the value of production but, since they are also included in the cost of materials used, they are automatically subtracted out in computing value added.

TABLE IV. The Breakfast Foods Industry

(Sample of worksheet procedure for bench-mark indexes of net output)

		1949	1949 unit value (2 ÷ 1) = P_o	1950	1951
Part A (Gross output index):					
1. Q_1 - Reported production of corn flakes	lb.	23,367,710 (Q_o)[1]		23,652,307	24,285,388
2. P_1Q_1 - Reported current value	$	5,224,636 (P_oQ_o)[1]	0.22358	5,482,310	6,083,904
3. P_oQ_1 - 1949 unit value × reported quantity	$	5,224,636 (P_oQ_o)[1]		5,288,183	5,429,727
1. Q_1 - Reported production of puffed grains	lb.	12,618,934		12,614,198	18,019,631
2. P_1Q_1 - Reported current value	$	3,622,394	0.28706	3,491,845	5,795,048
3. P_oQ_1 - 1949 unit value × reported quantity	$	3,622,394		3,821,032	5,172,715
1. 2. Other specified products[2] 3.					
(a) ΣP_1Q_1 (specified products) (Σ line 2)[2]		18,342,564		18,844,537	23,306,285
(b) ΣP_1Q_1 (census value of all products)		18,411,631 (ΣP_oQ_o)[1]		19,095,086	23,695,909
(c) Coverage ratio 100[(a) ÷ (b)]		99.6		98.7	98.4
(d) ΣP_oQ_1 (specified products) (Σ line 3)[2]		18,342,564		18,723,840	20,880,787
(e) ΣP_oQ_1 (all products) 100[(d) ÷ (c)]		18,411,631		18,970,456	21,220,312
(f) Index: 1949 = 100, 100[(e) ÷ ΣP_oQ_o]		100.0		103.0	115.2
Note: The same results, disregarding rounding error, can be obtained by deflating the census total value of products by the implicit Paasche unit value index derived from the current and constant dollar totals of the specified products as follows:					
(g) 100[(a) ÷ (d)]		100.0		100.6	111.6
(h) 100[(b) ÷ (g)]		18,411,631		18,970,456	21,220,312
(i) Index: 1949 = 100, 100[(h) ÷ ΣP_oQ_o]		100.0		103.0	115.2
Part B (Materials index exclusive of containers):					
1. q_1 - Reported use of wheat	bu.	607,139		628,450	701,602
2. p_1q_1 - Reported current value	$	1,378,162	2.26993	1,283,657	1,490,118
3. p_oq_1 - 1949 unit value × reported quantity	$	1,378,162		1,426,538	1,592,582
1. q_1 - Reported use of corn	bu.	955,914		586,874	974,148
2. p_1q_1 - reported current value	$	1,677,709	1.75508	962,245	2,098,555
3. p_oq_1 - 1949 unit value × reported quantity	$	1,677,709		1,030,011	1,709,708
1. 2. Other specified products[2] 3.					
(a) Σp_1q_1 (specified materials) (Σ line 2)[2]		5,948,374		5,304,229	7,203,768
(b) Σp_1q_1 (census value of all materials ex. containers)		6,268,454 (Σp_oq_o)[1]		6,178,370	7,730,161
(c) Coverage ratio 100[(a) ÷ (b)]		94.9		85.9	93.2
(d) Σp_oq_1 (specified materials) (Σ line 3)[2]		5,948,374		5,571,357	6,853,332
(e) Σp_oq_1 (all materials), 100[(d) ÷ (c)]		6,268,454		6,485,864	7,353,361
(f) Index: 1949=100, 100[(e) ÷ Σp_oq_o]		100.0		103.5	117.3
Part C (Containers):					
1949 value of containers projected on gross output index		2,434,366		2,507,397	2,804,390
Part D (Electricity purchased):					
1. q_1 - Reported quantity purchased	kwh.	19,949,882		19,134,229	17,635,879
2. p_1q_1 - Reported value of purchased electricity	$	108,071	0.00542	124,805	129,199
3. p_oq_1 - 1949 unit value × reported quantity	$	108,071		103,708	95,586
Part E (Purchased fuel used):					
(a) p_1q_1 - Reported total census value	$	182,343		202,814	208,295
(b) 1949 base-weighted price index (special computation)		100.0		102.9	105.9
(c) p_oq_1, 100[(a) ÷ (b)]	$	182,343		197,098	196,690
Part F (Net output index):					
(i) ΣP_oQ_1 Products [(e) of Part A]		18,411,631		18,970,456	21,220,312
(ii) Σp_oq_1 Materials [(e) of Part B]		6,268,454		6,485,864	7,353,361
(iii) p_oq_1 Containers (Part C)		2,434,366		2,507,397	2,804,390
(iv) p_oq_1 Electricity (3 of Part D)		108,071		103,708	95,586
(v) p_oq_1 Fuel [(c) of Part E]		182,343		197,098	196,690
(vi) Net output in 1949 dollars, (i)-[(ii) + (iii) + (iv) + (v)]		9,418,397		9,676,389	10,770,285
(vii) Net output index: 1949=100		100.0		102.7	114.3

[1] In the base year $P_o = P_1$ and $Q_o = Q_1$.

[2] Includes all those other reported products (or materials) for which both quantity and value were sufficiently consistent to be usable.

electric and gas utilities division, the distribution of natural gas, not covered in the old index, is now included; in addition, electric power and manufactured gas, measured at the production stage in the old index, are now measured at the point of distribution so that the new index for this sector reflects changes in the distribution pattern of electricity and gas. (See Part II).

All of these changes were also incorporated in the new annual series in order to make the revised index comparable throughout the period covered. The per cent increase shown by the old index between 1935-1939 and 1946 was 71.9 while the increase in the new index over the same period is only slightly higher at 72.8. While the changes described above resulted in considerably higher levels of output in most of the industries affected, these were mostly offset by the effects of the revisions in the 1935-1939 weighting system. (See Section 7).

14. Period Covered—Bench-mark Indexes

The bench-mark indexes for the more recent period beginning in 1946 (on the 1949 reference-weight base) were extended to 1953 for the majority of industries. In many cases, especially where the monthly series diverged considerably from the bench-mark indexes (most often in industries represented in the monthly index by man-hours) the latter were extended to the most recent year for which census data were available. The period covered by the bench-mark indexes is indicated for each industry in Appendix C. In general, bench-mark revisions are possible two years after the current period.

The monthly series were adjusted to the annual indexes up to the last computed bench-mark in each industry. The levels of the indexes at that point were projected forward on the basis of the monthly series. For industries where both "net" and "gross" bench-mark indexes were developed the "net" index is the one used in the compilation. Both the "net" and "gross" indexes are shown in Appendix C for purposes of comparison; for years subsequent to the last bench-mark, the net index is projected on the basis of the monthly indicators. Past experience has indicated that, generally speaking, no serious gap is likely to develop between the movements of the "net" and "gross" indexes over a short period of years, and any differences tend to be offsetting at the total level.

15. Description of Methods—Monthly Indexes

(a) Indicators

The majority of indicators available to measure output on a monthly basis are in the form of commodities produced, materials used or man-hours. Of necessity, monthly coverage of commodity data is much less complete than the coverage obtained in the annual census surveys. Since it is not possible to measure the concept of "net" output more frequently than at annual intervals, indicators of "gross" output are used as the most satisfactory alternative. Since the last revision of the index, the D.B.S. has initiated a number of additional commodity surveys and data from these have been incorporated in the new index. In addition, quarterly commodity production data on processed foods and clothing were adapted for use in the monthly indexes by using man-hours as interpolators between the quarterly levels. As a result, the coverage of industries represented by physical output data was increased from 44 per cent in the old monthly manufacturing index to 54 per cent in the revised series. By contrast, the proportion represented by man-hours was reduced from 43 per cent to 38 per cent in the same comparison. Moreover, the quality of the man-hour data was improved by the application of special adjustments as outlined below. New monthly commodity surveys on chemicals and small electric appliances have recently been inaugurated and as soon as it is possible to link these new series to existing indicators they will be incorporated, thereby further reducing the proportion of industries represented by man-hours. A complete description of the monthly indicators used in the revised index, together with the source of the data, is given in tabular form in Appendix B. The descriptions which follow apply to the period beginning in 1946. The bench-mark revisions to the earlier period were also applied to the monthly series; apart from these changes, the monthly indexes from 1935-1946 were not subject to revision and their construction is described in D.B.S. Reference Paper No. 34.

(b) Compilation

The first step was the tabulation by months of available data to represent total output in each industry. Where there was a choice to be made between various series, the indicator that most closely approximated the movement of the bench-mark index in a particular industry was chosen. In several cases, the monthly commodity figures for past years were adjusted to agree with the corresponding totals derived from the annual census surveys. In the industries for which the monthly indicators were of doubtful accuracy, the bench-mark indexes were projected as far forward as possible.

Within the majority of industries, the formula used was that of the average of relatives, whereby the index for each individual item[1] is assigned a percentage weight according to its value share in the industry as indicated by census data in the base year. The coverage of represented commodities within industries is generally lower in the monthly indexes than in the bench-mark series; in the monthly series, the weight of unrepresented items is imputed to the represented items by allocating pro-rata to the latter the total weight of the industry. It was thus assumed that the volume of unrepresented commodities moved in the same way as the volume of represented commodities. In most industries representation appeared adequate enough to justify

[1] The index (1949=100) for each item is derived by dividing the quantity reported in each month by the monthly average ($\frac{1}{12}$ of the annual total) in 1949.

this assumption. In two industries, namely dairy products and flour and feed milling, approximate value-added weights were obtained for each item of output by identifying in the base period the materials consumed in the production process and subtracting their value from the selling value of the products. By this procedure the averages of the monthly series agreed more closely with the "net" volume bench-mark indexes. It is desirable to establish a proper weighting pattern for industries of this type in which the ratio of value of materials to value of products is high since any change in the composition of production has a marked effect on the levels of the indexes.

In a number of industries, especially where new products were involved, the formula used was the relative of aggregates in which quantities are valued at base-year unit values or approximations thereto.

(c) Adjustments for Working Days

The flow of production month by month is affected by the inconsistencies of the calendar; production in February, for instance, tends to be lower than in any other month owing to the fewer number of working days; also, the number of Saturdays and Sundays varies from month to month, thus affecting the length of the work month in industries not operating seven days a week. After monthly indexes were compiled for each industry, they were adjusted for changes in the number of working days in each calendar month. The purpose of this adjustment is to place output on a monthly rate basis so that, in effect, the monthly indexes are re-arranged to reflect the changes in production that would occur if all months contained an equal number of working days in each industry. The adjustment was not necessary for industries represented by man-hours since the latter relate to a uniform period each month, generally the last weekly pay period. No working-day adjustment is made for statutory holidays, their influence being incorporated in the seasonal factors.

The number of days worked per week differs from industry to industry and from firm to firm, although firms in the same industry tend, in general, to follow a common practice. The adjustments in the old index were based on information contained in industry wage contracts provided by the Economics and Research Branch of the Department of Labour; the data were based on the early post-war years. For the revised index, a study was made of all the January, 1957 reports from establishments included in the Bureau's monthly Employment Survey in industries requiring working-day adjustments; the monthly questionnaire requests information on the number of days the plant was in operation in the survey week. Where coverage was low, additional data were obtained from the Department of Labour. Results were reviewed and discussed with industry specialists in the Bureau.

In the majority of industries the data indicated there was no change in the length of the work-week throughout the period covered by the revised index. Where the 1957 data showed a change compared with the earlier material, the approximate timing of the change was based on a study of trends over the period in standard working hours per week in each industry as published by the Department of Labour. In some industries, the change was substantial, from a 6-day work week in 1946 to a 5-day week in 1957.

The procedure consisted first of drawing up, from an examination of the calendars for the period 1946 to 1957, four schedules of the number of days worked in each month of the period. Each schedule related to a group of industries working, on the average, a common number of days per week as follows: 5 days, 5½ days, 6 days, and 7 days. The average obtained by combining the establishment data from the employment reports in each industry was rounded to the nearest of these categories. The number of working days by months in each category was placed on a percentage basis, the sum of the monthly ratios for any year averaging 100. Thus, four sets of working-day adjustment ratios were developed, each covering the entire period. The volume index for each industry (or in a few cases for components of industries) represented by quantitative data was then divided by the appropriate category of adjustment ratios. The number of days used for adjustment in each industry is given in Appendix B.

(d) Adjustments to Bench-mark Levels

The next step was the adjustment of the monthly indexes to the annual series. Where "net" annual indexes were available, these were used as the bench-marks. Where no annual "net" indexes could be constructed, however, the alternate annual series were used as bench-marks. Although year-to-year discrepancies between the annual indexes and the monthly averages were not, in general, too serious, the accumulation of these differences often reached considerable proportions over the longer term. Almost invariably the monthly indexes showed lower levels than the annual, the degree of bias being more pronounced in industries showing diverging trends of gross and net output and in those represented by monthly man-hour data. If a fixed ratio, based on the relation of the bench-mark figure to the average of the monthly figures is applied to each monthly figure, the monthly average will then correspond to the bench-mark level, but discontinuity often arises between figures for each December and the following January depending on variations over the period in the rate of change between the annual index and the monthly average. This discrepancy was especially serious in certain industries where changes in output per man-hour were considerable. After the fixed ratio had been applied to the original indexes, the series were examined to determine the years in which smoothing was necessary. The change between December and January in the unadjusted indexes was compared to the change after the indexes were adjusted to bench-mark levels. In those years where there was a significant difference the series were adjusted as follows: The January adjustment was derived by applying the January/December ratio of the original

series to the December figure after adjustment to bench-mark. In this way the change between December and January in the original series is retained in the adjusted series. The difference in index points between the new and the old January levels was distributed over the year as follows ("x" representing the difference in index points between the new and the old January levels):

January	x	July	$-\frac{1}{2}x$
February	$\frac{3}{4}x$	August	$-\frac{3}{4}x$
March	$\frac{1}{2}x$	September	$-\frac{1}{2}x$
April	$\frac{1}{4}x$	October	$-\frac{1}{3}x$
May	0	November	$-\frac{1}{6}x$
June	$-\frac{1}{4}x$	December	0

This "smoothing" adjustment has the effect of spreading the difference in the December-January movement over the entire year in such a way that no one month bears the full effect of the adjustment, and that, at the same time, the month-to-month movements are, generally speaking, not seriously disturbed. In cases where the adjustment was large and in the same direction for several years, the method, in effect, superimposes an additional seasonal pattern on the original series; this problem was handled by compiling two sets of seasonal adjustment factors for such industries: one based on the period covered by the bench-mark adjustments for the deseasonalization of this period, and the other based on the original series for the seasonal adjustment of the period subsequent to the last bench-mark. The use of estimated output per man-hour adjustments for those industries represented by man-hours should bring the levels of the monthly indexes in future more in line with the bench-mark indexes, thereby reducing the need for these special adjustments.

(e) Adjustments to Man-hours

In the case of industries for which no monthly quantum data on products or materials are available, it is necessary to use man-hours as indicators of output. Their use is confined to the manufacturing sector. The mining and electric and gas utilities divisions of the index are well covered with physical volume series.

The monthly man-hour data used in the index are collected by the Employment Section of the Bureau from establishments employing 15 or more persons. It is assumed, therefore, that the man-hours relating to plants employing fewer than 15 persons will follow the same trend as in the larger establishments. The use of man-hours in the monthly index, however, is concentrated in those industries where the bulk of production is accounted for by plants employing more than 15 persons.

The monthly hours data relate to hourly-rated wage-earners and cover the pay period ending nearest the last day in each month. For the majority of establishments the pay period consists of one week. If these figures were to be used as reported to indicate productive activity, it would have to be assumed that the hours worked during the last week of the month were representative of the hours worked during the whole month. For purposes of the index it would be preferable to have the data relate to the pay period ending nearest the 15th of the month. The figures, therefore, are subjected to a two months' moving average whereby the man-hours worked in the last week of two successive months are added and averaged arithmetically. This procedure has the effect of smoothing the monthly trend and of being more indicative of work done throughout the month.

When a strike occurs in an industry represented by man-hours, special care is taken to ensure that the series is not distorted. For instance, if a strike occurs in the last pay period of the month, and lasts for the entire week, the plant affected will report no hours for the period; however, the plant was in operation during the first three weeks of the month and the pay period in this instance is not representative of the entire month. A special adjustment is therefore necessary so that the loss of only one week is reflected in the figures. Any major strike not covering a complete month necessitates this type of correction. These timing adjustments are made only in cases where strikes are important enough to distort significantly the man-hours of the industries involved.

An important innovation in the revised index concerns adjustments to man-hours for estimated changes in output per man-hour. The failure to allow for such changes was a major shortcoming of the old index; most of the differences between the annual levels of the new indexes and those of the old indexes (when expressed on the same base) in recent years is attributable to the use of unadjusted man-hours in the old series.

During the period covered by bench-mark indexes, the man-hour series were automatically adjusted when they were "tied" into the annual levels (which were designed to measure output in every case) as described in the preceding section. For the period subsequent to the last bench-marks, however, the use of unadjusted man-hours to represent production would impart a downward bias to the series involved, especially in times of rapid or sustained industrial expansion. Adjustment factors for this period were developed in the following manner: apparent output per man-hour ratios were obtained in the years (since 1946) for which bench-mark indexes were available by dividing the bench-mark index for each industry by an index of man-hours; the latter was derived by dividing annual census production-worker payroll by average hourly earnings. The ratios were plotted and a fitted straight line was drawn through the ratios and projected to the current period. Where the trend in apparent output per man-hour was relatively smooth, the long-term annual average ratio was distributed by months and applied to the reported monthly man-hours in the current period. The ratios, however, are subject to adjustment. In a period of recession the trend of output per man-hour generally tends to flatten out or even decline, while in periods of sharp expansion it will tend to increase more rapidly. In 1957 and 1958, for in-

stance, when manufacturing output showed a declining trend, it appeared appropriate to dampen down many of the adjustment ratios. Where the past trend of the ratios was erratic, the industry bench-marks were projected to the most recent available year to reduce the possibility of accumulated errors. A running check on the ratios is maintained by compiling up-to-date preliminary bench-marks from the monthly survey on value of manufacturing shipments and inventories; the derived value of production for the industries involved is deflated with the most appropriate available price indexes. Although these preliminary annual series are only approximate, they provide a basis on which judgments can be made concerning adjustment to the ratios.

It is planned to incorporate revised bench-mark levels in the index at regular intervals as census of industry data become available. In this way, the indexes represented by adjusted man-hours will not have to run too long without revision. It is expected, however, that future revisions to these indexes will not be as large as in the past. The man-hour adjustments are designed to bring the monthly averages of the current index more in line with the eventual bench-mark levels.

(f) Adjustments for Seasonal Variations

(1) Introductory Note

Seasonally-adjusted data on production have been published by the Dominion Bureau of Statistics for many years. (See Monthly Review of Business Statistics, February, 1944 and May, 1947, for seasonally-adjusted indexes 1919-1946). However, at the end of 1952 publication of the seasonally adjusted Index of Industrial Production was suspended, pending further research into, and development of, improved seasonal factors. Publication was resumed in the February, 1956, issue of the Canadian Statistical Review. The method of seasonal adjustment used was described briefly in that issue of the Review and set out in detail in the D.B.S. Reference Paper No. 77, "Seasonally Adjusted Economic Indicators, 1947-1955, (An Outline of Problems and Methods)". In regard to the Index of Industrial Production, seasonal adjustment was carried out by the "hand" method at the total durables, non-durables, mining and electricity and gas levels; these four major components were then summed to obtain the total. For analytical purposes, sixteen of the industry groups within manufacturing were also seasonally adjusted, some on a quarterly basis, the others on a monthly basis. Although the movements of these component series were consistent with those of the composite groupings, they were never entirely integrated.

The present reference paper introduces seasonally-adjusted production indexes which incorporate the latest developments in this field. The indexes were processed in Washington on the Bureau of the Census Univac computer using methods developed by U.S. statisticians and programming specialists. It would have been impractical to develop and maintain by hand methods seasonally-adjusted series on the detailed and refined basis that the use of the electronic computer made possible.

The nature and causes of seasonality and problems of measurement are discussed in general terms in the reference paper referred to above. The following paragraphs are restricted to a discussion of specific problems arising and solutions adopted in the seasonal adjustment of the Index of Industrial Production by electronic computers.

Variation in the length of the reporting period, or what is known as calendar variation, is a basic seasonal factor. The treatment of this problem is discussed in an earlier section under the heading "Adjustments for Working Days". The industry components of the industrial production index are adjusted for variations in the length of the work month before the electronic computation of the seasonal factors.

(2) Definitions

Seasonal movements or variations are distinguished from secular, cyclical and random or irregular movements by students of time series. Time series are a composite of all four types of movement. Secular movements are defined as those smooth, regular, long-term movements whose persistence is associated with some basic underlying growth characteristic. Cyclical movements consist of expansion in a majority of economic activities, followed by a similarly general contraction, which in turn gives way to recovery and a new phase of expansion; cyclical movements may vary in length from one year to 10 or 12 years, but average 4 to 5 years, although no two are alike. Random or irregular movements are those occurring without any clear pattern in timing or amplitude. Seasonal movements are those recurring within each year and having some stability within the industry or area under observation. When these repetitive seasonal movements are removed from the data, the analyst is able to concentrate his attention on the other elements in the time series.

(3) Data Problems

In preparing the raw or unadjusted data for seasonal adjustment each series was carefully examined for irregularities and any factors which caused distortion or interruptions in the normal movement of the series. It is important that such elements be removed from the series before they are processed for the derivation of the seasonal factors since they tend to obscure or disturb the underlying seasonal pattern and thus make the mechanical extraction of the factors less accurate.

One of the most frequent causes of irregularity is major labour disputes. This problem was handled by estimating the approximate levels of output that would normally have been recorded during the strike period. In some cases strikes are followed by a period of abnormally high output in order to replenish depleted stocks; hence levels of output during these

months have to be reduced in accordance with the more regular production pattern. Each major strike had thus to be examined for its effect on the production indexes and appropriate corrections applied to the "raw" series preparatory to the computation of the seasonal factors.

Problems of discontinuity arose in many industries resulting in abrupt changes in the seasonal pattern. The most common type of discontinuity was in connection with the adjustment and smoothing of the monthly indexes in line with bench-mark levels. (See section on "Adjustments to Bench-mark Levels"). Where the smoothing adjustments were in the same direction for several years, the procedure resulted in an artificial seasonal pattern being superimposed on the original series. This particular characteristic was confined to the years for which bench-mark indexes were used so that the seasonal pattern for this period differed from that of the later period. In these cases, two sets of seasonal factors were derived; one based on the period covered by the bench-mark indexes and the other based on the original indexes (after adjustment for working days). The latter set was used to seasonally adjust the monthly indexes subsequent to the last bench-mark year. Where the smoothing adjustments did not result in any significant irregularities, only one set of factors was developed.

Another type of discontinuity arose from the introduction of new data or the substitution of one series for another where the seasonal pattern of the new data or series was substantially different from that of the original figures. For instance, when iron ore was first extracted in volume from the Quebec-Labrador fields in 1954, the seasonal pattern of total iron ore mining was greatly disrupted. Winter conditions prevailing in this northern area restrict mining operations to the period from late spring to early fall while iron ore properties in other areas are not so severely affected. Moreover, the summer production peak in these new fields dwarfs that of other iron ore mines. These conditions resulted in a sharp change in the seasonal pattern of iron ore production in 1954 and the pattern prevailing prior to that date was not applicable to subsequent years. Two sets of seasonal factors were therefore necessary, one of which was based on the 1946-1953 period. In order to obtain a sufficiently long period to develop factors for the second set, the 1955 production pattern in the Quebec-Labrador fields was added to that of the industry total from 1950 to 1954 (six years is the minimum period for electronic programming); and the resulting seasonal ratios were used to adjust the industry index since 1954.

In a few cases where man-hour data were replaced in the later years by volume of production series, and the seasonal pattern of the new series was substantially different from that of the man-hour indexes, the production pattern of the later period was used to interpolate the monthly series between the bench-mark levels of earlier years. The monthly indexes derived in this way were used along with the actual production series for the later period to derive the seasonal factors.

Adjustments were applied to the original series for other types of irregularity when these pertained to a short period of time. When longer periods were involved such as in 1946 and 1947 when industries were converting their operations from war production or were affected by the long, widespread strikes prevalent in this period, the disturbed years were deleted entirely from the computation of the seasonal factors or replaced by an adjacent, more typical year.

(4) Method

The computation of the seasonal factors was done by high speed electronic computers. It was thus possible to take advantage of the latest and more refined techniques developed mainly by the staff of the U.S. Bureau of the Census. The method used in deriving the seasonal factors, known as Univac Method II, may be briefly described as follows:

(1) A 12-month moving average is run through the original data (the production indexes after adjustment for calendar variation and other adjustments as noted above in sub-section c); an additional 2-month moving average is computed to centre the data.

(2) Ratios of the original data to the centered 12-month moving average are computed.

(3) Extreme items are identified and replaced by more representative ratios and smooth curves fitted to all ratios for each month.

(4) A preliminary seasonally-adjusted series is derived.

(5) A weighted 15-month moving average of the preliminary seasonally-adjusted series is computed.

(6) Ratios of the original data to the 15-month moving average are computed.

(7) Extreme items are again replaced by more representative ratios and a smooth curve fitted to the ratios for each month.

(8) A final seasonally-adjusted series is derived

(9) Seasonal factors are projected ahead one year.

In the process of carrying out the above steps the computer makes various checks for reliability, residual seasonal, etc: measures the irregular, cyclical and seasonal components and computes ratios of one to the other, gives the number of months required for the emergence of cyclical dominance, prints out several charts, including one showing the seasonally-adjusted data and original data, and one for each month showing the ratios from step (6) above together with the curve noted in (7) above. Many other tables and ratios helpful in analyzing the seasonal factors are printed out.

Although the above is a greatly abbreviated summary[1] of the step-by-step method followed by the electronic computer it is readily apparent that to

[1] For a complete description see "Seasonal Adjustments by Electronic Computer Methods" by J. Shiskin and H. Eisenpress – Technical Paper 12, National Bureau of Economic Research, Inc., New York, 1958.

obtain the same degree of accuracy as well as derive the same analytical charts, tables, ratios, etc., by a hand method would require very large resources. Without a computer it would not be feasible to use Method II on the large scale required for the Index of Industrial Production.

(5) Detail Used in the Seasonally-adjusted Index

Although seventy-one seasonally-adjusted series are published in this reference paper about 30 of these are the result of the weighted combination of two or more commodities, industries or industry groups. Altogether some 100 component series were processed by the electronic computer.

Even though it was decided to obtain seasonally-adjusted composites for industry groups and the total by adding the seasonally-adjusted components rather than by adjusting the composites directly, the composite indexes (total industrial production, mining, manufacturing, durables and non-durables) were also processed on the computer along with the industry components in order to determine the extent of differences between the two approaches. No significant differences in timing or magnitude of movements were observed. A running comparison of the two approaches will be maintained to check on any divergences that may develop. The method of summing components to totals was chosen since it provides an exact measure of the point contribution of each component series to the composite totals; this is an important advantage in the detailed analysis of the series.

(6) Editing Problems

Although the electronic computer did the vast bulk of the work in carrying through the seasonal adjustments some editing problems remained. One of the most important and time-consuming was the review of the data for residual seasonal (some seasonal pattern left in the seasonally-adjusted indexes). In cases where adjustments were necessary, it was usually sufficient, after studying the data and accompanying charts provided by the computer, to apply corrections to the charts showing the ratios of original to weighted moving average, then to read back the ratios and re-compute the seasonally-adjusted series. At the end of the series, where by the nature of the computing method, the results are more tentative (especially at cyclical turning points) it was found that approximately twenty per cent of the individual series required special treatment. This was accomplished by retaining the computer factors up to the year in which distortion first appeared and then extending these factors by using a "hand" technique.

Another editing problem arose from the fact (as pointed out earlier) that two seasonals were computed for series that showed important breaks in continuity. Here the linking of the two seasonally-adjusted series had to be carefully done in order not to seriously disrupt the movements of the series at the linking point.

Unique problems exist in some industries. Production in the motor vehicle industry, for example, is affected by shifting model changeover dates each year and by changes in the duration of these interruptions in production. Here it was necessary to develop a special hand method of seasonal adjustment for the later period as no mechanical approach would fully account for important recent shifts in the timing of model changeovers.

In cases where the original data had been adjusted for strikes or for irregular movements, the adjusted data were used to derive the seasonal factors. These factors were then applied in the usual manner to the original data to arrive at the seasonally-adjusted series, so that the irregular movements appear in the final-adjusted series.

The most important problem in editing the data falls in the current period where seasonal factors must be kept up-to-date. The electronic computer programme helps a great deal in this area by projecting[1] the seasonal factors one year ahead. However, in order to ensure as much as possible the appropriateness of current factors, adequate tests of the data must be maintained to correct for any sudden shifts in seasonal patterns. This problem is minimized by the annual re-run of the "raw" indexes on the computer. For instance, the seasonals for the current period are based on the original data for the years 1951-1957 and the computer-projected preliminary factors for 1958. After the index has run through the 12 months of 1958, it is planned to re-run the "raw" series for the period 1951-1958 on the computer and to revise the seasonally-adjusted series where necessary; projected factors for 1959 will be obtained at the same time. In this way, the seasonal factors will be kept sufficiently up-to-date to reflect adequately any gradual shifts in seasonal patterns.

16. Production Indexes and Their Relation to Employment Data

As production indexes are often used in conjunction with employment or man-hour series to indicate changes in productivity, it is important that the meaning of such comparisons be understood by users of the data.

The term "productivity" is commonly used to indicate the relationship between production and labour input, whether it be for a firm, an industry, a group of industries, or the economy as a whole. It is usually expressed as output per man-hour, that is, the total output divided by the total number of man-hours required to produce that output. It is this measurement that is widely known as "labour productivity". It must be made quite clear that this is a statistical measurement, and carries with it no implication that labour is solely responsible for

[1] The difference between the last two available seasonal factors in each month is divided by two and added to (or subtracted from, depending on the trend) the last factor to yield the projected factor.

either gains or losses in output per man-hour. Productivity can also be expressed in terms of output per dollar of capital, per hour of machine operation or per unit of energy consumed. It measures the performance of the whole productive process, not that of any one factor.

Actually, increases in productivity can be traced to a large number of factors. Technological progress, mass-production techniques, managerial ability, specialization of labour, improved working conditions and many other factors contribute to higher productivity. The gains of productivity, then, are the result of a joint effort, and it is difficult to isolate the exact contribution of each factor.

In calculating productivity, the most common procedure is to divide an index of production by a corresponding employment or man-hour index. If both production and labour series are comparable and satisfactorily constructed the resulting index of output per man or per man-hour will have some significance, but it must be remembered that small errors in either of the two series may be compounded, with the possible result that the error in the productivity index may be greater than the actual changes in productivity, since the latter usually fluctuates within very narrow limits. It is therefore preferable that both the employment and production data be obtained from the same source (such as censuses of industry).

When production indexes are used in this connection, careful consideration must be given to the statistical methods used in constructing the indexes and to the types of indicators selected to represent production before any significance can be attached to the ensuing productivity measure. A certain amount of circularity would result, for instance, if several industries in the production component were represented by unadjusted man-hours since it would then be assumed that output per man-hour in those industries remained constant.

Assuming it is possible to construct appropriate production and employment or man-hour series, what then is the significance of the productivity figure derived from dividing the production index by the labour index?

An index of productivity can be constructed to measure either of two basic concepts. In the first concept, labour productivity is considered as a specific characteristic of an individual product, plant or industry for which it is measured; if, for instance, two plants manufacture the same product, and the productivity of either plant has remained unchanged over a certain period, then the productivity of the two plants combined will remain unchanged, even though one of the plants produces at a higher rate of output per man-hour and its share of the combined production has increased. In order to obtain the desired productivity (unchanged) ratio according to this concept, the production index for the two plants combined would have to be so constructed that the output of each is weighted individually with unit labour requirements. In this way, the larger share of the composite acquired by the more efficient plant will not influence the resulting productivity index when the production composite is divided by the total hours expended in the output of both establishments.

In the second concept, productivity is considered in relation to the relative importance in the group of the constituent products, plants or industries for which the productivity measurement is computed. In this case, the productivity average for a group of components can change, even if the individual productivity for each component remains unchanged, because of changes in the relative importance of the components. This is commonly referred to as a productivity index inclusive of the effects of the changing "product mix". Referring to the above example, to measure this concept, the production of each plant would be added without allowing for different levels of efficiency, and productivity for the two plants combined would be expressed as the ratio of total production (computed with the weight for each plant equivalent to 1) to total man-hours. It will be noted that the implicit weights in this case differ from those used in the first concept where the weights reflected differences in levels of unit labour requirements. Thus the larger share, in the composite, of the more efficient plant is allowed to influence the productivity index which, in this instance, will show an increase.

In practice, the second concept is the more common. In the above example, the plants were producing only one product. If each plant were manufacturing a variety of products with different unit man-hour requirements (a more realistic hypothesis) it will be observed that, to measure productivity according to the first concept, each item in the production component would have to be weighted with its individual unit man-hour requirements. While unit man-hours are usually available from censuses of production at the plant and industry level, they cannot be allocated to individual products. If weights other than unit man-hours are applied to the production items, the resulting productivity index will measure the first concept only if the substitute weights are proportional to unit man-hour weights. This seldom is the case, and, as indicated in the above example, (where weights equal to 1 were used instead of unit man-hour weights) the use of weights which are not proportional to unit man-hours corresponds to a shift from the first to the second concept of labour productivity.

The division of an index of output for a specific industry or group of plants by the corresponding man-hour index will normally yield a productivity index which measures the second concept; each item in the production index is recorded in total, not by firms, thus taking no account of the differences in levels of productivity of the various plants which produced it; moreover, the weights used to combine the various production items into a composite index are not generally proportional to unit man-hours. Thus, a shift in output within the composite from

firms with a relatively low level of output per man-hour to more efficient firms, or changes in the relative movements of products, may result in a change of productivity whether or not the productivity ratios of individual plants or products have changed. In summary, removal of effects of the changing "product mix" is impracticable in the general approach, and in order to gain more knowledge of the influence of this factor, supplementary studies of individual plants are required.

When an index of production is used in the measurement of productivity the kind of weights which have been selected must be carefully scrutinized in order to assess the significance of the measurement. As indicated above, unit man-hours are usually not available at the product level, and substitute weights have to be used in the construction of the production index. Thus the resulting productivity index will not measure the first concept since it will reflect the influence of changes in the relative importance of each component as in the second concept. In order of preference, the most commonly-used substitute weights are census value added per unit and value per unit.

Although census value added per unit is difficult to measure directly for specific products, approximately the same effect is obtained for an industry as a whole by the compilation of a "net" output index as explained in an earlier section. Admittedly, census value added per unit is somewhat removed from unit labour requirements, but it has a fairly high labour-cost content and is free of the influence of raw materials. In some industries, of course, relative values added will differ quite considerably from unit labour requirements because of variations in capital equipment, overhead costs and profits related to the fabrication of individual products. However, the choice of the weighting system may have little influence on the results; in industries where one product dominates, where there are a large number of products, or where the majority of products have similar movements, the nature of the weights used has little influence. The same observations apply to the use of unit value weights. These, of course, are still further removed from unit labour requirements since they include the cost of raw materials and fuel and the cost of business services and mark-ups.

The use of these alternative weights, which is dictated by the availability of data, introduces an element of variation when changes occur in the composition of production. The productivity index will reflect the effect of any shifts from products or plants or industries with high man-hours per dollar value added or per dollar of total value to those with low man-hours per dollar value added or per dollar of total value, or vice versa.

For some studies, where shifts in employment from industries with low value added per man-hour to those with high value added per man-hour or from low-wage to high-wage industries, are considered relevant, a measure of man-hours per unit derived from a production index with value-added weights is appropriate. In this case the use of value-added weights would be by choice rather than necessity. For instance, if data on average wages for a group of industries (total wages for the group of industries divided by total man-hours or number of workers) are compiled for comparison with a measure of productivity for the same group of industries, the average wage figure will reflect the effect of shifts in the relative importance of high-wage and low-wage industries, and it will then be desirable that the productivity measure also reflect the effect of such inter-industry shifts.

It is desirable, of course, that where possible, both concepts of productivity be measured in order to appraise the extent of changes due to shifts in the composition of production. Unit man-hours are seldom available for individual products, but it is usually possible to obtain man-hour data on the plant or industry level from census records. It is possible, for instance, to weight production indexes for individual industries with man-hours when these indexes are combined into broader groups. The resulting productivity index would reflect possible shifts in the composition of production within industries, but not between industries.

The division of a production index with base-year weights (the most common form) by a man-hour index, will yield a productivity index which measures, in any given year as compared with the base year, the changes in man-hours required to produce the "market basket" of goods in the given year. It specifically answers the question: "How do the man-hours that would have been required in the base period to produce the given year's basket of goods compare with the man-hours actually worked in the given year?". A different market basket enters into every comparison with the base year. Thus, strictly speaking, the index for any year can be compared only with the base year and comparisons cannot be made between any other two years.

Thus it is important, when using productivity data, to analyse thoroughly the methods used and the significance of the concept measured. Although it is not possible, by using broad measures of production and man-hours, to account completely for the actual changes in productivity, these measures are nevertheless useful in a general type of analysis. Recently a research programme was initiated in the Business Statistics Section of the D.B.S. for the purpose of clarifying conceptual and data problems and of subsequently preparing limited studies on trends in output per man-hour within the Canadian economy.

PART II

Analysis and Appraisal of Results

PART II

Analysis and Appraisal of Results

1. Analysis of Industrial Trends

(a) Pattern of Growth

The period covered by the present index was generally one of sustained industrial expansion. Emerging from the great depression of the thirties, industrial operations in Canada entered a period of growth which was maintained with few interruptions throughout the war and post-war years. Indicative of this sustained increase, the volume of industrial production tripled in the last two decades. The compounded annual rate of increase between 1937 and 1957 amounted to 5.6 per cent.

(1) Manufacturing Production

The volume of output of manufactures rose steeply following the outbreak of hostilities in 1939 as productive facilities responded quickly to the urgent requirements of the defence programme. The production peak was reached in 1944 when weapons, supplies and equipment were rolling off the assembly lines at a record-breaking pace. The end of hostilities and the subsequent reconversion to peace-time production were attended by declines in output in 1945 and 1946. However, the upward trend was resumed in 1947, stimulated by the long accumulated demands of both consumers for personal goods and businesses for capital equipment. It continued without important interruption until 1953. The outbreak of hostilities in Korea in mid-1950 gave rise to certain adjustments which cut across calendar years (see chart X) and which are obscured by the annual figures. It is interesting to note that, according to the new index, the 1944 wartime peak in output was exceeded as early as 1950. The Korean armistice in mid-1953 marked the end of rapidly rising defence expenditures and the recessionary influences that developed following the armistice checked the growth of production. The year 1954 showed a mild contraction as the volume of manufacturing output declined by 3 per cent. The years 1955 and 1956 were ones of renewed vigorous expansion however, as business and consumer spending showed large advances. In 1955, manufacturing production rose by nearly 10 per cent over 1954, the largest gain of any post-war year. Over the two-year period, the volume of factory output jumped by 18 per cent. Expansion in production continued until the end of 1956. Early 1957 however, marked the beginning of another contraction and manufacturing output declined steadily throughout the year. Because of the very high level of output at the end of 1956, the average for 1957 was only 2 per cent below that of 1956; this obscures a drop of over 10 per cent between December 1956, and December 1957.

The levels of production reached in 1957 are compared with those of a decade earlier in chart III for total manufacturing and its major components. Between 1947 and 1957, the volume of total manufacturing production rose by nearly 53 per cent. This compares with an increase of only 20 per cent in total manufacturing employment.

All industry groups did not share equally in this advance in manufacturing output. Among those showing the largest gains were the petroleum and coal products industry (180 per cent), the non-metallic products industry (123 per cent), the electrical apparatus and supplies industry (102 per cent) and the chemical products industry (100 per cent). These industries were closely associated with the rapidly growing resource-development and capital investment programmes that characterized this period. Those industries showing only average increases (40 per cent to 80 per cent) ranked in order of size of increase, were as follows: miscellaneous manufacturing industries, tobacco products industry, printing and publishing industry, transportation equipment industry, paper products industry, iron and steel products industry, non-ferrous metal products industry and the foods and beverages industry. Those showing the smallest gains were the wood, clothing, textiles, rubber and leather industries. The latter industry showed little change over the period.

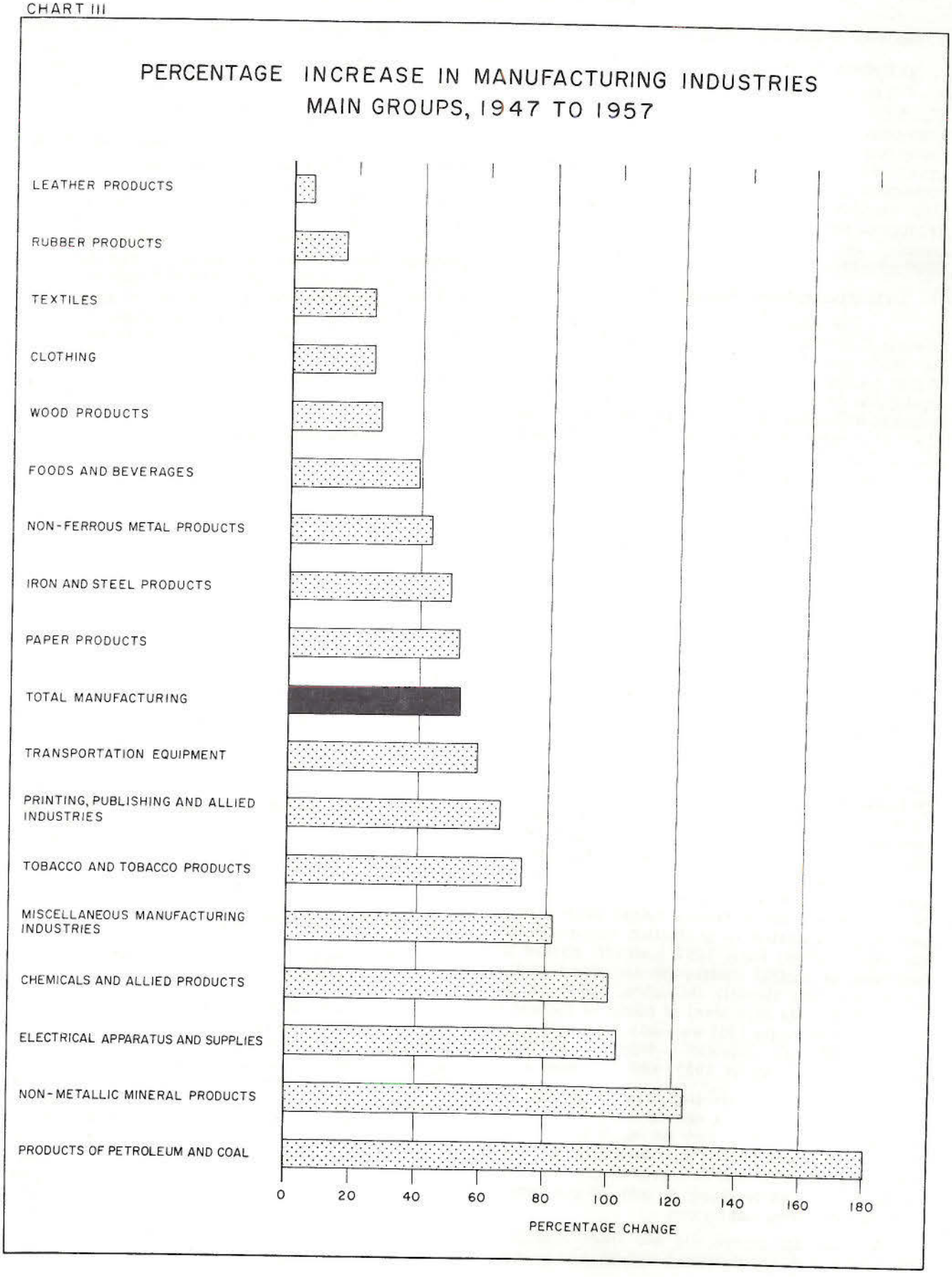
(2) Mining Production

The discovery and development of new mineral resources during the last ten years has been one of the outstanding features of Canada's post-war industrial expansion. The volume of mineral production attained a wartime peak in 1941 when the mining index rose to 101 (1949 = 100). Mainly because of the steady decline in the mining of gold and other principal metals during the next five years, the index gradually fell off to a low point of 74 in 1946. Subsequent sharp gains in the production of petroleum, natural gas, iron ore and uranium, together with sustained increases in the production of most other minerals, resulted in a very rapid and uninterrupted advance (chart V). In 1957 the new mining index stood at 228, indicating that mineral output had more than tripled during the previous 11 years. By contrast to the substantial advances of most mineral products, the mining of coal has shown a steady decline during recent years. In 1942, coal production reached its highest level of the past 22 years when the index stood at 102. It receded during the next five years, recovered temporarily in the early post-war years and then fell off steadily after 1949. In 1957 the coal index averaged about 65, the lowest in the 1935-1957 period.

(3) Production of Electric Power and Gas Utilities

Despite large advances in recent years in the distribution of natural gas, the movement of output in the electric and gas utilities industry is still influenced mainly by electric power. Except for a slight decline in 1945, the production index for this industry has shown a continuous series of increases throughout the period covered and since the war its substantial advance has parelleled that of the mining industry. A large part of the rapid post-war growth in the volume of electric power is accounted for by the relative increase in the distribution of the more expensive residential and commercial classes of power compared with the cheaper type of industrial power. Although the distribution of natural gas

CHART III


PERCENTAGE INCREASE IN MANUFACTURING INDUSTRIES
MAIN GROUPS, 1947 TO 1957
LEATHER PRODUCTS
RUBBER PRODUCTS
TEXTILES
CLOTHING
WOOD PRODUCTS
FOODS AND BEVERAGES
NON-FERROUS METAL PRODUCTS
IRON AND STEEL PRODUCTS
PAPER PRODUCTS
TOTAL MANUFACTURING
TRANSPORTATION EQUIPMENT
PRINTING, PUBLISHING AND ALLIED INDUSTRIES
TOBACCO AND TOBACCO PRODUCTS
MISCELLANEOUS MANUFACTURING INDUSTRIES
CHEMICALS AND ALLIED PRODUCTS
ELECTRICAL APPARATUS AND SUPPLIES
NON-METALLIC MINERAL PRODUCTS
PRODUCTS OF PETROLEUM AND COAL
0
20
40
60
80
100
120
140
160
180
PERCENTAGE CHANGE

nearly quadrupled between 1949 and 1957, its influence on the utilities index was to some extent offset by the substantial decline in the production and distribution of manufactured gas with the result that the increase in the composite gas index during the last ten years was considerably less than that of the electric power index.

(b) Monthly Trends in the Post-war Period

The post-war recovery of industrial operations which began toward the end of 1946 was reflected in the steady rise of the seasonally-adjusted production index until the middle of 1951. The appearance of North American recessionary influences in 1949 had little effect on the movement of Canadian industrial output. During 1949, the old index had shown a tendency to flatten out but no decline had been indicated. The new index does not show any slowing down in the rate of post-war recovery. It should be noted however, that Newfoundland's production was added to the new index in 1949 (See Part I, Section 9).

The effects of the Korean war (1950-1953) on industrial operations are clearly reflected in the movement of the index during this period (chart XI). The outbreak of hostilities in mid-1950 led to an acceleration in the post-war rate of advance of industrial production as business and consumer purchases rose sharply in expectation of shortages and higher prices. By mid-1951 the wave of forward buying subsided and production declined steadily during the second half of that year, despite rapidly rising defence expenditures. In early 1952 the anti-inflationary measures which had been instituted in 1950 and 1951 were relaxed. Production responded quickly to the resurgence of consumer spending, renewed activity in residential building and the business inventory build-up. The index rose to a peak of 131 in July, 1953. The Korean armistice at mid-year gave rise to recessionary influences as defence expenditures subsided and business inventory accumulation ceased to be a positive factor and gave way to inventory liquidation. From mid-1953 to mid-1954 the production index showed a moderate decline of around 3 per cent.

Highlights of the renewed vigorous expansion which began in mid-1954 and carried to the end of 1956 were the large gains in consumer expenditure and residential construction (1955) and the greatly enlarged scale of business investment in plant and equipment (1956). The result was a very rapid advance of 26 per cent in the production index between June 1954 and December 1956. Thereafter, recessionary influences re-appeared. Investment in plant and equipment levelled off and then turned down late in 1957, and downward pressures were strongly reinforced by the movement of business inventories. The Index of Industrial Production declined steadily and by the end of the year was 7 per cent below its level of 12 months earlier. Thus, during the course of 1957, the extent of the decline in industrial output was about equivalent to the extent of the increase during 1956. By December, 1957 the production index was back to its December, 1955 level.

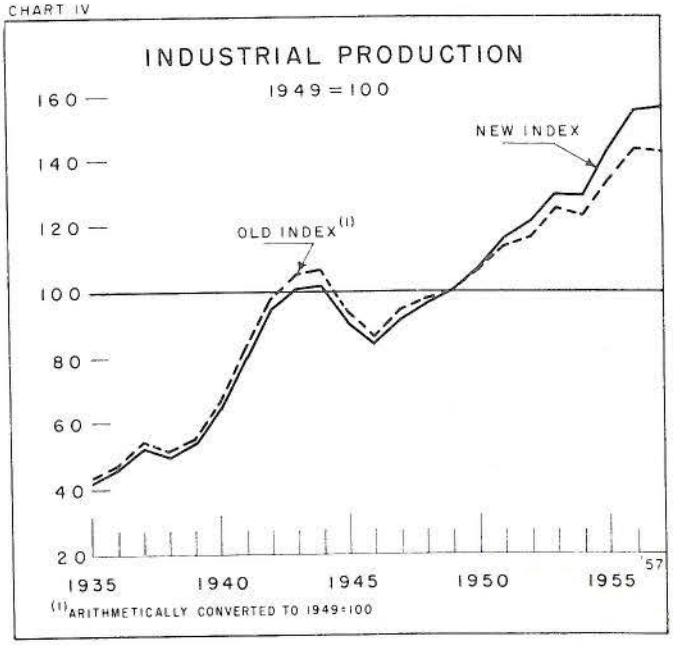
A study of chart XIII illustrates clearly the sensitivity of the durable manufacturing industries to periods of expansion and contraction. The upward trend of output of non-durable manufactures between 1946 and 1957 has been remarkably steady. The declines in overall industrial output which occurred in 1951, 1953-54 and in 1957 are hardly reflected in the monthly index of non-durable industries. By contrast, production of durable goods reacted strongly to changes in general economic conditions; each different phase of expansion and contraction described above is sharply reflected in the movement of the durable manufacturing index. The industries that comprise this latter index are largely influenced by defence and investment activity and by the demand for consumer durable goods. These demands are more vulnerable to changes in the economic and political climates than are the non-durable commodities, the demand for which is steadier and less subject to sudden change.

2. Comparison with the Old Index

(a) Annual Levels

The new Index of Industrial Production shows the same general trend in the movement of output as the previous index over the period covered. The revised index however, indicates a sharper growth in physical production, especially since 1950 (See chart IV).

CHART IV



Between 1935 and 1946 the percentage increase in production shown by both indexes was practically the same. In the new index however, the levels of output in the period 1942-1945 are somewhat below those shown in the old index. This was principally the result of a downward revision in the 1935-1939 weight for the aircraft industry. In view of the very large increase in production of aircraft during the war years, the smaller weight for the industry had a noticeable effect on the revised level of the total

index, as well as total manufacturing and durable manufacturing (See Charts VI and VIII). Changes in the 1935-1939 weighting system to incorporate more detailed G.D.P. industry data (Part I, Section 7) and in the indexes for several industries (Part I, Section 13) were largely offsetting and did not have any significant effect on the total index. Differences were more important however, at lower levels of aggregation.

CHART V

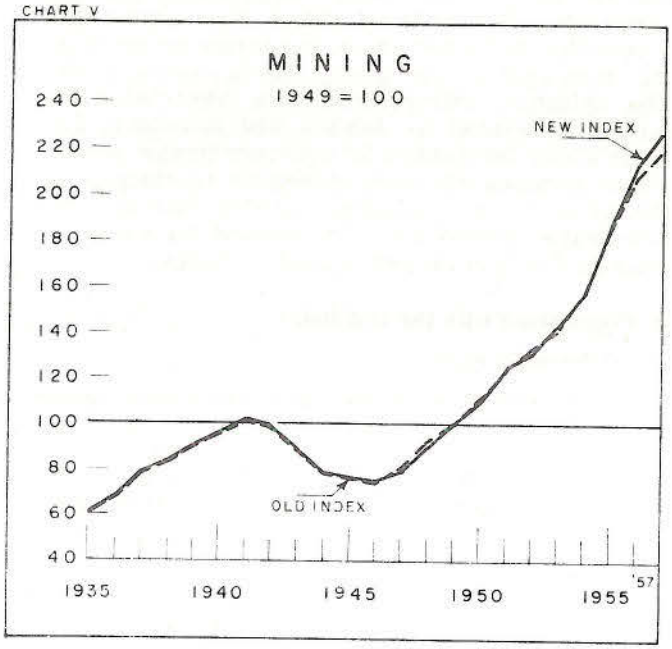
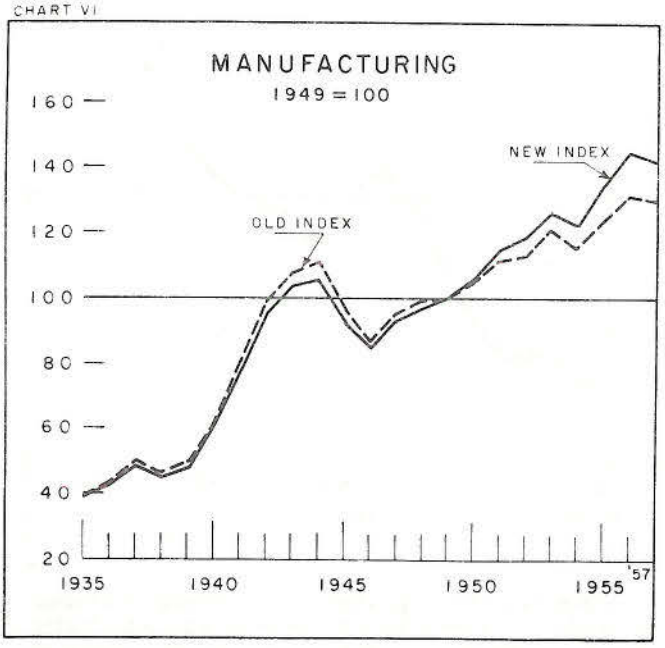


CHART VI



The old and new indexes for mining (Chart V) and non-durable manufacturing (Chart VII) in the earlier period showed parallel movements. The new index for electric and gas utilities however, recorded a sharper increase than the previous series in this period (Chart IX). This resulted largely, as noted earlier, from the extension of the concept of output in this industry to cover distribution of natural[1] and manufactured gas and electric power. In the old index, the concept of output for manufactured gas and electric power was limited to production at the manufacturing and generating sites and no distinction was made between the different types of distribution service involved. In the new index, the distribution of electricity and gas reflects changes in the type of service provided; the distribution of primary electric power between 1935 and 1946 more than doubled, whereas the sale of secondary power (used mostly in connection with the operation of boilers in off-peak periods and sold at a much lower unit price than primary power) actually declined over most of the period and showed only a small increase in the late war and early post-war years.

[1] The production of natural gas is classified to the mining industry in both the old and the new indexes.

CHART VII

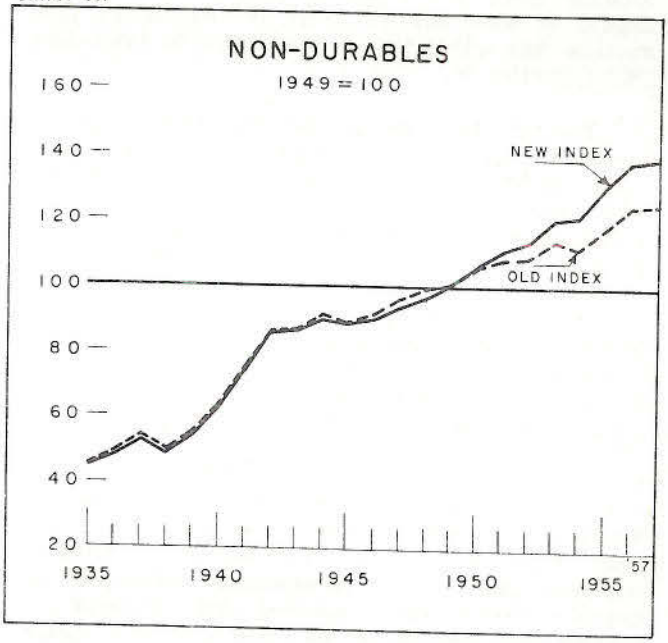


CHART VIII

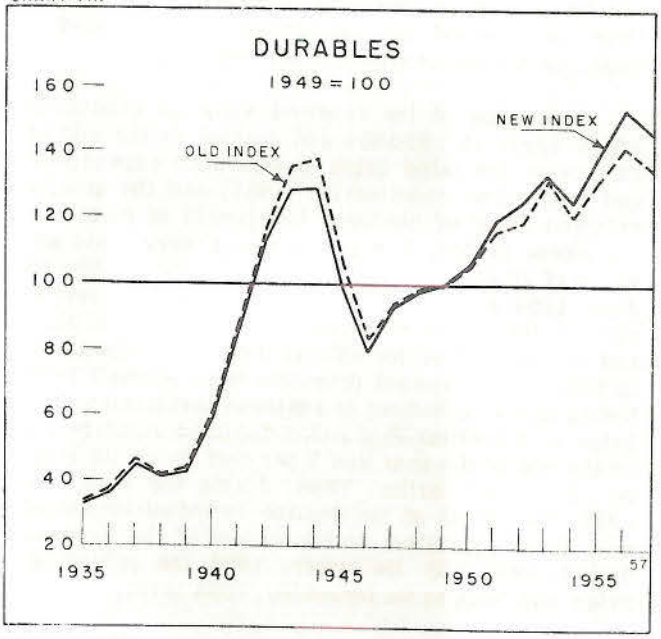
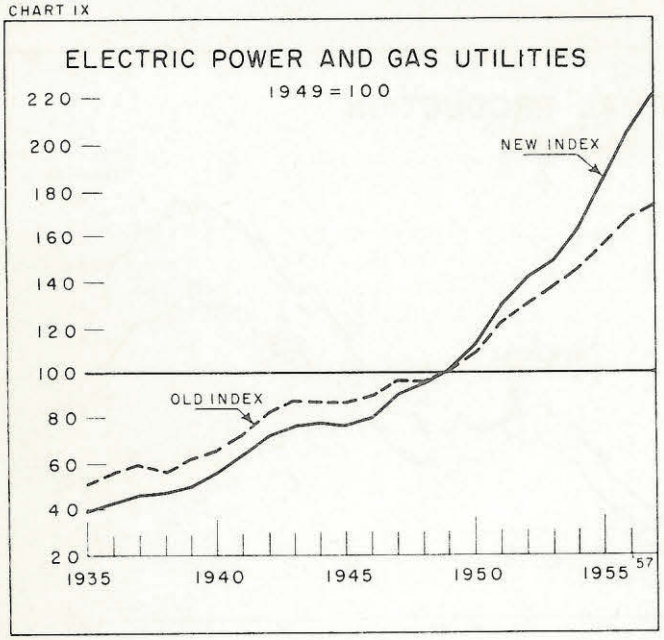


CHART IX



On balance, the old and new indexes, at the total level, showed roughly parallel movements during the period 1935-1947. This was to be expected since, apart from the few revisions outlined above, the great majority of the industry indexes were left unchanged; in the last revision of the index, all the industry series had been based on annual census data up to 1947 and, in the present revision, these bench-mark indexes were simply arithmetically converted to the new 1949 base. (See Part I, Section 13).

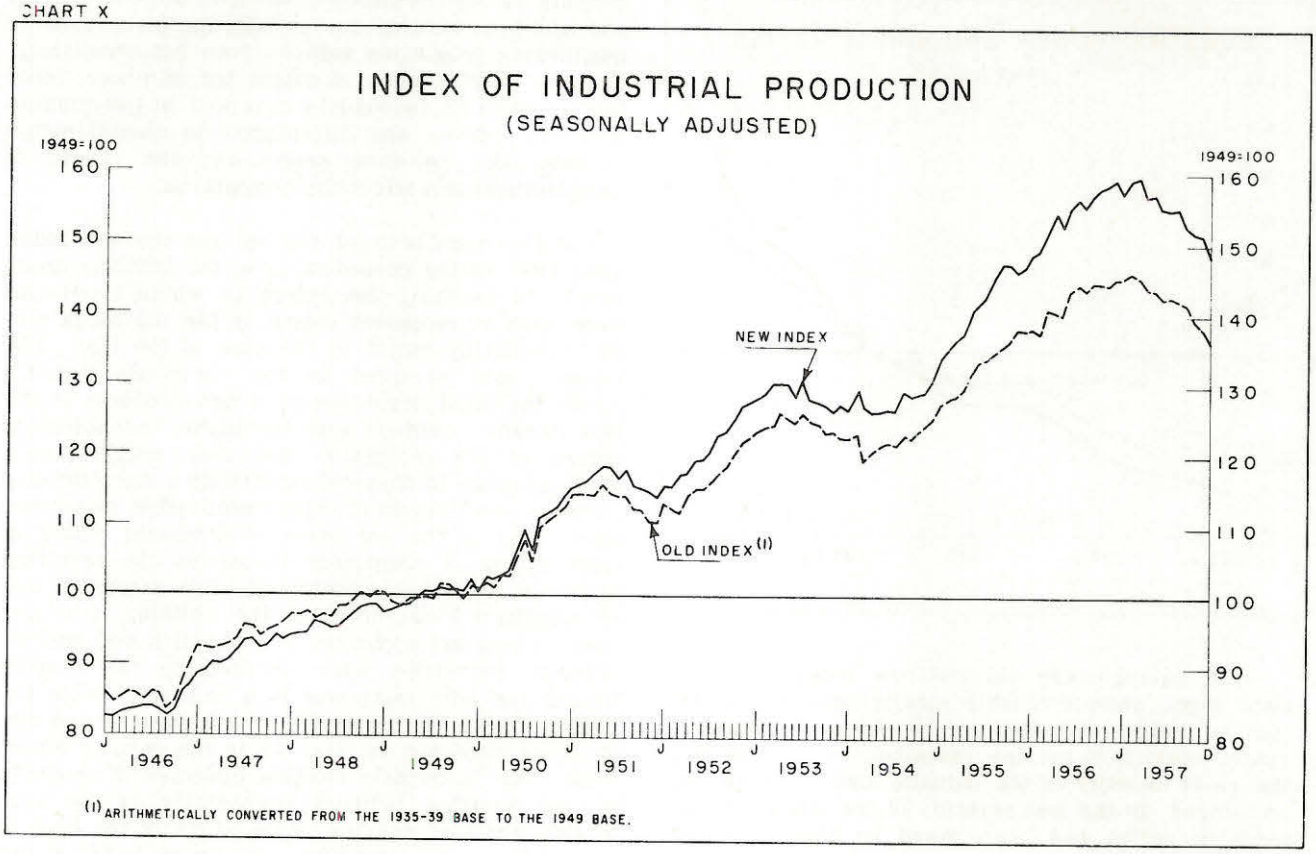
After 1947 however, the levels of the old index had not been adjusted to annual census bench-marks and the 12-month averages of the monthly series had been used as the annual indexes from 1947 to the present. When the compilation of the revised index was completed it was found that the old index had been progressively falling behind the revised series. Between 1949 and 1957, the old Index of Industrial Production showed an increase of 42 per cent while the new index rose by 55 per cent in the same comparison (Chart IV). This downward bias in the old index averaging about 1 per cent per year compounded was largely the result of using unadjusted man-hours to represent output for a large proportion (43 per cent) of manufacturing industries. A test was made whereby all those industries represented by production data in the old manufacturing monthly index were expressed as monthly averages and combined into one composite annual index and then compared with the corresponding annual composite of revised indexes; these two series showed roughly parallel movements throughout the 1947-1957 period. By contrast, a similar test of the industries represented by unadjusted man-hours in the old monthly index showed that the revised annual series increased much more rapidly than the corresponding unadjusted man-hour composite during the same period; actually the unadjusted man-hour series were understating the growth in output by the full amount of increases in output per man-hour in the industries involved. It should be noted however, that a comparison of the monthly man-hour totals derived from the employment and man-hour monthly survey with the corresponding bench-mark production indexes does not necessarily indicate only changes in output per man-hour; other factors such as incomplete coverage in the monthly man-hour survey and differences in classification between the man-hour series and the census of manufactures can affect the comparison.

Differences between the old and the new index after 1947 varied considerably at the industry group level. In general, the extent to which man-hours were used to represent output in the old index was the dominating factor in the size of the bias. The largest bias occurred in the chemicals industry where the rapid development of new products in the last decade combined with the highly technological nature of the production processes resulted in a sharp advance in physical output with a much smaller increase in employment. Since unadjusted man-hours were used in the old index to represent output in most chemical component industries the resulting downward bias was substantial. The extensive use of unadjusted man-hours in the clothing, iron and steel, electrical apparatus and supplies and miscellaneous industries also resulted in fairly large biases but here manpower is a relatively more important factor in the manufacturing process and differences were not as large as in the case of chemicals. The incomplete monthly coverage of products in the textiles industry, especially in the synthetics section, was the major cause of the bias in that industry. Smaller biases occurred in the foods and beverages, printing and publishing and wood products industries, for which monthly commodity data accounted for a fair coverage of the industries and where the use of unadjusted man-hours was on a relatively small scale. Where monthly production or related data were available to represent a large proportion of the industries, the old and new indexes were very similar; these include the tobacco products, rubber products, leather products, paper products, petroleum and coal products, transportation equipment, non-ferrous metal products and non-metallic mineral products industries.

The old index for the mining industry (Chart V) was very close to the revised index throughout the period covered with the exception of the last two years when output of a few mineral products not covered in the old index showed a sharper increase than the average for the composite; among these were lithia, titanium dioxide and iron ingots, barite and fluorspar. The mining component of the monthly index has always been well represented by commodity data and no large revisions had been expected.

Between 1947 and 1957 the old index of electricity and gas rose by 80 per cent. In the same comparison, the new index of electric and gas utilities showed an advance of 144 per cent. The major contributing factors, as noted earlier, were the sharp gain in the distribution of natural gas and the much larger growth in the consumption of the relatively expensive residential and commercial classes of electric power compared with the smaller increase in the cheaper industrial power.

CHART X



(b) Monthly Movements

A comparison of the old seasonally-adjusted Index of Industrial Production with the new series (Chart X) shows little difference in the pattern of month-to-month changes in physical output over the 1947-1957 period, although as described above, the level of the old index was gradually falling away from that of the revised index. It is interesting to review the behaviour of the old and new indexes during the Canadian post-war economic contractions of 1953-1954 and of 1957. In the 1953-1954 contraction, the new seasonally-adjusted index did not dip as far as its predecessor and showed a flatter trend, indicating that the production cutback was somewhat smaller than had been previously recorded. Between July, 1953 and April, 1954 the old production index declined by 4.5 per cent while the revised series fell off by only 3.4 per cent. This is largely the result of revisions in the basic data but also reflects some change in the seasonal corrections. Both series show that the 1957 contraction was the deepest of the post-war period to date. Between December, 1956 and December, 1957 the new index shows a decline of about 7 per cent; the previous index had dropped by the same amount.

3. Corrective Measures in the New Index

As described earlier, the use of unadjusted man-hours in the old index was the major contributing factor to the differences in level between the old and revised series. The introduction of estimated output per man-hour adjustments, although somewhat arbitrary, should help greatly in avoiding differences of the magnitude recorded in the past, especially in periods of vigorous expansion when productivity tends to rise at a more rapid rate.

In non-durable manufacturing, the use in the new index of quarterly production series for several food and clothing industries heretofore represented by unadjusted man-hours was a marked improvement. In the textiles group of industries, a new series on synthetic yarn production was added; previously, output in the synthetics section was based on synthetic fabric production which did not reflect the sharp advances recorded by basic yarn producers. Moreover, data from the new monthly surveys of chemicals production, which will soon be incorporated, will fill one of the major gaps and greatly improve the accuracy of the chemicals index which, in the past, was based on unadjusted man-hours and was found to be the least satisfactory component in the overall index. These changes reduce considerably the dependence on man-hours in the non-durables index and it is expected that future changes in this composite will be of a minor nature.

The use of adjusted man-hours is necessarily greater in the case of durable manufacturing industries. Here output is more difficult to measure in physical units, particularly for industries involved in the production of investment-type goods such as machinery and equipment. A new monthly survey on

the production of small appliances, the data from which will be incorporated in the index shortly, will reduce the dependence on man-hours in the electrical apparatus and supplies grouping. Moreover the development of new industry monthly price indexes mentioned earlier will help greatly in keeping the man-hour adjustments up-to-date: the use of these price indexes in conjunction with the monthly series on the value of manufacturing shipments and inventories will provide preliminary volume bench-marks well ahead of the availability of census of manufactures data. At the present time, because of the problems associated with the deflation of inventories on a monthly basis, it is considered too hazardous to use the deflated value series on manufacturing shipments and inventories as indicators of production except for a very limited number of industries. Rather it was judged preferable to use these data cumulated over a period of months to check the reasonableness of the adjusted man-hour indicators at regular intervals.

4. Analysis and Charting of Seasonally-adjusted Series

The Univac Method II programme of seasonal adjustment provides measures of the irregular, trend/cyclical and seasonal components of the individual series. Although seasonal adjustment removes most of the seasonal component from a time series, the resulting data still contain irregular as well as trend/cyclical components and may exhibit many short-term reversals of direction that can be misleading. In some adjusted series then, a relatively high irregular component can obscure movements in the underlying trend/cycle and it is often useful in such cases to remove the influence of this irregular so that trend/cycle changes may be observed more easily. A commonly employed method of doing so is to "smooth" the series by passing a moving average through it. For example, a five-month moving average would be derived by averaging the January to May values to yield a figure centred on March, then averaging the February to June values to yield a figure centred on April, and so on. Since the irregular component by definition moves randomly about the main path (i.e. the trend/cycle) traced by the adjusted series, the effect of this averaging process is to permit irregular movements to cancel out while leaving in the average cumulative movement or trend/cycle.

The M.C.D. (months for cyclical dominance) measure computed by Univac Method II indicates the number of months[1] required, on average, for the emergence of the trend/cycle component from the seasonally-adjusted series. On the assumption that the relative influences of irregular and trend/cycle remain stable over time, seasonally-adjusted data currently becoming available may be smoothed by a moving average equal to the M.C.D. calculated from historical data to provide a continuously unfolding picture of the approximate trend/cycle underlying the original data. The necessity of centering the moving average on the middle month means that its values are always less current than those of the seasonally-adjusted data on which it is based. This loss of timeliness is not too significant for cyclical analysis however, since the more current seasonally-adjusted data may merely reflect irregular influences.

It is advised however, that seasonally-adjusted series smoothed in this way should be interpreted with caution. No method has as yet been devised to smooth out all of the irregular movements as they occur. An M.C.D. of 5 for instance, indicates that over the period covered by the series processed on the Univac computer, 5 months, on average, are required for the emergence of cyclical dominance. This is an average measure and it should be kept in mind that, at any one time, the irregular component may be greater or smaller than indicated by the average. The actual size of the irregular component in the most current months is not necessarily equal to the average for the past period. If the irregular component at any one time is greater than that indicated by the average for the period, the series smoothed by a moving average equal to the M.C.D. will still contain irregular movements. Moreover, the smoothing procedure may result in a slight distortion of turning points in certain cases. Thus, the smoothed series will show the trend/cycle pattern more often than not, but it is not infallible.

For the majority of the monthly seasonally-adjusted indexes shown in Appendix D, the M.C.D. measures are indicated in the tables. In some cases, individual series were combined into sub-totals and the latter were not compiled in that form on the computer; for these series, the M.C.D. measures are not available. It is noted that the composite Index of Industrial Production has an M.C.D. of 1. This suggests that, on average, the month-to-month changes in the seasonally-adjusted index are largely indicative of the cyclical trend and that irregular movements in the component series are mostly offsetting. All of the major components of the index (mining, manufacturing, non-durable manufacturing, durable manufacturing and electric and gas utilities) show an M.C.D. of 2, indicating a moderate irregular component. At the more detailed levels, the M.C.D. varies between 1 and 6. This tendency of the M.C.D. at the total level to be less than the average of the components reflects the frequently-encountered pattern for the divergent timing of the irregular movements in individual industries to be offsetting, with less irregularity present in the total. In general, for those series in which the use of adjusted man-hours predominates, the M.C.D. is small. By contrast, where production data is the major indicator the M.C.D. tends to be higher. This is to be expected since production usually shows greater amplitude

[1] In a few cases where the computation procedure showed that more than 5 months were required for the trend/cycle to dominate the irregular movements, an M.C.D. of 6 was recorded by the computer since the latter was not programmed to calculate the required ratios beyond a span of 5 months. For all of the adjusted monthly series shown in this report for which an M.C.D. of 6 is recorded, inspection of the Univac print-outs indicated that 6 appeared to be the proper M.C.D. measure.

in seasonal movements and in month-to-month variations than employment which is, by nature, a more regular and steadier factor.

In charting the seasonally-adjusted production indexes in Appendix D, moving averages equal to the span of the M.C.D. measure have been passed through the series for which the M.C.D. is 4 or greater than 4. In the calculation of the smoothed series, the moving average is "centred" by dating it at the second month for an M.C.D. of 4 and at the third month for an M.C.D. of 5 or 6.

5. Provisional Nature of Current Indexes and Timeliness

For the period subsequent to the last bench-marks, annual levels obtained by averaging the monthly indexes must be considered preliminary until further bench-marks are developed from annual census data. As mentioned previously, it is planned to incorporate new bench-mark revisions at regular intervals. Meanwhile, the publication of the monthly index will follow a regular pattern. The index will be released each month on a provisional basis since many of the series are subject to revision in the following month.

At the present time, it is not feasible to release the Canadian monthly index sooner than six weeks after the end of the month to which the data relate; for instance, the preliminary December index will not be ready for publication before the middle of February, and the data for some industries will still have to be estimated. An earlier publication deadline would necessitate estimating the data for a greater number of industries with the resulting danger of large revisions in the following month. The bulk of the commodity data collected by various sections of the Bureau becomes available between the third and sixth week after the specified month. If, after that time, important series are still missing, estimates based on the current trend and past seasonal behaviour of the series are made. The use of man-hours raises a particular problem in this connection. The figures relating to the last week of each month become available, at the present time, two months after the month in question. It is thus necessary, in order to have the index ready within six weeks, to estimate the data for all industries represented in the index by man-hours. Actually however, the effect of errors arising from this practice is substantially reduced since, as outlined in an earlier section, the man-hour data are subjected to a two month moving average.

6. Appraisal of Results

The new Index of Industrial Production is considered to be a major improvement over its predecessor. The introduction of man-hour adjustments, more comprehensive coverage by commodity data, a more up-to-data base period and weighting system, new bench-mark levels, more precise seasonal adjustment, etc., all contribute to a better and more reliable index. There is no method of determining the absolute accuracy of the index. There can be little doubt however, that some individual industry indexes are more accurate than others, the margin of error depending chiefly on the quantity and quality of the output indicators available. It is probable that errors did occur but it is also probable that they occurred in both directions thereby offsetting each other to some extent. The composite index therefore, can be assumed to be more accurate than any of the major groups and these, in turn, more accurate than the indexes of their industry components. It is not believed that any recent changes in the weighting structure can have any substantial influence on the reliability of the overall results.

For many industries, a choice of several indicators was available, and the decision as to the most appropriate series was taken only after a careful examination of the data. The advice of Bureau specialists in different industries and the availability of individual plant census returns no doubt contributed markedly to the accuracy of the results. Users of the index must consider its accuracy in relation to the purpose for which the data are required. They must take into account the definition of output and the statistical formula employed, the nature of the data used in some industries and changes in census classification which occurred during the period covered. If the index is related to other series special care must be taken to consider the appropriateness of the comparison. As employment data are used frequently in this connection, considerations which must be kept in mind are discussed in Part I, Section 16.

In regard to the monthly index, the major source of error lies in the lack of actual volume of production data for many industries and the necessity of using inferior series as substitutes. For this reason, the indexes must be considered as being approximate. In the meantime efforts will be continued to expand the monthly collection of commodity data and to subject existing material to further analysis with the object of developing series which will reflect more accurately the monthly trends in physical output.

APPENDIX A

Select Bibliography

APPENDIX A

Select Bibliography

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APPENDIX B

Description of Indexes

APPENDIX B

Description of Indexes

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C.[1] No.	Description of monthly series	Average weekly plant working days	Source of data
INDUSTRIAL PRODUCTION INDEX	**100.000**					
MINING	**10.066**		1			
Metals	**5.968**		10 - 11			
Gold (auriferous quartz and placer mines only)	1.758	Gross output	101 - 103	Production of gold from auriferous quartz and placer deposits in fine ounces.		
Iron ore	0.309	Gross output	109	Production, at the mine, of iron ore in tons.	6	
Other metals	3.901	Gross output	107 and 114 - 119	Shipments of tungsten from the mine in pounds.		
				Mine shipments of uranium concentrates (U_3O_8 content) in pounds.		D.B.S. — Mineral Statistics Section.
				Production at the smelting stage, of gold (from base metal mines) and silver in fine ounces; of copper, nickel, lead, and zinc in pounds; of titanium dioxide and iron (remelt) in tons.	7	
				Production of the sulphur content of pyrite at the mine in pounds.		
Non-metals	**0.831**		13			
Asbestos	0.586	Gross output	131	Production of asbestos (crude, fibres, shorts) in pounds.		
Gypsum	0.068	Gross output	133	Shipments and amounts produced for own use of gypsum in tons.		
Salt	0.013	Gross output	137	Production of salt in tons.	6	D.B.S. — Mineral Statistics Section.
Other non-metals	0.164	Gross output	139	Shipments of feldspar, barite and nepheline syenite in tons; production of sodium sulphate and fluorspar in tons and of lithia in pounds.		
Fuels	**2.839**		12			
Coal	1.715	Gross output	121	Production of bituminous, sub-bituminous and lignite coal in tons.	6	D.B.S. — Mineral Statistics Section.
Petroleum	1.015	Gross output	124	Shipments and amounts produced for own use of petroleum, in barrels.	7	D.B.S. — Mineral Statistics Section.
Natural gas	0.109	Gross output	123	Shipments and amounts produced for own use of natural gas in cubic feet. Because of wide price differentials, shipments are compiled separately in the following areas: New Brunswick, Ontario, Alberta, and Manitoba, Saskatchewan, Northwest Territories.	7	D.B.S. — Mineral Statistics Section.
Quarrying and sand pits	**0.428**		15			
Sand and gravel pits	0.267	Gross output	159	Freight loadings, in tons, of sand and gravel, stone and rock, slate and block stone valued at base prices, and production of concrete brick, concrete blocks, in thousands, ready-mix concrete, in cubic yards, cement water pipe in tons, valued at base prices of materials used.	5½	D.B.S. — Transportation and Public Utilities Section.
Stone quarries	0.161	Gross output	153 - 157			D.B.S. — Metal and Chemical Products Section.
MANUFACTURING	**84.827**		2 - 3			
Foods and beverages	**11.834**		20 - 22			
Total foods	**8.986**					
Meat products	1.624		200	Dressed weight, in pounds, of cattle, calves, sheep, lambs, hogs slaughtered at inspected establishments and production, in pounds, of lard, shortening and margarine by establishments in the Meat Products Industry.	5	Department of Agriculture. D.B.S. — Animal Products Section. (Industry and Merchandising Division).
Slaughtering and meat packing	1.571	Net output	200			
Animal oils and fats	0.012	Gross output	200			
Sausage and sausage casings	0.041	Gross output	200			

[1] Source: Standard Industrial Classification Manual, D.B.S., 1948.

Description of Indexes — Continued

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING — Continued:						
Foods and beverages — Continued:						
Dairy products	1.396					
Butter and cheese	1.084	Net output	201	Production of creamery butter, factory cheese, evaporated milk, condensed milk, skim milk powder, milk powder and process cheese in pounds.		D.B.S. — Livestock and Animal Products Section. (Agriculture Division).
Concentrated milk products	0.165	Net output	203	Production of ice-cream in gallons.	6	
Process cheese	0.094	Net output	207	Production of margarine by establishments in the Dairy Products Industry, in pounds.		D.B.S. — Animal Products Section. (Industry and Merchandising Division).
Other dairy products	0.053	Net output	209	Sales of fluid milk in quarts and fluid cream in pounds of butter fat, in 21 major centres.		
Canning and processing	1.402					
Fruit and vegetable preparations	0.787	Net output	212	Quarterly pack of canned fruits and vegetables in pounds and quarterly production in pounds, gallons or tons of 32 types of other processed fruits and vegetables individually valued at base prices, aggregated and prorated monthly on the basis of man-hours.		D.B.S. — Foods and Beverages Section. D.B.S. — Employment Section.
Fish processing	0.615	Net output	210	Landed weight, in pounds, of 27 varieties of sea fish such as salmon, herring, cod, lobster, halibut, haddock, sardines, etc., individually valued at base prices.	7	D.B.S. — Fisheries Section.
Grain mill products	1.000					
Flour mills	0.434	Net output	214	Production of wheat flour in barrels, millfeed in tons, oatmeal, rolled oats and corn flour and meal in pounds.	5	D.B.S. — Crops Section.
Feeds	0.422					
Prepared stock and poultry feeds	0.378	Net output	216	Shipments, in tons, of 24 individual types of prepared stock and poultry feeds such as dairy and cattle feeds, swine feeds, laying and hatching feeds, growing feeds, turkey feeds, dairy and cattle concentrates, swine concentrates, chopped, ground or crushed grain, etc.	5	D.B.S. — Foods and Beverages Section.
Feed mills	0.044	Net output	213			
Breakfast foods	0.144	Net output	215	Quarterly production, in pounds, of ready-to-serve cereals, prorated monthly on the basis of man-hours.		D.B.S. — Foods and Beverages Section. D.B.S. — Employment Section.
Bakery products	1.734					
Biscuits	0.422	Net output	218	Quarterly production of plain and fancy biscuits, soda biscuits, in pounds, ice cream cones in thousands, individually valued at base prices, aggregated and prorated monthly on the basis of man-hours.		D.B.S. — Foods and Beverages Section. D.B.S. — Employment Section.
Bread and other bakery products	1.312	Net output	219	Quarterly production of bread in pounds valued at base price, and value of bakery products deflated by a price index, aggregated and prorated monthly on the basis of man-hours.		D.B.S. — Foods and Beverages Section. D.B.S. — Employment Section.
Miscellaneous foods	1.830					
Confectionery	0.665	Materials	225	Quarterly production of 15 types of confectionery such as chocolate bars, in dozens, chewing gum in boxes, penny goods in gross, sugar confectionery, etc., in pounds, individually valued at base prices, aggregated and prorated monthly on the basis of man-hours.		D.B.S. — Foods and Beverages Section. D.B.S. — Employment Section.
Sugar refining	0.331	Net output	227	Production, in pounds, of refined sugar:		D.B.S. — Crops Section.
				Beet sugar	7	
				Cane sugar	5	
Macaroni and kindred products	0.034	Net output	228	Quarterly production in pounds of 29 types of miscellaneous food preparations such as macaroni, coffee, tea, malt, baking powder, dried eggs, peanuts, jelly powders, pudding powders, prepared mixes, salad dressing, margarine, etc., individually valued at base prices, aggregated and prorated monthly on the basis of man-hours.		D.B.S. — Foods and Beverages Section. D.B.S. — Employment Section.
Miscellaneous food preparations	0.800	Net output	228			

Description of Indexes – Continued

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING – Continued:						
Foods and beverages – Concluded:						
Beverages	2.848					
Carbonated beverages	0.715	Net output	220	Production of carbonated beverages in gallons.	5	D.B.S. – Foods and Beverages Section.
Distilled liquors	0.631	Net output	221	Production of new spirits in gallons and bottled spirits, in proof gallons.	5	Department of National Revenue.
Breweries	1.436	Net output	222	Production of beer in gallons.	5	Department of National Revenue.
Wines	0.066	Net output	224	Unadjusted man-hours.		D.B.S. – Employment Section.
Tobacco and tobacco products	0.771					
Tobacco, cigars and cigarettes	0.709	Net output	230	Production of cigars and cigarettes in units, and of cut tobacco, plug tobacco and snuff in pounds.	5	Department of National Revenue.
Tobacco processing and packing	0.062	Net output	230			
Rubber products	1.334	Net output	236-239	Production, in pairs, of 10 types of rubber footwear, such as lumbermen's rubber boots, overshoes and goloshes, light and heavy rubbers, plastic waterproof footwear, etc.		The Rubber Association of Canada.
				Consumption, in pounds, of natural, synthetic and reclaim rubber in the production of tires, tubes, tire repair material, and other products (ex. footwear), including wire and cable.	5	D.B.S. – Textiles and Miscellaneous Products Section.
Leather products	1.577		24			
Leather boots and shoes	0.952	Gross output	241	Production, in pairs, of 8 types of leather footwear, such as men's, women's, boys', misses', etc.	5	D.B.S. – Animal Products Section. (Industry and Merchandising Division).
Leather tanneries	0.275	Gross output	247	Production of 9 types of finished leather: cattle leather (glove and garment and upper), calf and kip skin upper, and horse hide, glove and garment, in square feet; bag, case and strap leather and harness leather in sides; cattle leather (sole), in pounds; sheep and lamb (shoe, glove and garment leather), and goat and kid leather, in skins.	5	D.B.S. – Animal Products Section. (Industry and Merchandising Division).
Other leather products	0.350					
Leather gloves and mittens	0.078	Net output	245	Unadjusted man-hours.		D.B.S. – Employment Section.
Belting leather	0.009	Net output	247			
Leather boot and shoe findings	0.022	Gross output	249			
Miscellaneous leather goods, n.e.s.	0.241	Gross output	249			
Textiles	5.035		25- 26			
Cotton goods	1.571					
Cotton thread	0.062	Materials	251	Volume index of raw cotton bale openings on the 1935-39 base, arithmetically converted to the 1949 base.	5	Cotton Institute of Canada.
Cotton yarn and cloth	1.465	Net output	252			
Miscellaneous cotton goods	0.044	Gross output	254			
Wool goods	0.931					
Wool cloth	0.562	Gross output	255	Shipments of woollen fabric, worsted fabric in linear yards, blankets in units and production of worsted yarn, in pounds.	5	Canadian Woollen and Knit Goods Manufacturers Association.
Wool yarn	0.203	Gross output	257			
Miscellaneous wool goods	0.166	Gross output	259			
Synthetic textiles and silk	1.334	Net output	260	Deliveries for domestic consumption of 6 types of synthetic yarn in pounds.	7	Silk and Rayon Institute.
				Production of synthetic and silk fabric in yards.	5	
Other textile products	1.199					
Dyeing and finishing of textiles	0.166	Gross output	261	Adjusted man-hours.		D.B.S. – Employment Section.
Narrow fabrics	0.112	Materials	262			
Awnings, tents and sails	0.063	Materials	263			
Cotton and jute bags	0.078	Materials	266			
Cordage, rope and twine	0.106	Gross output	265			
Oilcloth, linoleum and other coated fabrics	0.212	Gross output	267			
Fabric auto accessories	0.053	Gross value deflated by a price index	269			
Embroideries, pleating	0.088	Man-hours	269			
Carpets, mats and rugs	0.137	Gross output	264			
Miscellaneous textiles, n.e.s.	0.184	Materials	269			

Description of Indexes — Continued

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING — Continued:						
Clothing	5.587		27			
Men's, women's and children's clothing ..	3.454					
Men's factory clothing	1.571	Gross output	272	Quarterly production, in units, of 155 types of clothing such as women's and misses' coats, suits, jackets, dresses, skirts, blouses, slips, pyjamas, etc.; men's, youths' and boys' suits, overcoats, trousers, shirts, pyjamas, etc.; children's coats, suits, dresses, skirts, slips, pyjamas, etc., valued at base prices, aggregated and prorated monthly on the basis of man-hours.		D.B.S. — Textiles and Miscellaneous Products Section. D.B.S. — Employment Section.
Women's factory clothing	1.543	Gross output	273			
Children's factory clothing	0.206	Gross output	270			
Men's clothing contractors	0.094	Gross value deflated by a price index	272			
Women's clothing contractors	0.040	Gross value deflated by a price index	273			
Knitting mills	1.221					
Hosiery	0.559	Net output	274	Production of 9 types of hosiery such as full fashioned, women's full length nylon, women's anklets, men's anklets, children's and infants' anklets and half-hose, in pairs.	5	Canadian Association of Ladies Hosiery Manufacturers. Canadian Woollen and Knit Goods Manufacturers Association.
Other knitted goods	0.662	Gross output	275	Adjusted man-hours.		D.B.S. — Employment Section.
Miscellaneous clothing	0.912					
Corsets, girdles and foundation garments	0.147	Gross output	276	Adjusted man-hours.		D.B.S. — Employment Section.
Fur dressing and dyeing	0.087	Man-hours	277			
Fur goods	0.375	Gross output	277			
Fabric gloves and mittens	0.022	Gross output	279			
Hats and caps	0.197	Gross output	278			
Oiled and waterproofed clothing	0.028	Gross output	279			
Miscellaneous clothing, n.e.s.	0.056	Gross output	279			
Wood products	6.540		28			
Furniture	1.427	Materials	286	Adjusted man-hours.		D.B.S. — Employment Section.
Saw and planing mills	4.479					
Hardwood flooring	0.100	Net output	283	Adjusted man-hours.		D.B.S. — Employment Section.
Sash, door and planing mills	0.918	Materials	283			
Sawmills	3.083	Net output	285	Production of lumber, in feet, board measure, lath in thousands, shingles in squares and ties in units.	5	D.B.S. — Forestry Section.
Veneers and plywoods	0.378	Net output	281	Consumption of hardwood and softwood peeler logs in feet, board measure, in the Veneer and Plywood Industry.	5½	D.B.S. — Forestry Section.
Other wood industries	0.634					
Beekeepers' and poultrymen's supplies	0.003	Materials	289	Adjusted man-hours.		D.B.S. — Employment Section.
Wooden boxes and baskets	0.184	Materials	287			
Cooperage	0.038	Gross output	289			
Excelsior	0.006	Gross output	289			
Lasts, trees and shoe findings	0.028	Wage-earners	289			
Morticians' goods	0.066	Gross output	288			
Woodenware	0.022	Materials	289			
Wood turning	0.053	Materials	289			
Miscellaneous wood products, n.e.s.	0.234	Materials	289			
Paper products	8.217		29			
Pulp and paper	6.537	Net output	294	Export shipments, in tons, of bleached sulphite dissolving, bleached sulphite paper pulp, unbleached sulphite (strong and news grade), sulphate, screenings, groundwood pulp (mechanical); production in tons, of newsprint; production, in tons, of building papers, box paper board, paper board container, wrapping paper, tissue and sanitary paper, book and writing paper and building boards.	6	Newsprint Association of Canada. Canadian Pulp and Paper Association. D.B.S. — Forestry Section.
Roofing paper	0.287	Net output	296	Production of asphalt floor tiles in square feet; 5 types of roofing paper: tar and asphalt sheathings, tar and asphalt felts, in tons, asphalt shingles, smooth surfaced rolls, mineral surfaced rolls, in squares.	5	D.B.S. — Forestry Section.

Description of Indexes – Continued

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING – Continued:						
Paper products – Concluded:						
Other paper products	1.393					
Paper boxes and bags	0.731	Materials	292	Adjusted man-hours.		D.B.S. – Employment Section.
Miscellaneous paper products, n.e.s.	0.662	Gross output	299			
Printing, publishing and allied industries	3.951		30			
Printing and publishing	1.868	Value of materials deflated by a price index	309	Domestic shipments of newsprint, in tons.	6	Newsprint Association of Canada.
Publishing (only) of periodicals	0.259	Value of materials deflated by a price index	301			
Other printing	1.824					
Printing and bookbinding	1.221	Value of materials deflated by a price index	301	Adjusted man-hours.		D.B.S. – Employment Section.
Trade composition	0.044	Adjusted wage-earners	301			
Engraving, stereotyping and electrotyping	0.284	Adjusted wage-earners	303			
Lithographing	0.275	Value of materials deflated by a price index	303			
Iron and steel products	12.493		31- 32			
Agricultural implements	1.406	Net output	311	Adjusted man-hours.		D.B.S. – Employment Section.
Boilers, tanks and platework	0.553	Gross value deflated by a cost of production index	314	Adjusted man-hours.		
Bridge building and structural steel	0.665	Materials	315	Adjusted man-hours.		D.B.S. – Employment Section.
Iron castings	1.202	Net output	320	Production, in tons, of iron castings, iron or steel pipe, pipe fittings and tubing; shipments of malleable iron castings.	5	D.B.S. – Metal and Chemical Products Section.
Hardware, tools and cutlery	0.809	Gross value deflated by a cost of production index	317	Adjusted man-hours.		D.B.S. – Employment Section.
Heating and cooking apparatus	0.615	Net output	318	Production, in units, of radiators, refrigerators, 12 types of stoves, ranges and furnaces, and 5 types of water-tank heaters.	5	D.B.S. – Metal and Chemical Products Section.
Machinery	2.639					
Household, office and store machinery	0.700	Gross output	319	Adjusted man-hours.		D.B.S. – Employment Section.
Industrial machinery	1.552	Composite of materials and payrolls in constant dollars	324			
Machine shops	0.303	Gross value deflated by a cost of production index	322			
Machine tools	0.084	Gross value deflated by a cost of production index	323			
Primary iron and steel	2.624	Net output	325	Production of ferro-alloys and production for sale of pig iron and steel ingots in tons.	7	D.B.S. – Metal and Chemical Products Section.
				Production in tons, of carbon steel castings and alloy steel castings.	5	
				Production less producer's interchange, in tons, of 18 individual types of steel shapes such as sheets, bars, billets, plates, wire rods, structural shapes, tin plate, tie plates and track material.	7	
Sheet metal products	1.112	Materials	326	Adjusted man-hours.		D.B.S. – Employment Section.

Description of Indexes – Continued

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING – Continued:						
Iron and steel products – Concluded:						
Wire and wire goods	0.537	Net output	327	Shipments, in tons, of steel wire and production in tons of 8 types of other wire products such as wire fencing, barbed wire, steel wire rope, wire nails, cut nails, steel wire staples.	5	D.B.S. – Metal and Chemical Products Section.
Miscellaneous iron and steel products	0.331	Gross value deflated by a cost of production index	329	Adjusted man-hours.		D.B.S. – Employment Section.
Transportation equipment	8.227		33			
Aircraft and parts	0.631	Adjusted man-hours	330	Adjusted man-hours.		D.B.S. – Employment Section.
Motor vehicles	3.211	Gross output	334	Production, in units, of the following types of passenger cars: convertible (soft top), convertible (hard top), 3-passenger coupe, 5-6 passenger coupe, 2-door sedan, 4-door sedan, 2-seat station wagon, 3-seat station wagon, chassis, and other models. Production, in units, of commercial vehicles by maximum gross vehicle weight in pounds, as follows: 6,000 and less, 6,001-10,000, 10,001-14,000, 14,001-16,000, 16,001-19,500, 19,501-26,000, 26,001-33,000, over 33,001. Production of buses.	5	D.B.S. – Metal and Chemical Products Section.
Motor vehicle parts	1.434	Gross output	335	Adjusted man-hours.		
Railway rolling stock	1.927	Gross value deflated by a cost of production index	336	Adjusted man-hours.		
Shipbuilding	0.809	Gross value deflated by a cost of production index	337	Adjusted man-hours.		D.B.S. – Employment Section.
Other transportation equipment	0.215					
Bicycles and parts	0.072	Gross output	332	Unadjusted man-hours.		D.B.S. – Employment Section.
Boat building	0.059	Materials	333			
Carriages, wagons and sleighs	0.084	Adjusted man-hours	339			
Non-ferrous metal products	4.969		34			
Aluminum products	0.397	Net output	341	Adjusted man-hours.		
Brass and copper products	0.746	Gross output	342	Adjusted man-hours.		D.B.S. – Employment Section.
Jewellery and silverware	0.375	Materials	343	Adjusted man-hours.		
Non-ferrous metal smelting and refining	3.192	Gross output	345	Production of refined copper, nickel, lead, zinc, in pounds; silver, gold (from base metal mines) in fine ounces; production of aluminum ingots in pounds; production, in tons, of iron (remelt) and titanium dioxide, at the smelting stage; exports of nickel in matte and copper in matte, in pounds.	7	D.B.S. – Mineral Statistics Section.
Other non-ferrous metal products	0.259					
White metal alloys	0.203	Gross output	347	Unadjusted man-hours.		D.B.S. – Employment Section.
Miscellaneous non-ferrous metal products	0.056	Gross value deflated by a price index	349			
Electrical apparatus and supplies	4.401		35			
Batteries	0.203	Gross output	351	Production of storage batteries for farm lighting and railway service, in units of cells and batteries for starting and ignition in units; establishments producing dry cell batteries are represented by unadjusted man-hours.	5	D.B.S. – Metal and Chemical Products Section. D.B.S. – Employment Section.
Heavy electrical machinery	1.518	Gross value deflated by a price index	352	Adjusted man-hours.		D.B.S. – Employment Section.

Description of Indexes — Continued

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING — Continued:						
Electrical apparatus and supplies — Concluded:						
Telecommunication equipment	0.440	Gross output	353	Production in units, of 12 types of radio receiving sets, 7 types of television receiving sets and 2 types of record players; adjusted man-hours used to represent the output of the establishments primarily engaged in the production of other telecommunication equipment.	5	D.B.S. — Metal and Chemical Products Section. D.B.S. — Employment Section.
Refrigerators, vacuum cleaners and appliances	0.706	Gross output	357	Production, in units, of refrigerators, electric stoves, electric washing machines, electric dryers, home and farm freezers, by establishments classified to this industry; adjusted man-hours used to represent the output of establishments primarily engaged in the production of other products.	5	D.B.S. — Metal and Chemical Products Section. D.B.S. — Employment Section.
Miscellaneous electrical products	1.534	Gross value deflated by a cost of production index	359	Adjusted man-hours.		D.B.S. — Employment Section.
Non-metallic mineral products	2.461		36			
Hydraulic cement	0.362	Gross output	363	Production of cement in barrels.	7	D.B.S. — Metal and Chemical Products Section.
Domestic clay products	0.244	Gross output	364	Production of structural tile, in tons, drain tile, building brick, in thousands, flue lining, vitrified sewer pipe in feet and sand-lime brick in thousands.	5	D.B.S. — Mineral Statistics Section.
Sand-lime brick	0.016	Gross output	364			
Concrete products	0.303	Net output	368	Production of concrete brick, concrete blocks and other aggregates, in thousands, cement pipe and tile in tons, and ready-mixed concrete in cubic yards.	5½	D.B.S. — Metal and Chemical Products Section.
Glass products	0.393	Net output	365	Adjusted man-hours.		D.B.S. — Employment Section.
Gypsum products	0.131	Gross output	366	Production of gypsum wallboard, lath, sheathing in square feet, and plaster in tons.	5½	D.B.S. — Metal and Chemical Products Section.
Lime	0.141	Gross output	366	Shipments of lime and production of lime for own use, in tons.	5½	D.B.S. — Metal and Chemical Products Section.
Salt	0.069	Gross output	369	Production of fine vacuum salt, mined rock salt, salt recovered in chemical operations, in tons.	5½	D.B.S. — Mineral Statistics Section.
Other non-metallic mineral products	0.802					
Abrasive products	0.256	Gross output	361			
Asbestos products	0.087	Gross output	362			
Imported clay products	0.175	Materials	364			
Monumental and ornamental stone	0.184	Gross output	367	Adjusted man-hours.		D.B.S. — Employment Section.
Miscellaneous non-metallic mineral products	0.100	Gross output	369			
Miscellaneous products of petroleum and coal[1]						
Products of petroleum and coal	1.590		37			
Coke products	0.181	Net output	373	Production of coke in tons, and sales of gas in cubic feet.	7	D.B.S. — Metal and Chemical Products Section.
Petroleum products (petroleum refining and lubricating oils and grease)	1.409	Gross output	375	Refinery production less own consumption, in barrels, of 12 categories of petroleum products such as motor gasoline, light fuel oil, heavy fuel oil, lubricating oil and grease, aviation gasoline, etc.	7	D.B.S. — Metal and Chemical Products Section.

[1] Included in this group for comparability with earlier years.

Description of Indexes – Concluded

Annual bench-mark series				Monthly series		
Industry	Industry weights 1949	Type of indicator	S.I.C. No.	Description of monthly series	Average weekly plant working days	Source of data
MANUFACTURING – Concluded:						
Chemicals and allied products	**4.216**		38			
Acids, alkalies and salts	0.637	Net output	380	Adjusted man-hours.		D.B.S. – Employment Section.
Fertilizers	0.437	Net output	382			
Medicinal and pharmaceutical preparations	0.675	Gross value deflated by a cost of production index	383	Value of shipments adjusted for change in inventory of finished goods and goods in process, deflated by a price index.	5	D.B.S. – Inventories Section. D.B.S. – Prices Division.
Soaps, washing compounds, etc.	0.543	Net output	385	Shipments, in pounds, of 12 types of soaps and synthetic detergents such as bar laundry soap, soap chips and flakes, toilet soap, soap powders, solid synthetic detergents, liquid synthetic detergents, paste synthetic detergents.	5	D.B.S. – Metal and Chemical Products Section.
Paints, varnishes and lacquers	0.556	Net output	384	Value of shipments adjusted for change in inventory of finished goods and goods in process, deflated by a price index.	5	D.B.S. – Inventories Section. D.B.S. – Prices Division.
Vegetable oil mills	0.128	Net output	387	Production, in pounds, of 6 types of oil, cake and meal: flaxseed oil, flaxseed cake and meal, soybean oil, soybean cake and meal, other oil, other cake and meal.	6	D.B.S. – Animal Products Section. (Industry and Merchandising Division).
Other chemicals	1.240					
Toilet preparations	0.166	Materials	386			
Primary plastics	0.153	Net output	388			
Explosives, ammunition, etc.	0.165	Net output	381	Production of synthetic rubber in pounds.	7	D.B.S. – Textiles and Miscellaneous Products Section.
Inks	0.069	Gross output	389			
Adhesives	0.047	Net output	389	Remainder of the "other chemicals" group represented by adjusted man-hours.		D.B.S. – Employment Section.
Polishes and dressings	0.081	Gross output	389			
Compressed gases	0.137	Net output	389			
Coal tar distillation	0.053	Gross output	389			
Miscellaneous chemicals, n.e.s.	0.369	Gross output	389			
Miscellaneous manufacturing industries	**1.624**		39			
Brooms, brushes and mops	0.144	Gross output	391			
Fountain pens and pencils	0.112	Gross output	394			
Musical instruments	0.069	Gross output	393			
Plastic products	0.153	Materials	392			
Scientific and professional equipment	0.325	Gross output	395			
Sporting goods	0.084	Gross output	396			
Toys and games	0.075	Man-hours	396			
Typewriter supplies	0.034	Gross output	394			
Artificial flowers and feathers	0.028	Man-hours	399			
Buttons and fasteners	0.084	Gross output	399			
Candles	0.019	Materials	399	Adjusted man-hours.		D.B.S. – Employment Section.
Hair goods	0.009	Gross output	399			
Artificial ice	0.088	Gross output	399			
Electric lamps and lamp shades	0.053	Gross output	399			
Pipes, lighters and smokers' supplies	0.041	Gross output	399			
Electric, neon and other signs	0.106	Man-hours	399			
Rubber and metal stamps and stencils	0.031	Man-hours	399			
Statuary, art goods and novelties	0.044	Man-hours	399			
Umbrellas	0.009	Gross output	399			
Miscellaneous manufacturing industries, n.e.s.	0.116	Gross output	399			
ELECTRIC POWER AND GAS UTILITIES	**5.107**		6			
Electric power utilities	**4.595**	Net output	602	Generation by utilities, in kilowatt hours, of primary and secondary electric power valued at base prices, adjusted for anticipated changes in distributive activity.	7	D.B.S. – Transportation and Public Utilities Section.
Gas utilities	**0.512**		604			
Manufactured gas	0.302	Net output		Sales, in cubic feet, by producers and distributors to 4 individual categories of customers: domestic, industrial, commercial, miscellaneous; sales of coke, in tons, by gas plants.	7	D.B.S. – Metal and Chemical Products Section.
Natural gas	0.210	Gross output		Sales, in cubic feet, by distributors to 4 categories of customers: domestic, industrial, commercial and miscellaneous; sales in Eastern and Western Canada compiled separately because of wide price differentials.	7	D.B.S. – Metal and Chemical Products Section.

APPENDIX C

Annual Net and Gross Industry Indexes

APPENDIX C

Annual Net and Gross Industry Indexes

1949 = 100

	Total industrial production		Mining						
			Total mining	Metals				Fuels	
				Total	Gold[1] mining	Iron ore	Other metals	Total	Coal
	Net	Gross	Gross	Gross	Gross	Gross	Gross	Gross	Gross
1949 weights	100.000		10.066	5.968	1.758	0.309	3.901	2.839	1.715
1935	41.4	42.2	60.8	72.1	..	..	..	49.3	74.5
1936	45.7	46.6	68.3	81.3	..	..	..	54.5	81.7
1937	52.3	53.1	79.4	94.3	..	..	..	59.8	85.6
1938	49.6	50.2	83.7	101.6	..	..	..	62.8	76.9
1939	53.3	53.9	90.3	108.6	..	..	..	69.7	85.3
1940	63.9	64.8	96.2	114.5	..	..	..	77.7	95.7
1941	80.1	80.7	101.0	118.8	..	..	..	81.7	98.6
1942	94.7	94.7	99.1	116.8	..	..	..	83.4	101.7
1943	100.5	100.6	88.8	101.8	..	..	..	77.5	94.4
1944	101.3	101.5	79.7	86.9	..	..	..	75.3	90.7
1945	90.1	90.2	77.2	83.5	..	..	..	70.0	86.1
1946	83.8	83.7	74.3	73.2	66.4	45.9	78.4	72.2	93.4
1947	91.5	91.9	78.5	79.6	75.7	50.7	83.6	66.0	82.1
1948	96.4	96.7	90.0	88.4	86.3	40.0	93.1	83.2	97.2
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	106.9	106.9	109.5	103.5	107.9	96.0	102.1	112.1	98.5
1951	116.6	116.2	123.4	107.9	103.9	115.9	109.1	143.5	95.6
1952	120.9[P]	..	131.0	110.3	106.9	126.5	110.6	163.9	90.5
1953	129.1[P]	..	142.1	115.7	97.9	170.6	119.4	192.7	81.5
1954	128.5[P]	..	158.7	129.0	104.5	185.4	135.6	215.6	75.2
1955	142.3[P]	..	185.2	142.7	107.7	316.5	144.8	273.2	74.1
1956	154.9[P]	..	212.3[P]	151.0[P]	105.3[P]	418.6[P]	150.4[P]	344.7[P]	74.6[P]
1957	155.1[P]	..	227.8[P]	170.0[P]	104.3[P]	462.6[P]	176.4[P]	358.2[P]	65.4[P]

	Mining						Total manufacturing	
	Fuels		Non-metals			Quarrying and sand pits		
	Natural gas	Petroleum	Total	Asbestos	Other non-metals			
	Gross	Gross	Gross	Gross	Gross	Gross	Net	Gross
1949 weights	0.109	1.015	0.831	0.584	0.247	0.428	84.827	
1935	71.7	6.7	39.1	44.9	29.8	35.2	39.0	39.8
1936	84.7	7.0	52.3	60.9	38.9	33.1	43.0	44.0
1937	92.1	13.7	69.9	85.8	46.5	42.7	49.2	50.2
1938	94.1	32.4	55.6	65.4	40.4	45.8	45.3	46.0
1939	101.5	36.4	66.6	79.2	47.4	46.2	48.7	49.3
1940	112.6	40.0	67.3	73.5	56.2	49.7	60.4	61.3
1941	107.8	47.2	84.4	95.7	66.0	49.9	78.7	79.4
1942	101.7	48.2	78.1	87.0	62.9	43.8	96.1	96.0
1943	86.5	46.8	81.9	92.2	64.8	40.4	104.0	104.1
1944	82.7	47.0	81.0	81.3	76.4	40.6	106.1	106.3
1945	85.7	39.5	87.0	91.1	77.2	44.0	92.9	93.0
1946	83.5	35.3	96.6	101.1	85.9	60.6	85.2	85.0
1947	91.5	36.0	109.2	114.9	95.8	85.6	93.2	93.6
1948	100.9	57.6	118.8	124.5	105.3	101.9	97.3	97.6
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	107.3	135.5	139.1	151.8	109.0	119.3	106.2	106.2
1951	120.5	226.9	156.3	170.7	122.0	142.9	115.0	114.6
1952	128.9	291.8	155.5	171.5	117.2	153.5	118.5[P]	..
1953	147.8	385.5	152.9	162.3	130.5	154.3	126.4[P]	..
1954	169.6	457.8	161.4	167.8	146.3	169.6	122.9[P]	..
1955	204.5	616.8	180.2	191.9	152.4	204.3	134.7[P]	..
1956	235.0[P]	812.7[P]	187.6[P]	188.4[P]	184.3[P]	237.7[P]	145.1[P]	..
1957	295.1[P]	859.5[P]	179.0[P]	184.3[P]	158.2[P]	264.2[P]	142.5[P]	..

For footnotes see page 73.

Annual Net and Gross Industry Indexes — Continued

1949 = 100

	Non-durables manufacturing											
	Total non-durables manufacturing		Total foods and beverages		Foods							
					Total foods		Meat products		Dairy products			
									Total		Butter and cheese	
	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross
1949 weights	45.736		11.834		8.986		1.624		1.396		1.084	
1935	44.1	45.6	44.5	46.1	51.2	52.9	54.7	59.1	41.3	54.8	44.2	63.4
1936	48.1	49.7	49.8	51.7	56.6	58.4	66.6	70.7	46.0	58.6	49.3	67.8
1937	52.8	54.4	53.1	54.8	58.7	60.1	67.5	74.3	48.3	61.1	51.0	69.1
1938	49.0	50.3	53.1	54.7	59.0	60.2	70.7	70.7	48.7	64.0	50.9	71.6
1939	53.7	54.9	56.3	57.8	63.0	64.1	81.9	76.4	50.5	65.7	52.7	72.9
1940	61.6	63.1	62.4	63.5	68.5	69.2	91.8	91.5	55.2	69.7	56.9	76.2
1941	73.7	75.1	72.3	72.9	79.5	79.2	107.9	106.7	63.9	77.9	64.3	83.2
1942	84.3	85.3	77.6	76.4	83.4	81.2	126.2	111.5	72.9	86.5	73.2	92.0
1943	85.9	87.1	80.8	79.7	89.9	87.7	141.2	124.9	77.7	90.8	78.1	95.4
1944	89.5	90.6	89.5	89.0	97.7	96.7	153.4	146.8	79.2	92.2	78.8	95.8
1945	88.2	88.8	91.7	90.3	98.7	96.4	148.4	128.3	84.2	95.3	84.6	98.5
1946	89.8	89.7	98.0	95.2	103.0	99.1	134.1	111.4	83.1	92.3	83.2	94.6
1947	93.2	93.8	97.2	96.9	100.4	99.5	119.9	99.5	87.7	96.9	86.0	97.7
1948	96.3	97.0	98.5	99.3	99.5	100.5	100.4	104.2	101.7	99.4	102.3	99.7
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	106.0	105.8	103.8	102.4	104.4	102.6	104.3	100.3	97.8	97.9	94.6	95.2
1951	110.8	110.1	106.8	104.7	107.0	104.6	102.8	99.7	104.6	100.2	99.3	96.4
1952	113.2[P]	..	113.5[P]	..	112.8[e]	111.0	122.6[e]	118.9	103.2	104.4	96.8	98.4
1953	120.2[P]	..	117.4[P]	..	115.1[e]	113.5	119.7[e]	116.1	111.5	110.9	109.6	106.3
1954	121.2[P]	..	120.6[P]	..	120.2[P]	..	126.5[P]	..	120.4	115.9	116.1	111.3
1955	130.4[P]	..	126.8[P]	..	125.6[P]	..	137.7[P]	..	127.3[P]	..	..	..
1956	138.1[P]	..	133.1[P]	..	131.4[P]	..	144.7[P]	..	130.5[P]	..	..	..
1957	139.3[P]	..	135.6[P]	..	133.2[P]	..	144.4[P]	..	136.4[P]	..	..	..

	Non-durables manufacturing											
	Foods											
	Dairy products						Canning and processing					
	Concentrated milk products		Process cheese		Other dairy products		Total		Fish processing		Fruit and vegetable preparations	
	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross
1949 weights	0.165		0.094		0.053		1.402		0.615		0.787	
1935	29.2	29.3	34.8	30.1	28.4	29.9	43.0	43.6	48.9	48.3	41.7	42.5
1936	30.2	29.6	39.6	34.3	33.8	34.5	51.7	51.8	52.1	53.8	53.7	52.5
1937	36.1	37.1	40.1	34.7	39.4	41.9	53.8	53.3	51.1	51.3	57.4	56.2
1938	40.0	42.4	44.6	39.1	37.4	41.5	53.2	53.3	53.6	53.9	55.2	54.7
1939	41.4	45.4	45.7	44.1	39.9	41.4	56.4	57.9	56.5	56.1	58.7	60.7
1940	43.5	51.6	50.3	48.0	47.1	49.2	63.1	59.7	68.6	63.3	62.8	59.8
1941	63.1	62.1	67.9	60.7	55.5	62.6	78.4	72.7	91.3	74.2	74.8	74.3
1942	70.3	67.7	74.9	71.7	70.6	69.3	71.1	68.4	81.4	71.3	68.7	69.0
1943	63.6	68.8	85.9	89.0	82.2	77.3	65.4	65.4	72.3	69.2	64.4	65.5
1944	70.2	74.6	93.7	90.6	89.0	81.5	85.8	83.9	71.4	67.6	96.9	95.2
1945	81.7	84.5	86.7	89.3	79.7	78.7	85.9	85.0	87.9	87.5	88.5	86.4
1946	80.0	81.7	87.7	92.9	83.1	78.0	105.5	101.8	88.6	89.3	118.7	111.6
1947	91.0	89.7	86.3	93.8	115.0	108.1	95.5	98.2	83.2	87.5	105.2	106.6
1948	103.3	102.9	77.5	86.0	111.0	105.1	102.7	102.6	85.6	88.2	116.1	113.9
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	106.9	100.5	123.0	123.8	89.8	98.0	112.0	109.1	113.8	111.9	110.5	107.0
1951	129.7	110.6	123.0	124.4	101.6	104.2	121.8	119.0	113.1	117.0	128.6	120.6
1952	125.5	123.2	142.7	139.5	95.2	107.2	119.8	114.1	99.9	100.4	135.3	124.9
1953	110.2	123.2	137.7	141.2	107.7	113.2	119.0	115.7	106.1	105.7	129.0	123.5
1954	138.0	129.9	146.2	147.0	107.2	110.9	129.1	126.6	115.5	116.1	139.8	134.9
1955	..	..	..	..	..	..	135.5[P]	..	104.7[P]	..	159.5	152.1
1956	..	..	..	..	..	..	134.4[P]	..	111.4[P]	..	152.4[P]	..
1957	..	..	..	..	..	..	143.8[P]	..	113.1[P]	..	167.7[P]	..

For footnotes see page 73.

Annual Net and Gross Industry Indexes — Continued

1949 = 100

	Non-durables manufacturing											
	Foods											
	Grain mill products										Total bakery products	
	Total		Flour and feed mills						Breakfast foods			
			Total		Flour mills		Feeds[2]					
	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross
1949 weights	1.000		0.856		0.434		0.422		0.144		1.734	
1935	56.1	51.4	53.4	48.1	..	..	..	..	70.8	69.7	..	..
1936	59.9	56.8	56.4	52.9	..	..	..	..	79.0	78.4	..	..
1937	59.3	55.2	54.4	50.1	..	..	..	..	86.2	83.6	..	..
1938	57.9	54.1	52.6	49.0	..	..	..	..	86.7	82.7	..	..
1939	61.0	59.6	57.3	56.3	..	..	..	..	81.3	78.0	..	..
1940	64.7	63.2	63.8	62.5	..	..	..	..	70.1	66.5	..	..
1941	73.2	73.2	71.9	72.7	..	..	..	..	80.5	75.6	..	..
1942	71.6	74.9	70.0	74.4	..	..	..	..	80.5	77.1	..	..
1943	93.5	95.1	87.9	91.4	..	..	..	..	123.5	116.0	..	..
1944	97.8	99.6	97.7	100.5	..	..	..	..	98.7	94.3	..	..
1945	98.1	102.6	96.3	102.4	..	..	..	..	107.9	103.2	..	..
1946	113.3	114.6	112.2	114.6	149.5	139.4	73.9	89.0	119.4	114.4	103.9	101.7
1947	111.2	121.9	111.3	124.8	129.0	142.9	93.1	106.1	110.4	104.7	100.7	98.8
1948	97.9	103.9	98.2	105.8	109.3	116.2	86.9	95.0	95.8	93.0	99.0	97.9
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	99.6	99.3	99.1	98.7	98.3	100.5	99.9	96.8	102.7	103.0	103.0	103.5
1951	109.8	109.8	109.0	108.8	107.2	114.5	110.8	103.0	114.3	115.2	109.1	108.8
1952	108.6*	111.5	108.2*	111.5	100.2	114.1	116.4	108.7	110.8*	111.7	114.8	115.4
1953	108.9*	110.5	109.2*	111.0	110.2	113.9	108.1	108.0	107.0*	107.8	121.8	121.7
1954	108.1*	109.8	108.6*	110.5	97.9	103.0	119.7	118.2	105.1*	105.9	122.4	123.0
1955	107.2[P]	..	106.1[P]	..	93.4[P]	..	119.1[P]	..	114.1*	115.0	126.7[P]	..
1956	116.9[P]	..	115.0[P]	..	94.4[P]	..	136.3[P]	..	127.8[P]	..	135.4[P]	..
1957	116.6[P]	..	114.1[P]	..	89.0[P]	..	139.9[P]	..	132.0[P]	..	129.6[P]	..

	Non-durables manufacturing											
	Foods										Beverages	
	Bakery products				Miscellaneous foods						Total beverages	
	Biscuits[3]		Bread and other bakery products		Total[3]		Confectionery[3]	Sugar refining		Other miscellaneous foods		
	Net	Gross	Net	Gross	Net	Gross	Gross	Net	Gross	Net	Gross	Net	Gross
1949 weights	0.422		1.312		1.830		0.665	0.331		0.834		2.848	
1935	..	..	59.1	57.0	49.0	51.7	..	71.3	69.5	46.4	49.6	27.1	28.5
1936	..	..	60.0	58.3	52.9	56.2	..	81.5	78.1	50.9	53.4	32.1	34.3
1937	..	..	64.6	62.4	55.2	57.2	..	75.7	72.8	52.2	55.6	37.8	40.7
1938	..	..	68.4	66.2	53.7	56.1	..	76.9	74.5	49.6	51.8	37.1	40.1
1939	..	..	68.2	66.9	58.6	60.8	..	87.9	82.8	54.2	56.6	38.7	41.0
1940	..	..	71.8	71.1	63.7	65.0	..	85.0	83.4	58.4	59.3	45.5	48.1
1941	..	..	77.7	77.2	74.3	74.3	..	94.7	88.3	66.4	66.4	52.9	55.9
1942	..	..	85.9	85.1	74.7	71.4	..	62.9	58.6	73.1	70.1	60.8	62.9
1943	..	..	94.4	93.3	75.7	72.9	..	64.5	62.8	77.4	74.3	56.6	58.4
1944	..	..	96.7	95.8	83.7	81.8	..	76.3	73.5	88.3	87.8	66.7	67.9
1945	..	..	99.9	99.2	83.3	82.7	..	72.1	71.1	91.9	94.0	71.8	72.8
1946	93.3	86.4	107.3	106.7	82.3	80.5	69.9	73.3	69.9	95.7	93.3	82.2	83.0
1947	91.1	84.4	103.8	103.4	90.6	90.8	86.7	71.0	78.4	101.5	99.0	87.3	88.6
1948	94.4	90.9	100.5	100.1	96.0	97.0	99.2	95.2	97.6	93.8	94.9	95.3	95.5
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	99.9	101.2	104.0	104.2	107.5	104.2	105.3	118.7	111.0	104.8	100.5	102.1	101.8
1951	110.4	108.2	108.7	109.0	97.6	94.7	81.2	98.7	95.3	110.2	105.3	106.2	105.2
1952	114.0	113.9	115.0	115.8	106.3	102.0	92.6	113.3	102.5	114.5	109.4	115.5[P]	..
1953	122.3	118.7	121.6	122.7	108.0	105.2	95.6	100.0	97.8	121.1	115.8	124.6[P]	..
1954	119.8	116.9	123.2	125.0	112.2[P]	..	98.8[P]	107.5	104.3	124.7[P]	..	121.7[P]	..
1955	122.2	117.8	128.1[P]	..	115.2[P]	..	94.9[P]	118.6[P]	..	130.0[P]	..	130.6[P]	..
1956	131.1[P]	..	136.8[P]	..	122.0[P]	..	107.5[P]	116.5[P]	..	135.8[P]	..	138.4[P]	..
1957	126.3[P]	..	130.5[P]	..	125.1[P]	..	109.9[P]	114.4[P]	..	141.5[P]	..	143.2[P]	..

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Annual Net and Gross Industry Indexes — Continued

1949 = 100

	Non-durables manufacturing											
	Beverages								Tobacco and tobacco products			
	Carbonated beverages		Distilled liquors		Breweries		Wines		Total tobacco and tobacco products		Tobacco, cigars and cigarettes	
	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross
1949 weights	0.715		0.631		1.436		0.066		0.771		0.709	
1935	19.9	19.9	38.3	35.9	24.6	28.0	52.9	56.9	31.1	39.3	31.5	40.7
1936	23.9	24.3	61.0	57.9	25.1	29.0	50.6	54.3	35.7	42.3	35.0	42.5
1937	28.0	31.3	75.7	69.7	28.6	32.6	61.0	72.2	41.4	47.7	41.6	48.9
1938	34.8	38.8	57.8	54.2	28.5	32.1	62.2	71.3	45.9	51.5	43.6	49.9
1939	40.5	42.9	54.8	51.7	28.8	32.1	64.8	78.3	49.2	55.1	46.2	52.4
1940	48.9	51.7	61.8	58.1	33.8	37.5	79.3	97.4	53.1	59.0	51.3	57.3
1941	54.0	58.7	61.1	57.7	44.1	48.0	78.8	93.9	61.3	64.1	62.3	65.5
1942	56.0	57.3	66.5	64.3	54.9	59.2	97.9	109.6	76.0	77.1	75.8	77.1
1943	55.1	57.0	67.4	64.2	48.6	52.2	65.8	75.9	82.3	81.9	83.5	83.5
1944	64.0	63.3	77.4	77.4	58.5	61.5	76.5	85.8	89.6	89.3	91.4	91.7
1945	52.9	50.9	103.2	102.7	66.5	69.4	79.2	91.2	103.2	102.2	103.8	103.2
1946	55.7	55.2	120.0	115.5	77.9	80.9	100.6	118.3	90.6	91.2	91.0	92.4
1947	69.5	68.4	99.1	102.1	90.2	91.2	103.9	122.8	93.4	94.8	91.7	93.7
1948	87.2	84.5	97.4	99.7	98.5	98.7	92.0	104.0	93.4	94.9	94.1	95.7
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	102.1	101.5	107.4	105.7	99.5	99.6	107.5	117.3	103.4	102.1	102.5	101.2
1951	94.8	93.7	129.4	123.5	102.3	103.0	91.4	102.8	95.0	94.8	94.3	94.2
1952	102.0[p]	..	131.2	124.8	116.3	115.0	96.3	107.3	108.0[p]	..	107.2[p]	..
1953	108.5[p]	..	151.5	139.3	122.3	120.3	92.1	100.8	120.3[p]	..	119.4[p]	..
1954	104.5[p]	..	145.4[p]	..	120.5	118.3	107.7	112.3	124.7[p]	..	123.8[p]	..
1955	119.4[p]	..	151.9[p]	..	127.7[p]	..	110.5	117.8	135.5[p]	..	134.5[p]	..
1956	122.6[p]	..	174.6[p]	..	131.4[p]	..	117.7	122.7	145.9[p]	..	144.8[p]	..
1957	129.7[p]	..	169.7[p]	..	139.5[p]	..	..	..	161.0[p]	..	159.8[p]	..

	Non-durables manufacturing											
	Tobacco and tobacco products		Total rubber products		Leather products							
	Tobacco processing and packing				Total leather products		Leather boots and shoes	Leather gloves and mittens		Leather tanneries	Other leather products	
	Net	Gross	Net	Gross	Net	Gross	Gross	Net	Gross	Gross	Net	Gross
1949 weights	0.062		1.334		1.577		0.952	0.078		0.275	0.272	
1935	27.3	26.2	49.8	45.7	70.8	71.4	67.1	72.5	85.7	95.2	58.5	57.8
1936	42.6	39.3	54.5	49.5	71.1	71.7	65.5	80.5	93.7	95.9	62.7	62.3
1937	38.7	35.5	63.6	57.3	78.1	78.6	73.2	77.5	92.8	98.1	75.2	73.6
1938	72.4	64.1	55.0	49.3	68.9	69.4	66.1	71.8	86.5	81.7	65.2	63.6
1939	83.3	76.2	60.4	56.2	80.3	80.7	75.0	77.5	90.9	101.8	78.2	76.2
1940	74.2	70.9	66.0	62.6	85.7	86.1	77.7	97.1	110.6	101.8	95.1	93.1
1941	51.2	49.1	87.5	84.1	104.2	104.2	94.2	122.7	131.3	110.2	129.7	126.5
1942	78.5	74.0	85.3	82.8	110.8	110.2	99.1	146.8	147.4	125.5	126.7	123.6
1943	68.8	65.0	83.3	86.9	111.6	111.7	100.9	136.3	145.3	130.3	123.7	121.6
1944	70.8	64.8	84.4	83.6	110.5	110.0	100.2	156.6	157.4	125.6	117.5	115.1
1945	97.7	90.0	102.1	99.7	114.5	114.1	106.9	153.4	151.8	129.3	114.6	113.4
1946	86.7	77.3	89.5	86.3	124.0	124.1	118.4	139.3	143.4	144.2	119.0	117.9
1947	112.7	107.3	127.4	123.5	109.1	109.0	100.8	134.1	137.2	134.1	105.6	104.0
1948	85.2	86.3	116.4	115.0	95.5	95.0	91.4	122.1	115.0	106.3	91.6	90.7
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	113.5	112.5	116.8	116.6	95.6	95.7	94.0	96.4	98.7	102.6	93.8	93.8
1951	102.4	101.4	124.9	123.1	90.4	90.7	93.2	109.6	112.2	82.2	83.6	84.3
1952	..	..	118.9	117.2	101.0[p]	..	106.4[p]	112.3	115.0	83.7	98.3	96.2
1953	..	..	130.3	128.4	106.4[p]	..	111.0[p]	102.6	105.0	99.4	98.2	98.3
1954	..	..	119.2	117.5	100.2[p]	..	103.9[p]	..	..	93.8[p]	..	..
1955	..	..	141.0	139.0	106.9[p]	..	108.7[p]	..	..	107.7[p]	..	..
1956	..	..	154.0[p]	..	115.6[p]	..	119.4[p]	..	..	111.4[p]	..	..
1957	..	..	147.8[p]	..	115.6[p]	..	120.7[p]	..	..	109.7[p]	..	..

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Annual Net and Gross Industry Indexes — Continued
1949 = 100

	Non-durables manufacturing											
	Textiles											
	Total textiles		Cotton goods						Wool goods			
			Total		Cotton thread	Cotton yarn and cloth		Miscellaneous cotton goods	Total	Wool cloth	Wool yarn	Miscellaneous wool goods
	Net	Gross	Net	Gross	[4]	Net	Gross	Gross	Gross	Gross	Gross	Gross
1949 weights	5.035		1.571		0.062	1.465		0.044	0.931	0.562	0.203	0.166
1935	49.7	50.2	57.2	60.3	94.9	56.1	59.5	46.1	59.3	58.3	65.7	54.9
1936	55.5	54.0	71.5	68.0	93.7	71.9	68.1	45.9	63.2	60.4	71.9	61.5
1937	59.8	58.3	76.4	73.4	103.5	76.4	73.1	54.6	67.0	60.9	74.5	76.6
1938	48.1	49.2	59.1	62.6	93.4	58.1	62.0	48.1	51.2	47.8	58.9	52.4
1939	59.5	58.7	78.5	78.0	92.3	79.7	79.0	48.7	64.9	62.5	65.8	70.7
1940	81.1	79.0	108.6	104.5	129.6	110.5	105.9	58.9	93.5	94.8	93.1	89.7
1941	91.7	88.6	121.6	114.3	137.1	124.0	116.0	67.5	94.4	93.7	92.9	97.5
1942	102.0	97.0	128.2	115.4	140.2	130.6	116.4	80.3	111.3	116.1	106.3	101.4
1943	93.8	89.5	108.3	97.1	138.9	108.3	96.0	85.7	102.4	107.3	97.4	92.7
1944	87.9	86.0	94.0	90.6	125.3	92.9	89.1	91.6	96.5	97.6	94.4	94.7
1945	87.5	87.3	91.4	93.7	116.1	90.9	93.4	91.6	99.0	100.7	99.5	92.3
1946	88.7	87.2	87.6	85.5	122.8	86.1	83.8	87.9	108.0	109.3	109.7	101.4
1947	94.0	92.9	96.4	92.9	108.7	96.0	92.3	91.3	111.0	110.3	122.5	99.5
1948	97.3	97.1	103.3	100.7	137.5	101.9	99.1	99.9	106.4	101.1	122.0	105.5
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	112.5	112.5	115.8	116.1	97.1	116.4	116.7	122.8	103.9	98.9	111.2	111.7
1951	113.1	112.1	109.5	108.7	97.6	108.5	107.6	161.1	95.7	91.4	101.0	104.0
1952	102.9[e]	103.1	93.9[e]	93.2	88.1	92.8[e]	92.0	139.1	80.4	73.2	92.9	89.3
1953	107.9[e]	108.7	97.3[e]	96.6	105.8	95.4[e]	94.6	149.4	89.6	85.2	94.3	98.6
1954	94.3[p]	..	86.7[p]	..	..	..	..	..	72.0	63.9	78.9	91.3
1955	114.0[p]	..	102.7[p]	..	..	..	..	..	89.2[p]	..	..	..
1956	117.3[p]	..	101.3[p]	..	..	..	..	..	93.0[p]	..	..	..
1957	117.6[p]	..	100.0[p]	..	..	..	..	..	86.9[p]	..	..	..

	Non-durables manufacturing											
	Textiles							Clothing				
	Total synthetic textiles and silk		Miscellaneous textile products					Total clothing		Men's, women's and children's clothing		
			Total	Dyeing and finishing of textiles	Cordage, rope and twine	Carpets, mats and rugs	Other miscellaneous textile products			Total	Children's factory clothing	Men's factory clothing
	Net	Gross	Gross	Gross	Gross	Gross	[4]	Net	Gross	Gross	Gross	Gross
1949 weights	1.334		1.199	0.166	0.106	0.137	0.790	5.587		3.454	0.206	1.571
1935	36.1[e]	34.5	47.5	38.8	89.8	57.8	42.1	57.2	58.7	57.9	..	..
1936	35.3[e]	33.7	51.9	37.6	97.4	68.4	46.6	60.5	61.6	59.8	..	..
1937	37.4[e]	35.7	58.4	41.0	90.9	88.4	53.6	65.3	65.8	63.9	..	..
1938	33.3[e]	31.8	50.3	33.2	69.9	60.8	50.5	61.3	61.3	58.2	..	..
1939	35.7[e]	34.1	57.9	41.1	82.3	68.2	57.3	67.3	66.9	61.7	..	..
1940	40.2[e]	38.4	84.4	47.3	124.3	72.8	90.8	78.2	78.4	74.9	..	..
1941	51.8[e]	49.5	97.8	65.0	128.6	82.7	105.0	88.4	88.8	90.3	..	..
1942	59.8[e]	57.1	110.5	80.1	142.7	76.3	119.9	100.9	101.7	110.2	..	..
1943	61.9[e]	59.1	105.9	74.6	130.3	64.8	117.8	97.7	97.9	106.9	..	..
1944	63.9[e]	61.0	101.4	68.9	144.6	55.2	111.8	91.7	92.6	98.4	..	..
1945	65.1[e]	62.2	99.2	73.7	139.5	58.1	107.3	91.4	92.9	96.8	..	..
1946	70.9	67.7	94.9	84.1	141.2	62.6	96.6	95.3	96.9	96.9	..	..
1947	77.2	77.2	96.4	86.7	131.0	68.8	98.5	92.2	94.2	92.5	..	..
1948	86.2	88.7	94.7	91.7	119.3	86.1	93.6	97.6	98.6	96.5	..	..
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	119.9	119.4	106.6	105.1	104.5	103.3	107.8	101.3	101.4	101.7	103.0	103.6
1951	134.0	131.2	108.1	110.9	143.8	74.7	108.5	101.2	101.1	101.0	107.7	101.0
1952	122.6	124.3	110.2	96.1	136.3	80.4	114.9	111.4	111.0	115.4	142.2	117.0
1953	127.5	131.6	114.1	97.3	83.4	99.4	124.3	115.0	114.2	117.0	148.8	119.8
1954	108.7	119.2	105.5[p]	..	97.0	99.7	..	108.9[p]	..	110.7[p]	..	..
1955	143.3	154.7	115.3[p]	..	116.0	..	..	112.8[p]	..	111.0[p]	..	..
1956	149.2	162.2	121.5[p]	..	122.9	..	..	117.6[p]	..	114.1[p]	..	..
1957	156.6[p]	..	121.2[p]	..	..	..	..	115.3[p]	..	112.6[p]	..	..

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Annual Net and Gross Industry Indexes — Continued

1949 = 100

	Non-durables manufacturing												
	Clothing												
	Men's, women's and children's clothing		Knitting mills					Miscellaneous clothing					
	Women's factory clothing	Clothing contractors	Total		Hosiery		Other knitted goods	Total	Corsets, girdles and foundation garments	Fur goods	Fur dressing and dyeing	Hats and caps	Other[5] clothing
	Gross	[4]	Net	Gross	Net	Gross	Gross	Gross	Gross	Gross	[4]	Gross	Gross
1949 Weights	1.543	0.134	1.221		0.559		0.662	0.912	0.147	0.375	0.087	0.197	0.106
1935	..	..	53.8	60.5	..	..	..	58.3	52.1	48.2	46.7	82.2	58.6
1936	..	..	60.2	65.5	..	..	..	61.2	48.1	54.3	47.0	85.0	69.7
1937	..	..	67.1	70.1	..	..	..	65.5	51.7	58.6	48.4	89.7	83.4
1938	..	..	66.1	66.8	..	..	..	63.3	53.7	60.1	41.5	83.8	63.3
1939	..	..	78.5	78.1	..	..	..	67.6	56.2	68.3	46.0	85.5	61.3
1940	..	..	81.5	83.3	..	..	..	82.5	59.4	78.5	60.2	111.8	94.4
1941	..	..	80.9	83.3	..	..	..	90.2	68.3	79.8	71.4	119.0	155.0
1942	..	..	80.2	80.2	..	..	..	96.9	74.4	87.1	60.4	128.7	179.9
1943	..	..	75.7	77.0	..	..	..	95.8	68.0	95.2	61.0	122.0	151.4
1944	..	..	74.4	78.4	..	..	..	91.8	71.5	94.4	67.5	108.5	127.4
1945	..	..	73.6	80.5	..	..	..	96.6	75.2	103.0	83.1	107.0	121.9
1946	..	..	82.2	89.6	..	..	..	106.5	95.8	105.3	96.2	122.9	103.8
1947	..	..	86.7	95.5	..	..	..	98.7	99.5	102.1	74.0	101.5	100.6
1948	..	..	99.6	104.1	..	..	..	99.1	99.3	106.5	93.4	90.1	94.1
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	99.2	106.7	100.7	100.8	102.2	102.4	99.4	100.8	103.4	98.3	94.0	101.9	109.1
1951	98.0	126.0	104.7	104.3	114.2	113.4	96.6	97.1	100.0	97.4	79.5	100.6	99.4
1952	108.3	137.4	104.8	102.8	116.4	112.1	94.9	105.1	112.1	104.3	83.1	108.4	109.7
1953	105.2	171.4	113.7	110.4	131.3	124.2	98.8	108.9	132.7	99.1	75.6	109.3	136.8
1954	..	..	110.5	105.7	136.6	126.2	88.4	100.0[P]	..	..	..	..	..
1955	..	..	121.3	116.1	141.0	129.6	104.6	107.9[P]	..	..	..	..	..
1956	..	..	131.2[P]	..	152.8[P]	..	..	112.7[P]	..	..	..	..	..
1957	..	..	126.6[P]	..	137.3[P]	..	..	110.4[P]	..	..	..	..	..

	Non-durables manufacturing											
	Paper products								Printing, publishing and allied industries			
	Total paper products		Pulp and paper		Roofing paper		Paper boxes and bags	Miscellaneous paper products n.e.s.	Total printing, publishing and allied industries	Printing and publishing	Commercial printing	Engraving, stereotyping and allied industries
	Net	Gross	Net	Gross	Net	Gross	[4]	Gross	Gross	[4]	[4]	[4]
1949 weights	8.217		6.537		0.287		0.731	0.662	3.951	2.127	1.265	0.559
1935	38.6	40.5	43.6	46.7	16.5	16.7	32.2	22.1	50.2	55.7	41.6	51.4
1936	42.4	46.6	47.4	53.7	20.4	21.0	35.0	27.5	53.2	59.4	45.1	50.9
1937	48.9	54.0	54.0	61.4	24.6	26.2	39.8	35.8	56.5	61.7	48.4	57.4
1938	39.3	42.5	41.2	45.6	21.0	23.3	38.5	36.6	52.9	57.5	46.3	53.0
1939	45.2	48.6	47.6	52.2	25.7	28.1	42.6	41.5	54.7	58.0	49.3	56.1
1940	54.3	59.6	58.1	65.6	32.6	33.8	45.9	48.3	54.6	56.2	51.2	58.1
1941	61.6	67.6	63.5	71.7	39.8	40.6	60.2	61.6	60.6	59.5	61.4	64.8
1942	61.5	67.5	62.1	70.3	38.5	38.7	64.9	65.4	61.2	60.5	62.5	62.2
1943	60.0	65.6	59.5	67.1	42.5	40.8	64.0	68.4	59.7	56.9	62.3	65.8
1944	63.9	68.3	63.1	68.9	51.7	50.9	67.0	72.9	61.4	57.2	64.3	71.5
1945	69.1	72.3	67.7	71.9	63.7	62.1	71.2	80.2	67.3	60.4	74.5	77.4
1946	81.0	83.5	80.5	83.6	76.5	78.5	81.1	87.5	76.9	68.3	86.6	87.6
1947	89.1	91.7	89.1	92.2	82.9	86.2	88.3	92.8	83.6	78.5	86.5	96.2
1948	94.9	97.2	95.1	97.8	83.6	89.7	94.4	97.9	92.6	88.6	93.4	105.8
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	109.3	109.2	108.4	108.1	105.0	108.8	118.1	110.5	101.5	97.0	105.4	109.5
1951	117.5	118.8	117.5	119.1	100.8	101.8	124.1	117.6	105.1	102.4	107.3	110.7
1952	113.4[P]	..	113.5[P]	..	101.2	99.8	117.8	112.6	107.5	107.6	107.3	107.2
1953	118.1[P]	..	117.5[P]	..	104.3	105.5	130.5	116.9	114.7	112.1	117.7	117.5
1954	124.1[P]	..	124.0[P]	..	107.8	106.5	128.8	127.0	121.6	119.6	123.9	124.1
1955	131.0[P]	..	131.1[P]	..	115.2[P]	..	133.5[P]		127.1	124.3	131.4	128.0
1956	137.8[P]	..	137.4[P]	..	110.1[P]	..	145.3[P]		137.3[P]	137.8[P]	136.8[P]	
1957	135.5[P]	..	133.6[P]	..	100.9[P]	..	151.8[P]		138.2[P]	132.1[P]	145.3[P]	

For footnotes see, page 73.

Annual Net and Gross Industry Indexes – Continued

1949 = 100

	Non-durables manufacturing													
	Products of petroleum and coal					Chemicals and allied products								
	Total products of petroleum and coal		Coke products		Petroleum products	Total chemicals and allied products		Acids, alkalies and salts and fertilizers						
								Total		Acids, alkalies and salts		Fertilizers		
	Net	Gross	Net	Gross	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	
1949 weights	1.590		0.181		1.409	4.216		1.074		0.637		0.437		
1935	37.8	37.9	52.8	53.6	35.6	31.4	32.9	27.2	28.0	31.2	32.3	11.4	13.6	
1936	40.8	40.9	60.1	60.4	37.9	33.7	35.1	29.4	29.5	32.4	33.3	16.0	16.4	
1937	44.9	45.0	64.0	64.5	42.0	39.3	40.6	34.9	35.8	37.2	39.5	22.7	22.2	
1938	44.4	44.3	59.9	59.3	42.1	37.9	38.9	32.6	33.3	32.4	34.3	28.0	27.2	
1939	48.1	48.3	57.2	58.7	46.8	40.7	41.8	37.6	37.4	38.4	39.9	29.2	26.8	
1940	53.6	53.7	75.0	76.0	50.4	49.8	51.1	49.5	49.8	53.3	55.6	30.4	29.3	
1941	61.1	61.3	78.3	79.6	58.5	77.2	78.9	75.8	74.6	87.9	89.3	28.9	26.9	
1942	59.4	59.7	82.0	83.6	56.0	126.5	129.7	96.8	95.8	111.4	114.6	39.5	35.3	
1943	65.1	65.7	84.3	88.5	62.3	135.1	138.8	105.5	106.9	117.9	124.5	53.0	48.3	
1944	73.6	73.4	104.0	102.4	69.0	142.8	146.5	112.0	111.4	115.7	119.7	83.2	77.8	
1945	71.9	71.6	101.7	99.5	67.4	107.1	109.4	104.5	101.5	104.4	104.8	87.8	82.7	
1946	74.3	74.6	82.4	84.4	73.3	87.0	88.7	86.0	84.2	76.2	77.6	100.3	93.7	
1947	79.8	80.3	83.9	88.5	79.3	90.8	93.1	95.0	94.2	89.7	89.3	102.8	101.3	
1948	89.9	90.3	99.2	102.9	88.7	95.7	96.5	97.0	98.3	95.7	98.1	98.9	98.5	
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
1950	111.9	112.0	105.6	106.2	112.7	107.7	109.4	109.6	110.2	117.5	117.1	98.0	100.1	
1951	128.5	128.4	107.4	107.0	131.2	120.0	118.5	126.4	125.6	144.1	141.7	100.6	102.2	
1952	140.1	140.0	112.9	112.1	143.6	122.3[e]	121.7	125.6	123.0	139.3	134.9	105.5	105.6	
1953	153.5	153.9	113.1	116.5	158.7	139.9[e]	138.9	137.4	134.5	159.5	153.1	105.2	107.5	
1954	165.0	165.1	95.5	95.7	174.0	152.1[p]	..	158.7	153.3	187.4	177.9	116.8	117.5	
1955	188.3[p]	..	114.3[p]	..	197.8[p]	165.5[p]	..	184.0	180.0	231.1	222.7	115.3	117.8	
1956	216.1[p]	..	122.8[p]	..	228.1[p]	174.8[p]	..	187.8[p]	..	..	..	..	..	
1957	223.5[p]	..	120.2[p]	..	236.8[p]	181.5[p]	..	190.1[p]	..	..	..	..	..	

	Non-durables manufacturing												
	Chemicals and allied products												Total miscellaneous manufacturing industries
	Medicinal and pharmaceutical preparations	Paints, varnishes and lacquers		Soaps, washing compounds and cleaning preparations		Vegetable oil mills		Primary plastics		Toilet preparations	Miscellaneous chemicals		
	[4,6]	Net	Gross	Net	Gross	Net	Gross	Net	Gross	[4]	Net	Gross	[4]
1949 weights	0.675	0.556		0.543		0.128		0.153		0.166	0.921		1.624
1935	44.9	31.3	36.4	50.0	55.9	10.6	13.3	6.5[e]	6.9	54.3	26.2	26.5	31.4
1936	46.3	36.7	41.1	46.8	53.3	15.2	17.1	7.5[e]	8.0	59.0	28.8	29.3	34.3
1937	51.6	45.8	47.0	50.2	58.3	15.9	19.4	9.2[e]	9.8	64.6	34.4	34.9	37.1
1938	48.9	43.2	44.8	51.6	57.7	13.8	14.4	8.4[e]	8.9	57.4	34.9	35.3	36.9
1939	51.2	43.9	47.4	57.0	63.9	17.0	17.8	10.1[e]	10.8	57.4	37.0	37.3	38.6
1940	54.1	54.1	55.5	55.9	64.0	20.1	22.9	13.3[e]	14.2	70.4	50.3	50.8	42.6
1941	60.3	68.4	71.0	64.1	73.6	29.3	33.7	14.3[e]	15.2	88.2	109.2	110.5	60.8
1942	65.9	75.7	79.2	69.0	75.7	31.4	36.0	15.6[e]	16.6	88.4	257.5	260.6	88.5
1943	79.0	75.6	77.1	70.8	78.2	33.4	35.0	20.5[e]	21.8	111.9	268.8	272.1	112.1
1944	98.6	83.1	84.7	77.4	83.7	41.2	48.4	27.6[e]	29.4	122.0	270.7	273.8	113.0
1945	106.2	77.8	80.5	81.7	89.9	49.7	73.4	29.5[e]	31.4	129.2	146.3	147.7	98.3
1946	105.1	83.6	88.3	83.7	89.4	72.6	91.0	40.6	43.2	124.6	82.1	82.8	80.2
1947	105.0	88.9	94.0	89.5	94.9	65.1	87.6	44.7	52.9	100.6	86.8	87.7	84.1
1948	101.3	97.9	99.5	94.2	100.3	131.2	104.7	74.1	76.7	80.1	91.1	91.9	81.4
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	98.5	104.1	110.2	112.1	113.5	83.3	93.8	135.4	141.3	101.2	111.6	111.9	104.8
1951	103.6	120.4	117.0	110.0	107.3	116.8	104.6	173.5	176.8	95.5	126.0	125.1	119.0
1952	107.4	117.5[e]	114.2	120.3	120.0	72.2	95.8	155.2[e]	158.2	117.8	135.7[e]	134.5	121.8
1953	121.2	133.8[e]	130.0	122.8	125.3	101.5	109.3	192.1[e]	195.8	129.8	168.6[e]	166.5	141.1
1954	129.3	126.5[e]	122.9	133.7	129.7	114.8	112.8			182.1[p]			134.3[p]
1955	143.5	142.6[e]	138.6	138.5[p]	..	120.7[p]	..			188.3[p]			136.4[p]
1956	158.6[p]	140.7[p]	..	151.4[p]	..	140.4[p]	..			201.4[p]			147.0[p]
1957	178.4[p]	138.5[p]	..	157.2[p]	..	145.8[p]	..			209.4[p]			153.3[p]

For footnotes see page 73.

Annual Net and Gross Industry Indexes — Continued

1949 = 100

	Durables manufacturing												
	Total durables manufacturing		Wood products										
			Total wood products		Saw and planing mills								
					Total		Veneers and plywoods		Sawmills		Sash, door and planing mills	Hardwood flooring	
	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	[4]	Net	Gross
1949 weights	39.091		6.540		4.479		0.378		3.083		0.918	0.100	
1935	32.7	32.8	42.3	42.4	41.0	41.2	..	..	54.7	55.0	24.5	41.2*	42.3
1936	36.9	37.0	47.5	47.8	46.8	47.2	..	..	60.1	60.9	32.1	49.6*	50.9
1937	44.9	45.1	53.6	54.5	52.3	53.7	..	..	68.8	71.2	33.0	57.7*	59.2
1938	40.9	40.8	50.7	50.9	49.9	50.2	..	..	65.4	66.1	31.6	54.6*	56.0
1939	42.7	42.6	54.0	54.1	52.8	53.0	..	..	69.5	69.9	33.4	54.1*	55.5
1940	59.3	59.3	65.5	65.9	64.8	65.5	..	..	81.9	83.1	47.4	63.6*	65.2
1941	85.8	85.2	74.5	75.1	72.1	73.0	..	..	87.2	88.7	59.2	78.4*	80.4
1942	112.1	109.9	77.4	77.8	76.0	76.6	..	..	89.5	90.5	66.9	82.5*	84.6
1943	128.2	126.1	73.6	74.0	68.6	69.1	..	..	78.6	79.4	62.3	102.3*	104.9
1944	128.3	126.4	76.1	76.6	71.9	72.6	73.4*	72.8	79.2	80.4	50.7	82.9*	85.0
1945	99.8	98.7	77.2	77.8	72.8	73.8	68.7*	68.1	79.3	80.8	54.9	83.1*	85.2
1946	79.9	79.5	86.8	87.2	82.9	83.5	79.7	79.0	88.2	89.1	67.1	77.6	79.6
1947	93.3	93.3	98.2	98.5	96.4	96.9	106.3	101.4	101.4	102.6	75.7	95.9	96.5
1948	98.4	98.4	100.6	99.9	100.9	99.9	115.5	109.2	101.1	100.4	95.7	85.2	89.2
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	106.5	106.7	108.2	107.9	111.4	111.0	118.6	116.9	110.1	109.8	113.0	110.8	109.3
1951	119.9	119.9	114.8	113.7	119.3	117.7	144.0	135.2	116.9	115.8	117.0	119.3	116.9
1952	124.8*	124.8	115.8*	114.7	118.8*	117.3	141.2*	132.6	115.2*	114.1	124.3	95.8*	93.9
1953	133.6*	133.6	125.4*	124.1	129.6*	127.8	178.3*	167.4	124.7*	123.5	128.7	103.7*	101.6
1954	124.8[P]	..	124.2[P]	..	128.7[P]	..	185.5[P]	..	122.5[P]	..		126.5[P]	
1955	139.7[P]	..	136.4[P]	..	143.9[P]	..	226.2[P]	..	133.5[P]	..		144.7[P]	
1956	153.3[P]	..	138.3[P]	..	143.6[P]	..	247.3[P]	..	131.3[P]	..		142.2[P]	
1957	146.2[P]	..	125.2[P]	..	127.5[P]	..	235.7[P]	..	114.6[P]	..		126.3[P]	

	Durables manufacturing												
	Wood products					Iron and steel products							
	Furniture	Other wood industries				Total iron and steel products		Agricultural implements	Boilers, tanks and plate-work	Bridge building and structural steel	Hardware, tools and cutlery	Heating and cooking apparatus	
		Total	Wooden boxes and baskets	Morticians' goods	All other wood products								
	[4]	Gross	[4]	Gross	[4]	Net	Gross	Gross	[4]	[4]	[4]	Net	Gross
1949 weights	1.427	0.634	0.184	0.066	0.384	12.493		1.406	0.553	0.665	0.809	0.615	
1935	40.3	55.0	77.0	65.4	45.5	29.2	29.3	19.7	30.0	22.4	36.6	29.6*	28.8
1936	46.4	56.0	77.0	69.6	46.4	33.8	33.7	21.8	31.8	31.2	40.1	37.2*	36.2
1937	51.5	66.3	98.8	73.5	53.8	42.9	42.9	26.3	37.6	44.9	48.5	44.2*	43.0
1938	48.0	62.4	93.5	74.3	49.6	36.6	36.1	25.9	33.6	38.3	42.9	38.8*	37.8
1939	49.7	70.0	103.8	82.1	56.4	39.1	38.6	18.2	29.6	34.3	48.0	41.3*	40.2
1940	60.2	82.2	122.4	79.7	68.3	58.9	58.4	28.4	47.6	72.8	71.8	52.4*	51.0
1941	69.9	99.2	156.3	90.5	80.6	86.4	85.2	37.1	66.9	123.7	116.7	62.1*	60.5
1942	67.1	107.0	168.1	89.7	88.2	114.7	111.6	50.2	75.1	162.8	147.5	60.4*	58.8
1943	71.7	107.0	154.9	94.5	91.7	131.6	127.8	59.5	82.0	195.4	175.8	63.5*	61.8
1944	73.1	107.4	158.5	100.1	90.4	118.4	115.7	59.0	66.3	139.2	145.8	62.4*	60.8
1945	77.8	102.7	150.0	97.4	86.5	96.3	94.1	55.1	65.1	105.4	123.0	68.8*	67.0
1946	93.0	100.5	113.4	95.4	95.3	80.8	79.5	53.7	65.9	79.4	123.9	76.7	74.7
1947	99.9	107.1	117.5	94.4	104.3	93.6	93.2	64.2	79.4	89.1	124.4	86.0	85.8
1948	98.2	103.9	107.6	101.6	102.5	101.5	101.7	91.5	86.4	103.7	122.6	95.9	95.8
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	107.3	87.3	84.9	99.1	86.4	102.5	102.8	82.5	100.3	107.3	108.0	107.8	112.4
1951	109.1	96.1	89.1	98.7	98.9	117.0	117.5	85.6	118.6	124.5	128.8	97.4	105.8
1952	113.7	98.9	97.6	101.6	99.1	118.9*	119.4	94.6	127.7	143.2	125.5	105.3	114.0
1953	126.5	92.8	85.7	104.3	94.2	115.3*	115.6	70.9	130.1	147.5	124.4	135.2	141.0
1954	128.5	82.4[P]	..	..	..	106.2[P]	..	49.7	117.9	154.2	112.5	142.2	150.2
1955	133.7[P]	89.6[P]	..	..	..	123.8[P]	..	49.6	126.8	169.8	122.7	154.9[P]	..
1956	140.6[P]	95.3[P]	..	..	..	145.3[P]	..	43.6[P]	135.4[P]	208.2[P]	132.5[P]	213.5[P]	..
1957	133.8[P]	89.4[P]	..	..	..	139.7[P]	..	45.9[P]	150.7[P]	241.1[P]	121.8[P]	183.5[P]	..

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Annual Net and Gross Industry Indexes — Continued

1949 = 100

	Durables manufacturing												
	Iron and steel products												
	Iron castings		Machinery, machine shops and machine tools					Primary iron and steel		Sheet metal products	Wire and wire goods		Miscellaneous iron and steel products
			Total	Industrial machinery	Household, office and store machinery	Machine shops	Machine tools						
	Net	Gross	Gross	[4]	Gross	[4]	[4]	Net	Gross	[4]	Net	Gross	[4]
1949 weights	1.202		2.639	1.552	0.700	0.303	0.084	2.624		1.112	0.537		0.331
1935	38.8	41.4	26.3	..	..	19.5	..	27.6	28.0	36.8	39.0	44.0	20.7
1936	41.7	44.3	30.4	..	..	22.5	..	32.8	32.5	46.4	41.8	48.2	20.9
1937	53.4	56.5	39.4	..	..	28.6	..	44.9	45.0	55.6	51.1	56.3	20.3
1938	43.9	45.4	33.2	..	..	24.1	..	36.8	35.5	44.5	47.3	48.3	20.8
1939	41.3	42.9	35.1	..	..	25.7	..	43.8	41.7	52.3	55.7	57.3	36.9
1940	62.2	63.5	62.1	..	..	39.0	..	65.0	64.1	62.3	65.3	72.3	53.0
1941	90.6	91.5	91.4	..	..	56.8	..	88.0	84.7	83.8	88.6	86.3	164.5
1942	95.7	92.2	103.3	..	..	80.5	..	121.6	111.8	106.1	81.5	81.8	591.4
1943	92.4	86.6	114.9	..	..	133.3	..	117.9	106.3	106.4	83.2	79.1	996.1
1944	81.5	80.2	103.1	..	..	151.7	..	104.3	95.0	103.3	80.6	80.2	961.6
1945	80.9	81.9	92.2	..	..	130.7	..	96.7	89.1	95.9	84.9	82.7	408.6
1946	78.6	78.1	89.3	105.2	44.2	104.3	115.4	71.7	68.6	90.1	77.4	74.9	111.1
1947	87.6	88.1	103.0	118.5	69.5	97.8	114.8	93.9	92.1	95.3	98.1	96.4	122.7
1948	98.1	98.1	104.5	116.2	85.0	95.3	85.7	99.1	101.5	102.9	103.7	99.1	121.8
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	102.7	108.6	98.8	100.5	93.6	99.1	110.1	109.4	107.2	102.7	112.2	112.0	115.7
1951	104.7	111.8	117.7	125.2	102.4	107.6	144.0	129.0	127.3	108.2	134.9	128.4	184.9
1952	99.9°	106.7	116.8	123.3	95.1	114.3	185.0	127.9°	126.2	106.9	128.8°	122.6	206.6
1953	94.2°	100.6	111.6	113.5	102.0	114.7	143.2	120.8°	119.2	114.1	120.5°	114.7	214.8
1954	88.1°	94.1	113.0	119.8	99.7	108.0	117.3	94.6°	93.4	113.8[p]	122.3°	116.4	199.8
1955	122.6[p]	..	120.3	126.8	108.6	122.0	92.4	133.0°	131.2	125.6[p]	148.0[p]	..	201.0
1956	155.4[p]	..	144.7[p]	..	..	..	..	158.3[p]	..	137.0[p]	169.8[p]	..	225.5[p]
1957	129.4[p]	..	146.3[p]	..	..	..	..	149.0[p]	..	125.8[p]	144.6[p]	..	226.8[p]

	Durables manufacturing												
	Transportation equipment							Non-ferrous metal products					
	Total transportation equipment	Aircraft and parts	Motor vehicles	Motor vehicle parts	Railway rolling stock	Shipbuilding	Other transportation equipment	Total non-ferrous metal products		Aluminum products		Brass and copper products	
	Gross	[4]	Gross	Gross	[4]	[4]	[4]	Net	Gross	Net	Gross	Net[7]	Gross
1949 weights	8.227	0.631	3.211	1.434	1.927	0.809	0.215	4.969		0.397		0.746	
1935	34.2	1.8	48.9	32.6	43.8	25.4	24.2	40.1	40.5	10.9	10.9	31.8	33.3
1936	35.5	2.7	47.6	35.7	48.4	23.3	26.6	46.7	47.3	13.3	13.4	38.3	41.3
1937	43.4	3.9	60.5	41.7	56.2	31.5	32.0	54.4	55.2	15.7	15.8	40.6	44.9
1938	38.1	10.7	47.7	37.4	50.2	31.9	26.1	55.8	56.4	15.2	15.1	38.8	41.3
1939	37.7	23.4	44.6	38.0	44.7	31.1	28.2	58.4	59.2	15.3	15.7	43.0	46.8
1940	61.1	48.0	73.3	50.3	58.2	99.4	33.1	70.5	71.8	28.2	28.9	71.7	80.0
1941	106.1	144.0	100.2	92.4	81.7	218.4	42.2	98.9	97.4	47.3	36.8	145.4	142.7
1942	157.1	295.6	119.9	123.8	97.0	396.2	38.5	130.4	123.8	64.8	54.3	267.5	232.8
1943	198.4	452.4	123.3	123.8	93.0	628.2	38.1	145.6	139.9	79.6	65.9	292.9	267.9
1944	235.7	804.5	108.2	109.9	88.9	607.2	41.6	130.9	124.7	74.2	63.4	244.5	211.3
1945	157.0	444.7	77.3	92.0	89.5	397.4	47.9	98.8	96.1	64.1	66.9	159.8	141.5
1946	80.6	105.0	59.8	72.4	83.4	159.7	53.3	81.8	81.9	80.4	82.5	96.2	96.2
1947	95.3	87.8	90.3	91.5	79.5	174.9	59.4	89.6	89.8	92.3	94.7	97.3	97.3
1948	97.2	76.3	89.7	90.0	101.9	154.2	61.6	99.2	99.0	100.3	97.8	101.3	101.3
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	108.3	98.7	129.1	130.9	74.0	80.0	88.6	104.0	104.2	100.6	103.9	98.4	98.4
1951	131.3	194.6	143.5	135.1	102.6	108.8	79.7	114.1	114.1	124.1	123.8	116.7	116.7
1952	149.1	320.3	146.4	136.0	105.6	169.8	87.8	112.2°	112.1	125.6°	125.3	116.5	116.5
1953	165.2	398.4	164.4	146.1	101.9	188.6	100.7	120.1°	120.1	133.9°	133.6	106.5	106.5
1954	137.3[p]	355.4	130.7	114.2	88.3	161.7[p]	98.6	117.0[p]	..	112.2°	111.9	96.9	96.9
1955	145.1[p]	308.8	167.7	130.1[p]	75.7[p]	132.5[p]	97.0	127.5[p]	..	108.5°	108.2	111.1	111.1
1956	157.9[p]	313.1[p]	184.1[p]	135.1[p]	89.7[p]	151.7[p]	99.6[p]	133.0[p]	..	111.6[p]	..	119.4[p]	119.4[p]
1957	150.7[p]	350.4[p]	162.0[p]	121.2[p]	90.5[p]	161.7[p]	91.5[p]	128.6[p]	..	109.4[p]	..	113.8[p]	113.8[p]

For footnotes see page 73.

Annual Net and Gross Industry Indexes – Continued

1949 = 100

	Durables manufacturing												
	Non-ferrous metal products				Electrical apparatus and supplies						Non-metallic mineral products		
	Jewellery and silverware	Non-ferrous metal smelting and refining	White metal alloys	Miscellaneous non-ferrous metal products	Total electrical apparatus and supplies	Batteries	Heavy electrical machinery	Telecommunication equipment	Refrigerators, vacuum cleaners and appliances	Miscellaneous electrical products	Total non-metallic mineral products		Hydraulic cement
	[4]	Gross	Gross	[4]	Gross	Gross	[4]	Gross	Gross	[4]	Net	Gross	Gross
1949 weights	0.375	3.192	0.203	0.056	4.401	0.203	1.518	0.440	0.706	1.534	2.461		0.362
1935	33.5	47.5	23.9	41.4	22.9	..	..	..	..	..	24.6	24.9	21.7
1936	35.5	55.6	27.1	41.6	25.0	..	..	..	..	..	29.8	30.2	30.7
1937	39.4	65.8	31.3	45.9	32.5	..	..	..	..	..	38.2	38.4	38.3
1938	38.2	68.9	29.7	39.5	28.0	..	..	..	..	..	34.3	34.6	34.8
1939	39.6	71.3	34.3	49.2	28.4	..	..	..	..	..	35.7	36.0	35.6
1940	51.5	79.5	44.3	83.7	41.9	..	..	..	..	..	45.0	44.9	43.3
1941	63.1	100.3	73.6	150.6	61.8	..	..	..	..	..	60.1	59.8	52.8
1942	59.2	120.9	76.7	158.3	74.9	..	..	..	..	..	68.2	68.1	53.8
1943	51.3	138.9	71.1	142.9	85.0	..	..	..	..	..	68.8	69.0	50.0
1944	53.4	127.0	75.4	122.4	85.5	..	..	..	..	..	66.8	66.8	47.3
1945	63.9	94.3	81.7	154.8	70.7	..	..	..	..	..	63.7	63.7	48.7
1946	80.9	76.4	98.6	149.7	67.7	92.7	70.3	80.0	34.2	73.6	72.0	72.1	66.5
1947	72.5	87.7	103.4	142.7	89.6	99.6	86.5	108.5	59.0	100.1	86.3	86.4	76.0
1948	84.1	93.7	109.4	157.0	91.5	104.3	99.2	88.3	68.4	93.6	92.2	92.6	87.2
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	104.4	105.5	113.0	79.8	112.5	112.7	105.5	126.5	142.9	101.5	111.0	111.9	104.1
1951	94.0	114.0	118.7	136.1	120.7	107.9	130.4	139.5	118.4	108.6	119.8	121.0	106.6
1952	78.2	114.5	102.1	90.1	124.5	113.9	130.5	208.1	103.8	105.4	122.8[e]	124.3	114.6
1953	93.2	126.0	105.8	101.6	150.9	106.4	132.3	351.1	134.7	125.2	139.2[e]	140.9	139.5
1954	82.1[p]	127.4	105.2[p]		151.7	106.2	119.5	388.8	131.4	130.9	146.1[p]	..	140.2[p]
1955	80.8[p]	140.1	117.0[p]		176.2[p]	110.9[p]	126.2	543.4	136.8	146.9	171.1[p]	..	156.1[p]
1956	81.1[p]	145.9	120.7[p]		191.3[p]	113.2[p]	157.0[p]	460.3[p]	160.4[p]	172.6[p]	191.5[p]	..	183.3[p]
1957	75.9[p]	141.8[p]	113.1[p]		181.5[p]	112.9[p]	163.4[p]	370.9[p]	143.8[p]	171.5[p]	193.3[p]	..	221.1[p]

	Durables manufacturing											
	Non-metallic mineral products											
	Concrete products		Domestic[3] clay products	Glass products		Lime and gypsum products		Salt	Abrasive products		Other non-metallic mineral products	
	Net	Gross	Gross	Net	Gross	Net[7]	Gross	Gross	Net[7]	Gross	Net[7]	Gross
1949 weights	0.303		0.260	0.393		0.272		0.069	0.256		0.546	
1935	4.2	4.4	31.0	31.7[e]	31.6	24.6	24.1	70.1	35.6	35.8	20.7	21.7
1936	7.0	7.3	36.2	35.4[e]	35.3	29.1	28.9	75.0	43.0	42.4	24.5	26.3
1937	14.5	15.0	45.7	46.1[e]	45.9	35.8	35.0	80.0	54.6	54.6	31.3	32.1
1938	14.0	14.5	44.9	41.7[e]	41.5	32.9	33.0	86.0	35.9	36.0	32.3	33.1
1939	16.3	16.9	51.1	42.3[e]	42.1	39.0	38.3	74.0	38.3	37.9	30.9	32.2
1940	22.9	23.8	60.3	43.1[e]	42.9	50.5	49.3	75.9	57.8	57.3	41.2	41.3
1941	23.9	24.7	68.0	63.4[e]	63.1	59.9	59.7	92.7	92.2	90.3	56.6	56.0
1942	26.9	28.4	61.2	73.7[e]	73.4	59.4	60.2	99.5	115.8	114.3	69.3	68.7
1943	21.5	22.1	55.0	76.2[e]	75.9	64.8	64.6	101.5	123.8	124.3	69.7	69.8
1944	24.8	26.7	57.4	76.3[e]	76.0	63.8	63.0	100.5	104.9	106.1	71.9	71.2
1945	35.0	35.8	65.5	79.4[e]	79.1	63.4	62.7	100.7	92.5	92.9	57.2	56.9
1946	51.4	52.9	86.9	72.5	72.2	74.7	74.7	92.7	91.3	91.3	66.5	66.5
1947	62.0	63.9	91.2	96.6	96.0	86.8	86.8	99.1	110.1	110.1	83.8	83.8
1948	79.7	82.0	102.8	95.4	96.0	98.5	98.5	103.5	109.7	109.7	82.5	82.5
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	115.0	122.8	114.9	114.3	113.7	109.3	109.3	110.8	112.2	112.2	109.4	109.4
1951	130.7	141.0	120.7	117.7	117.4	116.8	116.8	122.9	136.9	136.9	116.7	116.7
1952	168.1[e]	181.3	116.0	120.4[e]	120.1	110.3	110.3	127.0	114.8	114.8	117.3	117.3
1953	182.4[e]	196.8	130.8	148.5[e]	148.1	122.8	122.8	124.2	132.7	132.7	125.4	125.4
1954	231.9[e]	250.2	136.7	138.1[e]	137.7	128.3	128.3	131.0	124.9	124.9	133.3	133.3
1955	317.6[e]	342.6	146.6	158.2[e]	157.8	147.5	147.5	168.7	124.1	124.1	154.8	154.8
1956	376.5[p]	..	160.0[p]	170.3[p]	..	142.2[p]	142.2[p]	230.2[p]	159.5[p]			
1957	356.9[p]	..	145.5[p]	164.0[p]	..	143.1[p]	143.1[p]	252.3[p]	160.7[p]			

For footnotes see page 73.

Annual Net and Gross Industry Indexes — Concluded

1949 = 100

	Electric power and gas utilities								
	Total electric power and gas utilities		Electric power utilities		Gas utilities				
					Total		Natural gas	Manufactured gas	
	Net	Gross	Net	Gross	Net	Gross	Gross	Net	Gross
1949 weights	5.107		4.595		0.512		0.210	0.302	
1935	39.1	39.4	37.7	37.8	57.0	59.6	47.9	63.2	67.9
1936	42.1	42.3	40.8	41.0	57.7	59.2	55.5	59.2	61.8
1937	46.1	46.3	45.0	45.1	59.8	60.9	62.3	58.1	59.8
1938	46.3	46.3	45.1	45.1	60.3	61.0	64.0	57.7	58.8
1939	49.7	49.6	48.5	48.5	62.2	63.4	68.2	58.0	59.8
1940	55.9	55.9	54.6	54.6	70.1	71.2	77.9	64.7	66.2
1941	64.2	64.3	63.2	63.2	73.8	74.6	78.3	70.6	71.9
1942	72.2	72.1	71.3	71.2	79.0	79.8	78.3	79.6	80.8
1943	77.2	77.3	76.5	76.4	80.4	82.3	75.8	83.6	86.9
1944	78.2	78.6	77.3	77.7	83.2	84.8	79.3	85.9	88.5
1945	75.7	75.9	74.4	74.6	87.7	89.1	86.9	88.1	90.4
1946	79.4	79.8	78.2	78.6	90.1	90.4	86.2	92.8	93.2
1947	89.8	89.4	89.3	88.8	94.5	95.0	95.8	93.5	94.4
1948	94.8	94.5	94.2	93.9	100.1	99.6	99.2	100.6	99.9
1949	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1950	113.2	112.9	113.7	113.2	108.8	110.4	121.7	100.0	102.6
1951	129.4	128.1	131.1	129.5	114.3	115.2	133.8	100.9	102.5
1952	140.7	138.9	143.4	141.3	116.1	117.0	139.7	99.8	101.2
1953	147.9	147.9	151.0	151.0	119.7	120.1	151.9	97.4	98.1
1954	161.4[P]	..	164.6	163.3	132.8[P]	..	181.5[P]	99.1[P]	..
1955	183.3[P]	..	187.9	185.5	142.0[P]	..	244.6[P]	71.0[P]	..
1956	204.9[P]	..	208.9[P]	..	169.0[P]	..	302.7[P]	76.7[P]	..
1957	220.3[P]	..	223.6[P]	..	190.9[P]	..	381.2[P]	59.5[P]	..

[1] Includes auriferous quartz and placer gold mining only.
[2] Includes the prepared stock and poultry feeds industry and the feed mills industry, which were combined in 1952 to form the feeds industry.
[3] Prior to 1946, total miscellaneous foods include biscuits and confectionery.
[4] See Appendix B for type of indicator used to represent gross output.
[5] Not comparable prior to 1946 due to classification changes.
[6] For penicillin and streptomycin preparations, 1955 unit values were used as weights in the compilation of the bench-mark indexes. (See Part I, Section 9 (f)). If 1949 unit values had been used, the production index for the industry would be as follows:

1946	96.5	1950	104.3	1954	170.1
1947	97.0	1951	110.5	1955	202.3
1948	96.9	1952	121.9		
1949	100.0	1953	153.4		

[7] Gross Index used to represent net index since 1946.
[8] Sand-lime brick included.