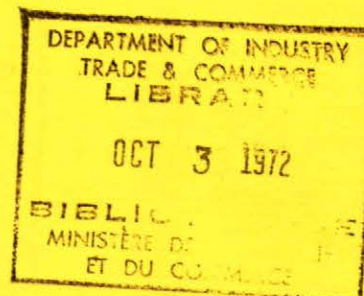# CANADIAN MANUFACTURING INDUSTRIES
# STRUCTURE AND PERFORMANCE
# WITH PARTICULAR REFERENCE
# TO PRODUCTIVITY

PRODUCTIVITY BRANCH
OFFICE OF ECONOMICS
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CANADIAN MANUFACTURING INDUSTRIES
STRUCTURE AND PERFORMANCE
WITH PARTICULAR REFERENCE TO PRODUCTIVITY


Executive Summary


This study endeavours to take a new, integrated systems approach to the analysis of the structure, growth and performance of Canada's manufacturing sector. Its purpose is to provide a firm base for a better understanding and comparative assessment of our various manufacturing industries, and to assist in the development of the most effective industrial strategy.

In view of the vital importance of productivity to virtually all aspects of economic progress of Canada, the main thrust of the report is in the area of productivity. Section three of the report examines the meaning and measurement of productivity, the determinants of its level and growth, and the actual productivity performance of 87 industry groups in manufacturing. In other sections of the report, the levels and changes in productivity are compared and correlated with other strategic variables, such as output, employment, average wages and salaries, profitability, unit costs, selling prices, and foreign trade performance.

Most of the statistical material is based on data obtained from Statistics Canada. It has been drawn together and released recently in a comparative form by the Productivity Branch of the Office of Economics under the title "Statistical Handbook on Canadian Manufacturing Industries".

To enable the reader to weigh the importance of the different industries and industry groups, the second section of the report is concerned with their absolute and relative sizes and their growth over the past decade. The emphasis is on production and employment.

During the 1960's manufacturing accounted for about one-quarter of the gross domestic product and almost as much in employment. It is expected to maintain this position during the 1970's. Output and employment were concentrated in a minority of the 20 major groups into which manufacturing is statistically classified. In Table 1 (page 7) it can be seen that over 50 per cent of output and 45 per cent of employment originated in five groups only, led by food and beverages, transport equipment and metals, while 75 per cent of both originated in ten of the groups.

Table 2 (page 9) shows the percentage increases in value added and employment for the 20 major groups which occurred between 1961 and 1969. Over this period, the growth in value added and employment was greatest in transport equipment manufacturing and in the machinery group. The increases were also relatively high in miscellaneous products, metal fabricating and electrical products. It is interesting to note that most of the rapid-growth industries are producing durable goods, and that they also chalked up higher-than-average

productivity increases. Within the major groups, there tended to be wide variations in growth rates amongst the component industries and firms.

Section three examines the meaning, concepts and various measures of productivity.

Productivity is a relationship between the physical quantity of goods and services produced and the physical quantity of one or more of the resources utilized in turning out those goods and services. It can be measured in a number of ways, each of which has its own significance and use. There is no one "right" productivity measure to satisfy all needs.

The most important productivity concept is the so-called "labour productivity", which shows the amount of goods and services produced per unit of labour. This concept expresses the basic function of the economy, namely what people produce to satisfy their wants. Obviously, this productivity, expressed in the terms of output per person employed, is the basis of our standard of living. The more and the better goods and services Canadians produce per head, the more they have to contribute to the general well-being, including their quality of life. All private and social advances can only come from gains in output per person employed, including higher real earnings for labour, satisfactory returns to capital, expanded and improved public services, and lower prices for the consumer. The influence of productivity on costs and prices explains its critical importance in the fight against inflation and for improved competitiveness.

Labour productivity measures only show what variations exist in productivity but they do not indicate why these variations occur. Such variations in labour productivity are not due to more or less contribution by labour alone. Productivity is affected by a large variety of factors, such as the quality and effort of labour and management, the state and application of technology, the availability of capital, the scale of production, the degree of specialization as well as institutional and environmental factors.

Precise knowledge of these various factors is still very limited, and continuing detailed investigation is needed to assist the development of the most effective industrial strategies. It is, however, clear that the variety of sources of productivity increase suggests the need for policies on a broad front, some of which must be of a long-term nature while others have to deal with short-term problems.

In the long run, the rate of productivity increase is very stable, around 2 to 3 per cent per year. In the short run, however, the year-to-year changes in productivity vary considerably, usually ranging from 0 to 7 per cent. These occur mainly because of fluctuations in demand and production. Considering that higher levels of productivity are possible, as indicated, for instance, by the differences between Canadian and American productivity, it is logical to search for ways of closing the productivity gap.

The report shows that labour productivity and the so-called "total-factor productivity", i.e. the measure which relates production to labour

and capital inputs together, are highly and positively correlated, and that both tended to increase with the volume of output. The report also shows that productivity tended to be higher in the capital-intensive industries.

Contrary to what is often believed, the report shows that not only output but also employment tended to rise faster in those industries experiencing faster rates of increase in productivity.

It is a significant finding that those industries which recorded the highest productivity increases, showed relative reduction in labour and material costs, and recorded the smallest price increases. Some actually were able to reduce their prices.

For the 87 industries, as for the 20 major groups, there is a high overall correlation between productivity and average hourly earnings. Despite this correlation between levels of productivity and earnings, wage increases in the various industries showed remarkable similarity and were not significantly correlated with the productivity increases in the specific industries. At the overall national level, an almost perfect correlation exists between increases in productivity and increases in real earnings.

There was a wide variation in the rates of increase in productivity among industries over the 1960's. Motor vehicles and parts recorded the greatest increase, 99 per cent; the lowest, -11.9 per cent was in the fertilizer industry. Among those showing the highest increases were also distilleries, petroleum refineries, industrial chemicals and wineries. Those recording the lowest percentage improvements were planing mills, other clothing, sporting goods and toys, hosiery mills, leather products and fish products.

Compared with the United States, Canada's productivity growth was somewhat faster over the 1960's but, as labour remuneration increased at an even more rapid rate, unit labour costs in Canada rose more quickly.

Section four of the report examines in detail the structure of costs in Canadian manufacturing industries and the variations of cost components over the 1960's. The section pays particular attention to the relationships between output, productivity, wages and prices. Table 5 on page 50 shows the relative movements of productivity and prices in various industries, while the correlations between changes in different variables are presented on page 51.

In 1969, materials and components accounted for about 55 per cent of the total value of manufacturing output, fuel and electricity 2 per cent, wages and salaries (excluding fringe benefits) 24 per cent, capital costs 3 per cent, income tax 3 per cent and profits after taxes 4 per cent. The remaining 9 per cent is due to external services such as advertising, auditing, legal and consultant fees, maintenance, rent, insurance, royalties and patent fees, etc.

Compared with the United States, our productivity and wages are lower but the cost of machinery, capital and materials is higher.

In the fifth section, attempts were made to present comparable measures of profitability for the 20 major groups. Similar measures are presently being prepared for the 87 industries. The two measures used were operating profit over operating assets, and, operating profit over value added. There was some correlation between each of these measures, particularly the latter, and value added per employee.

The returns on assets (average 1966-68) were very low, except in printing, publishing and allied industries, food and beverages, and tobacco products. In terms of profit on value added, tobacco products, food and beverages, printing and publishing, and primary metals were the strongest (page 57).

Section six presents a preliminary analysis of the relative volumes of exports and imports, and their relative increases since 1964. Ratios are also shown of exports to total shipments and imports to domestic disappearance.

An attempt was made to relate the findings to the levels of productivity in the various industries. The report found a small positive correlation between productivity and exports. This correlation appears much stronger from further studies now under way, although the various forces at work in the international trade area are still far from clear.

In subsequent studies in this series, the Productivity Branch intends to focus attention on specific problem areas revealed in this report, and it will give particular care to the exploration of the behaviour of international productivity performance and its impact on competitiveness.

Productivity Branch,
Office of Economics.
        1972

# CANADIAN MANUFACTURING INDUSTRIES
## STRUCTURE AND PERFORMANCE
## WITH PARTICULAR REFERENCE TO PRODUCTIVITY

## TABLE OF CONTENTS

(1)  INTRODUCTION

The primary objective of this report is to provide a comprehensive

analysis of the structure, growth and performance of Canada's manufac-

turing industries during the past decade.

The information provided allows appraisal of the size and performance

of each of the 20 major groups and 87 industries into which the manufac-

turing sector has been statistically organized in the Corporation Financial

Statistics, and facilitates inter-industry comparisons and evaluations of

relative performance.  Such evaluations of past data allow one to identify

both the weak and strong industries, some of their problems, and provide

a framework for developing forecasts of the future growth or decline of

specific industries.

In order to provide a firm base for the comparative assessment of

the various Canadian manufacturing industries, and to assist in the deve-

lopment of the most effective industrial policies, the analysis examines

the relative standing of each of these industries at the latest point

of time for which all the necessary data are available as well as the

changes that have taken place over the past decade.

To enable the reader to weight the importance of the different industries

and industry groups, the next section of the report is concerned with their

absolute and relative sizes and their absolute growth over the past decade.

The emphasis is on output and employment.

The main thrust of the report is in the area of productivity which is

highlighted in the third section.  After an examination of the meaning and

significance of productivity, various types of productivity measures are des-

cribed.  Following that are analyses of productivity development in total

manufacturing as well as inter-industry comparisons of productivity levels and productivity growth. As the main emphasis in this report is on productivity, the subsequent chapters also endeavour to highlight any inter-relationships between productivity and other economic variables.

Section 4 examines the composition and relative importance of costs in manufacturing industries, changes over time in the elements of costs as well as their inter-relationships, and their relationship to changes in productivity and prices.

The fifth section examines conventional types of profitability measures which have been developed for the 87 industries and the 20 major groups in terms of 1966-68 averages. For the 20 major groups, it also presents two improved profitability measures which are considered to be more suitable and meaningful for the assessment of industrial performance.

Section 6 analyzes the relative volumes of exports and imports and their increases since 1964. The chapter is concluded with a preliminary examination of the relative trade performance of the industries and an attempt is also made to relate the findings to the levels of productivity in the various industries.

Most of the statistics used in this report are based on data obtained from Statistics Canada, namely from the Censuses of Manufactures and the Corporation Financial Statistics. Both of these sources follow the Standard Industrial Classification, but whereas the census data are given for some 140 three-digit-industry classes, the financial data are grouped into only 87 industries. Because of this, it has been necessary to combine the census data to correspond with the 87 classes used in the financial statistics. The data derived from Corporation Financial Statistics are not strictly comparable with establishment data from the census, because in the former source all establishments of a company are generally included in those industries in

which the greatest value was added to goods being produced or sold by the company. The annual Censuses of Manufactures gather data from establishments, i.e. statistical accounting units corresponding roughly to plants or mills. Statistical tests indicate, however, that the above differences between the sources used do not significantly distort the findings of the present analysis.

Export and import statistics are collected and published on the basis of a commodity classification. To enable comparisons with industrial data, they had to be re-classified to follow as closely as possible the Standard Industrial Classification. The basic trade data used in this report have been obtained from the Market Analysis Branch of the Office of Economics which undertook such a re-classification.

It should also be remembered of course that the statistics represent aggregates or averages, and that within each industry there may be great variations in performance between firms or commodities. The identification of weak performers in strong industries or strong performers in weak industries requires, of course, more detailed analyses.

Most of the statistical material examined in this report is available in the Statistical Handbook but some of the data and background information have been drawn from other studies of the Productivity Branch, namely (1) Comparative Tables of Principal Statistics and Ratios for Selected Manufacturing Industries, Canada and the United States, 1967, 1963 and 1958, (2) Indicators of Canadian Manufacturing Performance, 1966-68 Levels and 1961-70 Trend (20 major groups), and (3) a forthcoming report on The Impact of Effective Protection on Productivity in Canadian Manufacturing.

The present study attempts to take a new, integrated systems approach to the analysis of industrial performance, and it undoubtedly still has many shortcomings. It is hoped, however, that it will nevertheless contribute to a better understanding of Canadian manufacturing industries, and provide an improved base for more specific studies and the development of industrial strategy.

(2)  THE STRUCTURE AND GROWTH OF THE MANUFACTURING SECTOR

During the 'sixties, Canadian manufacturing industries accounted for roughly 25.5 percent of the gross domestic product at factor cost and about 24 percent of employment.  Food and beverages is the largest major group in manufacturing, accounting in 1969 for 17.9 percent of shipments, 14.1 percent of value added and 13.4 percent of employment.  The percentage contributions of each group are set out in table 1.  From this table it is possible to gauge quickly the relative size and importance of each group and to determine the overall pattern of manufacturing in Canada.  Over 50 percent of shipments and value added originate in only five of the twenty groups.  They also employ 45 percent of the labour force in manufacturing.  About 75 percent of shipments, value added and employment originate in the largest ten groups.  It can be seen from the table that there is an approximately equal split of employment between the durable and non-durable goods industries.  We have found in addition that the ten most capital intensive major groups employ about 55 percent of the manufacturing labour force.

In the Statistical Handbook, the same information is set out for the 87 individual industries.  The top ten in terms of value added are:

| Manufacturing Value Added in 1969 | |
|---|---|
| Industry | Percent |
| Motor vehicles and parts | 7.7 |
| Pulp and paper mills | 6.3 |
| Iron and steel mills | 3.9 |
| Other machinery | 3.6 |
| Smelting and refining | 3.5 |
| Sawmills | 2.9 |
| Other food products | 2.5 |
| Industrial chemicals | 2.3 |
| Commercial printing | 2.1 |
| Publishing and printing | 2.1 |
| Sub total | 36.9 |

Table 1       PERCENTAGES OF EMPLOYMENT, VALUE ADDED AND SHIPMENTS ACCOUNTED

FOR BY EACH OF THE MAJOR GROUPS IN MANUFACTURING IN 1969.

| Major Groups | Employment | | Value Added | | Shipments | |
|---|---|---|---|---|---|---|
| | Percentage | Cumulative | Percentage | Cumulative | Percentage | Cumulative |
| Food & beverages | 13.4 | 13.4 | 14.1 | 14.1 | 17.9 | 17.9 |
| Transportation equipment | 9.6 | 23.0 | 11.6 | 25.7 | 14.1 | 32.0 |
| Metal fabricating | 8.5 | 31.5 | 8.1 | 33.8 | 6.9 | 38.9 |
| Electrical products | 7.7 | 39.2 | 6.3 | 40.1 | 5.7 | 44.6 |
| **Paper & Allied** | 7.1 | 46.3 | 8.5 | 48.6 | 8.3 | 52.9 |
| Primary metals | 6.5 | 52.8 | 8.0 | 56.6 | 7.8 | 60.7 |
| Clothing | 6.0 | 58.8 | 3.2 | 59.8 | 2.9 | 63.6 |
| Wood products | 5.6 | 64.4 | 4.7 | 64.5 | 4.7 | 68.3 |
| Printing, publishing & allied | 5.1 | 69.5 | 4.9 | 69.4 | 3.2 | 71.5 |
| Machinery | 5.0 | 74.5 | 4.4 | 73.8 | 3.8 | 75.3 |
| Miscellaneous | 4.7 | 79.2 | 3.9 | 77.7 | 3.0 | 78.3 |
| Textiles | 4.6 | 83.8 | 3.7 | 81.4 | 3.7 | 82.0 |
| Chemicals & Chemical products | 4.5 | 88.3 | 6.9 | 88.3 | 5.6 | 87.6 |
| Non metallic mineral products | 3.0 | 91.3 | 3.7 | 92.0 | 2.8 | 90.4 |
| Furniture & fixtures | 2.7 | 94.0 | 1.9 | 93.9 | 1.6 | 92.0 |
| Leather products | 1.9 | 95.9 | 1.0 | 94.9 | .9 | 92.9 |
| Knitting mills | 1.5 | 97.4 | 0.9 | 95.8 | .9 | 93.8 |
| Rubber products | 1.4 | 98.8 | 1.6 | 97.4 | 1.4 | 95.2 |
| Tobacco products | .6 | 99.4 | 1.0 | 98.4 | 1.1 | 96.3 |
| Petroleum & coal products | .6 | 100.0 | 1.6 | 100.0 | 3.7 | 100.0 |

Of the remaining industries only three had 2.0 percent of the total value added each. Consequently, 15 percent of the 87 industries accounted for nearly 43 percent of the value added.

The growth which occurred in value added and employment over the period 1961 to 1969 in each of the twenty major groups is shown in table 2. These figures for value added reflect cost and price inflation as well as volume changes.

Transportation equipment marked up the greatest increase in value added over the period, and was also the source of 18 percent of the employment increase in manufacturing. It is unlikely that this group will be able to repeat this performance in the 'seventies. The other more rapidly expanding groups also tended to produce durable goods, in part to meet the new demands of the automobile industry. Six of the ten fastest growing groups were labour intensive relative to the other groups.

Employment rose fastest in machinery, transportation equipment, electrical products, miscellaneous products, and metal fabricating. Together they accounted for 61.5 percent of the total increase in employment. These industry groups also recorded high, or at least average, productivity increases. Declines in employment were experienced in petroleum and coal products, leather products and tobacco products. None of these however is a large employer of labour.

The growth which occurred in each of the 87 industries can be seen in section III of the Statistical Handbook. Within most major groups there were considerable differences among industries in the rates of growth experienced. This results from and emphasizes the differences which existed in their product mixes and market conditions. It also emphasizes the dangers associated with making inferences from aggregations of non-

Table 2

GROWTH IN VALUE ADDED AND EMPLOYMENT 1961 to 1969

IN THE TWENTY MAJOR GROUPS IN MANUFACTURING.

| Major Groups | Percentage Increase in Value Added | Percentage Increase in Employment | Absolute Change in Employment | Percentage of total increase in employment |
|---|---|---|---|---|
| Transportation equipment | 201.9 | 59.0 | 58,559 | 18.0 |
| Machinery | 148.0 | 63.9 | 31,798 | 9.8 |
| Miscellaneous | 136.0 | 46.2 | 24,481 | 7.5 |
| Wood products | 118.2 | 12.9 | 10,489 | 3.2 |
| Metal fabricating | 116.3 | 40.7 | 40,768 | 12.5 |
| Furniture & fixtures | 111.4 | 32.7 | 10,895 | 3.3 |
| Electrical products | 105.4 | 54.7 | 44,638 | 13.7 |
| Rubber products | 95.3 | 15.6 | 3,075 | .9 |
| Non metallic mineral products | 93.9 | 18.9 | 7,947 | 2.4 |
| Textiles | 92.2 | 18.8 | 11,919 | 3.7 |
| Primary metals | 83.4 | 23.2 | 20,284 | 6.2 |
| Chemicals & chemical products | 80.9 | 22.3 | 13,395 | 4.1 |
| Printing, publishing & allied | 72.4 | 12.6 | 9,463 | 2.9 |
| Knitting mills | 68.2 | 9.7 | 2,192 | .7 |
| Clothing | 68.1 | 6.2 | 5,805 | 1.8 |
| Food & beverages | 65.5 | 5.9 | 12,351 | 3.8 |
| Paper & allied | 60.0 | 23.5 | 22,084 | 6.8 |
| Tobacco products | 59.0 | -3.3 | -343 | -0.1 |
| Leather products | 47.6 | -6.3 | -2,083 | -0.6 |
| Petroleum & coal products | 9.5 | -15.7 | -1.812 | -0.6 |
| Total | 93.0 | 24.7 | 325,905 | 100.0 |

homogeneous data. The table below indicates the size of such differences

by showing the highest and lowest percentage increases in employment within

each major group.

### Percentage Increases in Employment, 1961 to 1969.

| Industrial Group | Lowest | Highest |
|---|---|---|
| Food and beverages | - 6.7 | 43.9 |
| Tobacco products (one only) | 3.3 | 3.3 |
| Rubber products ( " " ) | 15.6 | 15.6 |
| Leather products ( " " ) | - 6.3 | - 6.3 |
| Textiles | -16.0 | 55.5 |
| Knitting mills | - 7.7 | 21.1 |
| Clothing | -25.1 | 19.0 |
| Wood products | - 8.0 | 25.2 |
| Furniture and fixtures | 24.6 | 59.0 |
| Paper and allied | 18.2 | 48.6 |
| Printing, publishing & allied | 5.1 | 29.8 |
| Primary metals | 16.8 | 41.6 |
| Metal fabricating | - 1.5 | 87.1 |
| Machinery | 19.9 | 75.1 |
| Transportation equipment | 19.1 | 179.6 |
| Electrical products | 3.1 | 103.9 |
| Non-metallic mineral products | 1.1 | 77.4 |
| Petroleum and coal products | -16.0 | - 8.4 |
| Chemicals and chemical products | 3.2 | 55.9 |
| Miscellaneous products | - 4.6 | 63.6 |

During the period, 1961 to 1969, employment declined in 14 of the

87 industries, almost exclusively in non-durable manufactures. They are

listed below together with the percentage of total employment which each

accounted for in 1969.

## Industries in which Employment Declined

| Industries | Percentage Decrease | Percentage of Total Employment |
|---|---|---|
| Dairy products | 6.7 | 1.9 |
| Bakery products | 1.4 | 2.3 |
| Breweries | 3.0 | .6 |
| Tobacco products | 3.3 | .6 |
| Leather products | 6.3 | 1.9 |
| Cotton & woollen mills | 16.0 | 1.3 |
| Hosiery mills | 7.7 | .5 |
| Fur goods | 24.3 | .2 |
| Other clothing | 25.1 | .7 |
| Coffins & caskets | 8.0 | .1 |
| Heating equipment | 1.5 | .3 |
| Petroleum refineries | 16.0 | .6 |
| Other petroleum & coal products | 8.4 | .0 |
| Broom, brush & mop | 4.6 | .1 |

In three of these industries, Fur goods, Other clothing and Leather products, employment declined mainly because output also declined, while the others recorded slow output growth.

Of the remaining 73 industries, which experienced increases in employment over the period, 14 had increases of over 50 percent between 1961 and 1969. These are listed below.

## Industries with the Fastest Growth in Employment

| Industries | Percentage Increase | Percentage of Total Employment |
|---|---|---|
| Other textile products | 55.5 | 1.0 |
| Office furniture | 59.0 | .3 |
| Boiler and plate works | 59.1 | .5 |
| Hardware and tools | 57.7 | .9 |
| Machine shops | 87.1 | .9 |
| Commercial refrigeration | 75.1 | .2 |
| Other machinery | 75.1 | 4.0 |
| Motor vehicles & parts | 82.3 | 5.1 |
| Truck bodies | 179.6 | .6 |
| Communications equipment | 103.9 | 3.0 |
| Industrial electrical equipment | 53.6 | 1.5 |
| Ready-mix concrete | 77.4 | .4 |
| Toilet preparations | 55.9 | .3 |
| Other manufacturing | 63.6 | 2.4 |

It is interesting to note that most of these industries are producing durable goods and that they also chalked up high or at least average productivity increases.

This section, in combination with the Statistical Handbook, indicates the relative volumes of output and employment generated by each industry and group. They also show which ones have been growing and which ones have been contracting over the period. Such figures provide an initial evaluation of the past performance of the different industries and, if recent trends continue, where growth is likely to occur in the future. Of course the simple extrapolation of past trends is no substitute for forecasting, which invariably requires an expert knowledge of the specifics involved, but it does help one to obtain a quantitative feel for prospective developments. For example, we could assume that during the 'seventies, each industry grows or contracts at the same rate as in the 'sixties, and then examine what this means in terms of increased output, employment, etc. Such projections could then be modified to take into account structural and other changes, such as a shift in the rate of growth of the automobile industry.

Changes in output and employment reflect and influence changes in the conditions of supply and demand. In the following sections, attention will be directed to these underlying forces and how they interact. We will be particularly concerned with the measurement of productivity and the way in which productivity differences and development influence the growth and structure of industry.

## (3)  PRODUCTIVITY

### A.  Meaning, Significance and Determinants of Productivity.

"Productivity" is often loosely defined and frequently misunderstood or misinterpreted.  It seems, however, that its tremendous economic and social importance is becoming more widely recognized.  Two questions are frequently asked about productivity: "Exactly what is it?", and "Which is the right productivity measure to use?".  The following remarks will attempt to answer these questions.

Productivity is a concept and a measure of relationship.  It expresses the relation between the quantity of goods and services produced and the quantity of one or more of the resources utilized in turning out those goods and services.  Usually, it is expressed in a ratio form.  For example, the number of bushels of wheat per acre, the number of tons of aluminum per kilowatt-hour of energy used, or the tons of cement produced per man-hour are all measures of productivity.  Each of these ratios measures performance, and indicates how effectively the resources utilized are converted into goods and services.

Productivity can be measured in a number of ways, each of which has its own significance and use.  For some purposes a combination of such measures might be the most appropriate.

The basic and most important productivity concept is labour productivity, which shows the amount of goods and services produced per unit of labour. This concept expresses what the economy is all about, namely people producing the goods and services which they need to satisfy their wants.  Obviously, this productivity, expressed in the terms of output per person employed, is the basis of our standard of living.  The more goods and services Canadians produce per head, the more they have to contribute to the general well-being. It is also worth noting that not only material wealth but also many, if not

most aspects of the quality of life have to be produced, and are, therefore, also reflected in the productivity ratios. It is clear that all private and social advances can only come from gains in output per person employed, including higher earnings for labour, satisfactory returns to capital (which is needed to assure further investment), expanded and better public services, and lower prices for the consumer. In order to progress towards meeting the expectations of individuals as well as society as a whole, the advancement of productivity is therefore of vital importance.

From the point of view of a firm or industry, a relatively high level of productivity generally allows it to pay higher returns to its factors of production, and to charge lower prices than its less productive competitors. This advantage helps it to compete successfully and to attract capital and labour into its employ. Over time those firms or industries which are able to raise their productivity relatively fast also strengthen their competitive position. The subsequent analyses in the report examine in depth these general observations.

It is very important to note that output per person employed or other labour productivity measures in themselves only show what variations there are in the productivity of different firms, different industries or different countries, and do not indicate why these variations and changes occur. Such variations in labour productivity are not due to more or less contribution by labour alone. Productivity is affected by a large variety of factors, a few of which are mentioned below.

Obviously, the quality of labour is a major contributary factor; it reflects elements such as the health, energy, willingness, motivation, knowledge, skill, training, adaptability and mobility of the worker.

Another very important factor is management. It is responsible for the efficient acquisition and combination of the productive resources, for

recognizing and taking advantage of innovation and other possibilities of progress. The efficiency of management accounts for a large part of productivity variations. Even in the field of technological progress, experts who have extensively studied the factors that influence technological progress, emphasize the overriding importance of the management of technology.

It is hardly necessary to underline that it is not only the contribution of labour and management separately that has a great bearing on productivity but also the quality of labour-management relations.

It is obvious that the amount, quality, type, age and capacity of capital equipment are also important determinants of productivity.

The level and advance of technology have, of course, a major influence on productivity. In this context, technology does not only include scientific research as such but also, and perhaps primarily, the application of existing modern methods and tools in both production and distribution, through the innovative process.

The scale of production is another major determinant of productivity. In most industries, however, it is the degree of specialization, variety reduction, standardization and the length of production runs that result in greater productivity rather than the size of plant as measured by the number of its employees.

The quality of raw materials, components and outside services, as well as the efficiency with which they are used, are also important factors of productivity.

Environmental factors are another important group of matters that affect productivity. These would include the relative abundance of natural resources; industrial location in relation to markets; the size of accessible markets; the legislative framework, including industrial and trade policies, monetary and fiscal policies, labour and educational policies, and so on.

Precise knowledge of the relative influence of these various factors on productivity is still very limited, and continuing detailed investigation will assist the development of the most effective industrial strategies. It is, however, clear that the many sources of productivity increase suggest the need for policies on a broad front. It is also clear that while most of the factors are of a long-term nature, such as education, training, capital formation and technological change, other determinants are subject to short-term variations, such as those which affect capacity utilization. It would seem logical that complementary policies may be required to influence the long-term and short-term productivity determinants.

In the long run the rate of productivity increase is very stable, around 2 to 3 percent per year. In the short run, however, the year-to-year changes in productivity vary considerably, usually ranging from 0 to 7 percent. These occur mainly because of fluctuations in demand and production.

The observed long-term stability of the rate of productivity growth suggests that it cannot be speeded up suddenly. Considering however, that higher levels of productivity are possible, as indicated by the differences between Canadian and American productivity, it is logical to search for means of closing this productivity gap.

## B. Concepts and Measures of Productivity

It has been mentioned earlier that productivity is the relationship between production and the resources utilized in achieving it; that it is measured in real, physical units, and presented in a ratio form; and that there is no "right" productivity measure for all purposes but, different measures can be calculated for specific purposes by altering the numerator and/or the denominator of the ratio.

In the numerator we can use either gross output, i.e. total production, or net output. The latter shows the contribution of the industry, firm or plant to total production exclusive of the resources provided by other industries or firms, such as materials, fuel and electricity and service inputs. These services include such matters as maintenance and repairs performed by outsiders, a variety of consultant services, advertising, telephone and telegraph services, insurance, royalties, licence and patent fees, etc. At industry and establishment levels, data for purchased services are usually not available, and, value added is used as an approximation of net output. Value added is gross output less materials, fuel and electricity used. Usually, this statistical shortcoming does not overly distort the productivity measures when they show changes which have occurred over time within an industrial group. However, when inter-industry comparisons are made of productivity levels the possible significance of such purchased services should be taken into consideration.

Each plant, industry or sector produces many different products and these must be added up by the use of proper weights. In theory, the weights should be chosen to suit the productivity ratio in question. For instance, the proper weights for combining the various products in the numerator of the output per man-hour ratios would be unit man-hour requirements, that is the labour time required for the production of each unit of output. In

practical measurement this is hardly ever possible and unit-value or unit-value-added weights are used for combining the various elements of the numerator. For the purpose of measuring productivity changes over time the most common weight is based on unit value.

This means that although the intention is to measure physical output or changes in physical output, the value weights will reflect the relative valuation of the various output components by society. Quality changes will be reflected in as much as they are incorporated in the values after allowance for inflationary price changes.

The output shown in the numerator of the productivity ratios can be related to a wide variety of inputs, i.e. resources used, or a combination of inputs in the denominator. The most commonly used inputs are labour time, capital or a combination of both. Other important productivity ratios include output per unit of material used and output per unit of power. Each of these ratios reflects the combined effect of a variety of interrelated influences on the use of the factor in question in the production process. But none of the ratios should be interpreted to measure the specific contribution of that factor in the production process.

Labour productivity measures show, for instance, the overall fruitfulness of human labour under different circumstances but do not vary in relation to the quality and efforts of labour alone.

Long-term measures which have been prepared for the United States are a general indication of the relative importance of the primary factors. Over the past eighty years, the whole economy, excluding the government sector, showed an annual growth rate of close to $2\frac{1}{2}$ percent in output per man-hour. Improvements in the quality of labour have been estimated to account for some 0.5 percentage points, the increased amount of capital equipment for another 0.5 points,

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while other factors, including the efficiency in combining the resources, brought about the residual of 1.5 points.

In view of its significance to the standard of living, output per person employed is one of the most used productivity measures. The denominator usually includes all persons employed in the production process including wage and salary earners as well as employers and own-account workers. Since, however, the work-week varies from industry to industry and particularly over time, output per man-hour ratios are also calculated to eliminate the impact of variations in work time. The denominator may include the number of hours worked or the number of hours paid. Since productivity is basically a technical measure the hours-worked denominator is usually preferable, although the hours-paid figure might be chosen to suit certain purposes, for instance, for comparisons with wage rates. As the hours worked per week or per year by salaried employees is often not known, it is sometimes necessary to relate output to man-hours of production workers only.

Output can also be related to the amount of capital used in the production process. Just as in the case of labour productivity, output per capital input does not indicate either the changes in efficiency of capital as such but shows that more or less capital is being used per unit of output or alternatively whether more or less output is produced per unit of capital. Historically, the output-capital ratio has risen less than the output-labour ratio, simply because the capital-labour ratio has been rising. It will be seen later that capital productivity tends to be inversely correlated with labour productivity.

The so-called total or total-factor productivity is another important productivity measure. It divides the measure of output by a combination of labour and capital inputs. In cross-sectional studies of productivity, this is usually achieved by converting the capital input into an equivalent value

of labour input. In trend studies, the most common technique is to express each of the labour and capital inputs in volume indexes and then to combine them together with base-year weights. The significance of this combined measure is that it takes into account the varying amounts of capital as well as labour.

For both theoretical and practical reasons, the more comprehensive and technically simpler labour productivity measures are in most cases preferable, at least as a starting point for further analysis. Since in our production process labour input far outweighs capital input, labour productivity and total productivity measures are closely correlated. It will be seen later in this report that rankings of industries by the two types of productivity measures were significantly different for only a handful of highly capital-intensive industries.

Depending on the purpose of the specific measure, both the capital productivity measure and the total productivity measure may include fixed capital only, total tangible capital, or both tangible and intangible capital such as the education and training of the work force. These latter measures pose, however, many difficult measurement problems. For instance, the education of the work force is often measurable only by the level of earnings of the workers, and this method has at least two major shortcomings. First, earnings reflect various qualities and conditions, for instance innate ability as well as education. Second, the level of earnings is at least partially determined by the productivity of the economic unit. Its inclusion into the productivity measure introduces, therefore, a feed-back bias.

While the various productivity measures may answer specific questions, two or more of them in combination with other economic indicators give us a better insight into the operation of our industries. In their analysis, it should be kept in mind that the overall productivity increase is not a simple

total of the productivity increases of the various factors but that a
significant part of it is the result of the interaction of the various
factors. It is also noteworthy that while productivity is likely to grow
in individual industries, the overall productivity is also increased by a
shift of resources from lower-productivity to higher-productivity industries.
This implies that productivity can be increased by assisting individual firms
or industries to increase their productivity and also by helping resources
to shift from lower-productivity to higher-productivity uses.

In conclusion, it should be noted that while productivity measures are
very important and useful, they are indicators rather than precise measures.
They must be constructed carefully because they are ratios and any errors in
the components might be cumulative. They still have numerous statistical
limitations which require a great deal more study, analysis and improvement,
but even with our present knowledge, productivity measures help us consi-
derably in understanding the working of our economy. Some of these measures
are examined in the following pages  to throw light on the development and
performance of Canadian manufacturing industries.

## C. Productivity Growth in Total Manufacturing

Statistics Canada prepares several aggregate productivity indexes, including one for manufacturing as a whole. They are useful for tracing and comparing rates of increase but provide little knowledge about the sources and processes of productivity growth. Two series for manufacturing and the commercial nonagricultural sector are given below for the period 1961 to 1970.

### Productivity Growth in Canada

#### 1961 to 1970

| Year | Manufacturing | | Commercial nonagricultural Industries | |
|------|---------------|--------------|---------------|--------------|
| | Output per man-hour | Output per person employed | Output per man-hour | Output per person employed |
| 1961 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1962 | 105.0 | 106.1 | 103.0 | 103.2 |
| 1963 | 108.9 | 110.4 | 106.5 | 106.2 |
| 1964 | 113.7 | 115.8 | 110.4 | 110.0 |
| 1965 | 117.9 | 119.9 | 112.9 | 112.1 |
| 1966 | 121.5 | 122.7 | 116.2 | 114.0 |
| 1967 | 124.8 | 125.2 | 118.9 | 116.2 |
| 1968 | 133.1 | 133.4 | 125.5 | 121.2 |
| 1969 | 137.8 | 135.6 | 127.5 | 121.4 |
| 1970 | 139.6 | 136.7 | 131.1 | 123.5 |

The growth of productivity in manufacturing has, therefore, compared favourably with that of the total commercial nonagricultural sector, both in terms of output per man-hour and output per person employed.

During the past decade, the productivity performance of Canadian manufacturing has also risen faster than that of the United States, although in absolute terms productivity in United States manufacturing still seems to be about one-quarter higher than in Canada.

The following table shows the respective changes of productivity, average hourly earnings and unit payroll costs in the two countries.

INDEXES OF OUTPUT PER MAN-HOUR, AVERAGE HOURLY EARNINGS AND

UNIT PAYROLL COSTS IN MANUFACTURING, 1961-1970, CANADA & UNITED STATES

| Year | Output per Man-hour | | Ave. Hourly Earnings[1] | | Unit Payroll Cost[1] | |
|---|---|---|---|---|---|---|
| | Canada | U.S. | Canada | U.S. | Canada | U.S. |
| 1961 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1962 | 105.0 | 105.9 | 102.7 | 103.0 | 97.8 | 97.3 |
| 1963 | 108.9 | 110.2 | 106.6 | 106.0 | 97.9 | 96.2 |
| 1964 | 113.7 | 115.6 | 110.4 | 109.1 | 97.1 | 94.4 |
| 1965 | 117.9 | 120.3 | 115.8 | 112.5 | 98.2 | 93.5 |
| 1966 | 121.5 | 122.2 | 123.0 | 117.2 | 101.2 | 95.9 |
| 1967 | 124.8 | 122.3 | 131.1 | 122.0 | 105.0 | 99.8 |
| 1968 | 133.1 | 128.1 | 141.0 | 129.7 | 105.9 | 101.2 |
| 1969 | 137.8 | 130.8 | 152.5 | 137.5 | 110.7 | 105.1 |
| 1970 | 139.6 | 132.3 | 164.5 | 144.8 | 117.8 | 109.4 |

(1) In local currencies.

From the above data it is evident that average hourly earnings have also risen more rapidly in Canada than in the United States, 64.5 percent and 44.8 percent respectively. As a result, unit payroll costs have risen faster in Canada than in the United States.

International productivity comparisons with countries other than the United States are extremely hazardous because of conceptual and statistical differences. It seems that the most promising avenue towards producing such data lies in the co-operative development of bilaterally comparable statistical series. Various attempts have been made on a multilateral basis but, in view of the present statistical difficulties, all that can be concluded from these figures with reasonable confidence, is that Japan and the advanced European countries reported considerably more rapid productivity increases during the past decade than Canadian manufacturing. This finding, in itself, is however, sufficient warning to Canadian industry that further productivity improvements are necessary in order to strengthen our international competitive positions.

## D. Inter Industry Comparisons of Productivity Levels

This section measures and analyzes the levels of productivity in Canadian manufacturing both for the 20 major groups and a breakdown into 87 industries. The data from which these measures were calculated are available in a complete form only up to 1968. As productivity may be influenced substantially by erratic and short-period changes in output and employment, averages for the three years, 1966 to 1968, have been used rather than the data for only one year. Two measures of productivity have been calculated: (1) the value-added per employee and (2) the value-added per employee plus the employee equivalent of the estimated fixed capital used up in production in the respective industry. As value-added is available at present only in current prices, the three year average gives in consequence of inflation a higher weight to the later years. As an input, labour is considered to be homogeneous. That is, no consideration is given to the different amounts of capital embodied in labour as manifested in their different functions and skills. This, however, is desirable in this analysis where we are concerned among other things to identify high-income generating industries. The productivity measure which includes fixed capital as an input as well as labour is much less accurate than the simple labour productivity measure. This is so because capital stock figures on an establishment basis are not available and it has been necessary for us to prepare estimates, using a number of assumptions, with the result that in some industries the capital input figure may be significantly different from the unknown actual figure. In short, the capital stock figures were obtained on a depreciated basis in current prices from "Fixed Capital Flows and Stocks in Manufacturing" for the twenty major groups in manufacturing, and we distributed these figures among the 87 component industries in proportion to the fixed capital which was

recorded against them in the other Statistics Canada publication "Corporation Financial Statistics". Having obtained an approximate indication of the capital stocks, it was then assumed that an industry's capital input during the year was equivalent to 10 percent of its capital stock. Our use of the net capital stock may understate the actual capital consumption, but the use of 10 percent is more likely to err on the high rather than the low side. The main weakness of the estimates perhaps is the application of a common percentage to all industries, but this is unavoidable at present because of the lack of data and analysis in this area. Once having derived the estimated capital inputs it was necessary to convert them in some way into labour units so that they could be combined with the pure labour inputs. This was done, after running several tests, by assuming that a man-year equivalent of capital equals in amount the average annual wages and salaries in the machinery group plus 20 per cent of the difference between average yearly earnings of the machinery and transportation equipment groups to allow for mobile capital equipment produced by the latter. As approximate as the final composite measures of productivity may be, they indicate how capital intensity affects the relative levels of productivity and narrows the range between the top and bottom levels.

From the following table it can be seen for the twenty major groups that petroleum and coal products have the highest level of value added per employee, $19,595, and that the clothing industries, with $5,812, have the lowest. When the labour equivalent of the fixed capital inputs are added into the calculation, tobacco products becomes the leader with a level of $14,605 but the clothing industries remain bottom with $5,711. Petroleum and coal products, with $8,968, fell to twelfth place. Despite the considerable drop in the top level, the range remains significant and indicates that although over time the less productive firms and industries may be

forced out of operation by their inability to meet rising costs, at any one time and for no doubt a significant length of time there is a considerable range of productivity levels in which they may continue to operate. Further analysis of the two measures of productivity for the twenty major groups shows that although the addition of capital into the calculations alters the ranking for a number of groups, particularly petroleum and coal products and paper and allied products, the two rankings are highly correlated. It can also be seen that although the groups with the highest productivity levels are in the non-durable goods sector, on average the level of productivity is over 9 percent greater in durable goods than in non-durable goods.

The table also contains figures for the value added per man year equivalent of fixed capital, a measure of capital intensity (the current value of net fixed capital stock per employee), and average wages and salaries. The rankings of the several variables which are shown have been correlated as follows:

| Variables[1] | | | Rank Correlation Coefficients |
|---|---|---|---|
| $\frac{\text{Value Added}}{\text{Employees}}$ | and | $\frac{\text{Value Added}}{\text{Fixed Capital}}$ | -0.678 |
| " | and | $\frac{\text{Value Added}}{\text{Employees \& Fixed Capital}}$ | +0.805 |
| " | and | $\frac{\text{Wages \& Salaries}}{\text{Employees}}$ | +0.872 |
| $\frac{\text{Value Added}}{\text{Employees \& Fixed Capital}}$ | and | $\frac{\text{Wages \& Salaries}}{\text{Employees}}$ | +0.630 |
| $\frac{\text{Net Fixed Capital Stock}}{\text{Employees}}$ | and | $\frac{\text{Value Added}}{\text{Fixed Capital}}$ | -0.962 |
| " | and | $\frac{\text{Value Added}}{\text{Employees \& Fixed Capital}}$ | +0.471 ✻ |
| " | and | $\frac{\text{Wages \& Salaries}}{\text{Employees}}$ | +0.717 |

1. Definitions of the variables are contained in the preceding text.
✻ Not statistically significant at the 1% level.

These correlations indicate, at least for the period covered that

(1) The addition of fixed capital to the inputs does not alter the labour productivity rankings considerably;

(2) The measures of labour productivity and capital productivity are inversely related;

(3) Average wages and salaries are highly and positively related to labour productivity;

(4) Average wages and salaries are highly and positively related to capital intensity.

(5) The productivity of capital is closely but inversely related to capital intensity;

The productivity estimates for the 87 manufacturing industries are more useful than those for the 20 major groups simply because they represent more narrowly defined aggregates; each contains fewer, more comparable products than those consolidated in the broader measures and they provide therefore a more precise indication of the level of productivity. The need for the finer breakdown is substantiated by the great differences in productivity which are observable between industries in the same major group. For example, to take the largest difference, in food and beverages, distilleries have a value-added per employee of $36,042 whereas fish products have a level of $5,500. Other groups in which there are substantial differences between industries in the ratio of value-added to both labour and capital are chemicals and chemical products, transportation equipment, and pulp and paper.

Table 3         ESTIMATES OF PRODUCTIVITY, CAPITAL INTENSITY AND AVERAGE WAGES & SALARIES

FOR THE 20 MAJOR GROUPS IN MANUFACTURING

ANNUAL AVERAGES 1966 TO 1968

| Groups | (1) Value Added per Employee | | (2) Value Added per Man-Year Equivalent of Fixed Capital (X) | | (3) Value Added per Employee and Fixed Capital combined (X) | | (4) Current Value of Net Fixed Capital Stock per Employee | | (5) Average Wages & Salaries | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $ | Rank | $ | Rank | $ | Rank | $ | Rank | $ | Rank |
| Food & Beverages | 11,597 | 10 | 63,290 | 14 | 9,801 | 7 | 11,862 | 6 | 4,996 | 15 |
| Tobacco Products | 17,008 | 3 | 103,178 | 8 | 14,605 | 1 | 10,656 | 8 | 5,731 | 11 |
| Rubber Products | 11,807 | 9 | 82,395 | 12 | 10,327 | 5 | 9,276 | 10 | 5,778 | 10 |
| Leather Products | 5,987 | 19 | 164,970 | 2 | 5,776 | 19 | 2,354 | 19 | 3,875 | 18 |
| Textiles | 8,159 | 16 | 45,897 | 15 | 6,928 | 17 | 11,503 | 7 | 4,675 | 16 |
| Knitting Mills | 6,513 | 18 | 108,535 | 7 | 6,146 | 18 | 3,894 | 16 | 3,732 | 19 |
| Clothing | 5,812 | 20 | 327,950 | 1 | 5,711 | 20 | 1,146 | 20 | 3,643 | 20 |
| Wood Products | 8,708 | 15 | 70,426 | 13 | 7,750 | 15 | 8,001 | 11 | 5,038 | 13 |
| Furniture & Fixtures | 7,736 | 17 | 162,754 | 3 | 7,384 | 16 | 3,065 | 18 | 4,613 | 17 |
| Paper & Allied | 12,567 | 7 | 28,292 | 19 | 8,702 | 14 | 28,748 | 2 | 6,636 | 4 |
| Printing & Publishing | 10,529 | 12 | 85,571 | 10 | 9,376 | 9 | 7,965 | 12 | 5,994 | 7 |
| Primary Metals | 12,833 | 6 | 32,247 | 18 | 9,180 | 10 | 25,759 | 4 | 6,698 | 3 |
| Metal Fabricating | 10,646 | 11 | 100,730 | 9 | 9,628 | 8 | 6,841 | 13 | 5,895 | 9 |
| Machinery | 12,555 | 8 | 134,549 | 5 | 11,483 | 4 | 6,045 | 14 | 6,409 | 6 |
| Transportation Equipment | 13,673 | 4 | 84,179 | 11 | 11,763 | 3 | 10,517 | 9 | 6,728 | 2 |
| Electrical Products | 9,917 | 13 | 118,751 | 6 | 9,152 | 11 | 5,402 | 15 | 5,679 | 12 |
| Non-Metallic Mineral Products | 12,904 | 5 | 41,719 | 16 | 9,856 | 6 | 20,025 | 5 | 5,908 | 8 |
| Petroleum & Coal Products | 19,595 | 1 | 16,535 | 20 | 8,968 | 12 | 76,704 | 1 | 8,286 | 1 |
| Chemicals & Chemical Products | 17,088 | 2 | 40,237 | 17 | 11,994 | 2 | 27,482 | 3 | 6,554 | 5 |
| Miscellaneous | 9,496 | 14 | 158,901 | 4 | 8,960 | 13 | 3,869 | 17 | 5,014 | 14 |
| All Manufacturing | 11,089 | | 58,343 | | 9,318 | | 12,303 | | 5,637 | |

(X) All fixed capital measures are net of depreciation.

## Table 4

ESTIMATES OF PRODUCTIVITY IN 87 SELECTED MANUFACTURING INDUSTRIES, CANADA, 1966-68 AVERAGES

| INDUSTRY (OR GROUP) | TOTAL VALUE ADDED PER EMPLOYEE | | TOTAL VALUE ADDED LABOUR + CAPITAL (x) | |
|---|---|---|---|---|
| | Dollars | Rank | Dollars | Rank |
| Distilleries | 36,042 | 1 | 23,221 | 1 |
| Petroleum Refining | 31,443 | 2 | 10,743 | 23 |
| Cement Manufacturers | 26,871 | 3 | 8,867 | 49 |
| Breweries | 26,235 | 4 | 18,327 | 3 |
| Soap and Cleaning Compounds | 22,694 | 5 | 18,521 | 2 |
| Industrial Chemicals | 21,883 | 6 | 11,883 | 11 |
| Wineries | 19,448 | 7 | 11,576 | 14 |
| Other Petroleum and Coal Products | 17,818 | 8 | 13,706 | 9 |
| Motor Vehicles and Parts | 17,405 | 9 | 14,220 | 7 |
| Toilet Preparations | 17,079 | 10 | 15,255 | 4 |
| Pharmaceuticals | 17,022 | 11 | 14,562 | 6 |
| Tobacco Products | 17,013 | 12 | 14,608 | 5 |
| Other Chemicals | 15,875 | 13 | 10,912 | 20 |
| Ready-Mix Concrete | 15,009 | 14 | 11,668 | 12 |
| Other Food Products | 14,969 | 15 | 11,501 | 16 |
| Pulp and Paper Mills | 14,726 | 16 | 8,863 | 50 |
| Publishing Only | 14,681 | 17 | 13,785 | 8 |
| Iron and Steel Mills | 14,375 | 18 | 10,107 | 30 |
| Grain Mills | 14,268 | 19 | 11,660 | 13 |
| Other Non-Metallic Mineral Products | 13,645 | 20 | 11,351 | 18 |
| Fertilizers | 13,492 | 21 | 7,594 | 70 |
| Paint and Varnish | 13,363 | 22 | 11,397 | 17 |
| Other Machinery | 13,067 | 23 | 11,898 | 10 |
| Smelting and Refining | 13,005 | 24 | 8,796 | 51 |
| Rubber Products | 12,545 | 25 | 10,883 | 21 |
| Battery Manufacturers | 12,431 | 26 | 11,570 | 15 |
| Structural Steel | 11,918 | 27 | 10,325 | 27 |
| Soft Drinks | 11,809 | 28 | 9,859 | 31 |
| Concrete Manufacturing | 11,676 | 29 | 10,154 | 29 |
| Miscellaneous Electrical Equipment | 11,607 | 30 | 10,708 | 24 |
| Small Electrical Appliances | 11,578 | 31 | 11,048 | 19 |
| Radio and T.V. Receivers | 11,478 | 32 | 10,787 | 22 |
| Other Paper Products | 11,401 | 33 | 10,322 | 28 |
| Metal Stamping | 11,394 | 34 | 9,758 | 35 |
| Publishing and Printing | 11,195 | 35 | 9,735 | 36 |

| INDUSTRY (OR GROUP) | TOTAL VALUE ADDED PER EMPLOYEE | | TOTAL VALUE ADDED LABOUR + CAPITAL (x) | |
|---|---|---|---|---|
| | Dollars | Rank | Dollars | Rank |
| Commercial Refrigeration | 11,039 | 36 | 10,551 | 25 |
| Boiler and Plate Works | 11,007 | 37 | 10,517 | 26 |
| Industrial Electrical Equipment | 10,744 | 38 | 9,369 | 41 |
| Hardware and Tools | 10,710 | 39 | 9,857 | 33 |
| Wire and Wire Products | 10,681 | 40 | 9,770 | 34 |
| Heating Equipment | 10,634 | 41 | 9,685 | 37 |
| Agricultural Implements | 10,431 | 42 | 9,587 | 39 |
| Fruit and Vegetable Canners | 10,417 | 43 | 8,991 | 47 |
| Dairy Products | 10,395 | 44 | 9,122 | 44 |
| Scientific and Professional Equipment | 10,393 | 45 | 9,672 | 38 |
| Glass and Glass Products | 10,361 | 46 | 9,104 | 45 |
| Major Electrical Appliances | 10,336 | 47 | 9,858 | 32 |
| Miscellaneous Metal Products | 10,262 | 48 | 9,502 | 40 |
| Meat Products | 9,781 | 49 | 8,773 | 53 |
| Miscellaneous Transport Equipment | 9,754 | 50 | 8,940 | 48 |
| Aircraft and Parts | 9,664 | 51 | 8,783 | 52 |
| Ornamental Iron Works | 9,633 | 52 | 9,165 | 43 |
| Commercial Printing | 9,551 | 53 | 8,546 | 58 |
| Engraving and Allied Industries | 9,522 | 54 | 9,018 | 46 |
| Fur Goods | 9,472 | 55 | 9,190 | 42 |
| Other Manufacturing | 9,430 | 56 | 8,722 | 54 |
| Paper Boxes and Bags | 9,361 | 57 | 8,647 | 55 |
| Sawmills | 9,359 | 58 | 8,126 | 65 |
| Iron Foundries | 9,325 | 59 | 8,646 | 56 |
| Truck Bodies | 9,301 | 60 | 8,478 | 61 |
| Clay Products | 9,256 | 61 | 8,433 | 62 |
| Synthetic Textiles | 9,191 | 62 | 6,495 | 78 |
| Machine Shops | 9,095 | 63 | 8,534 | 59 |
| Communication Equipment | 9,078 | 64 | 8,340 | 63 |
| Office Furniture | 9,070 | 65 | 8,628 | 57 |
| Other Primary Textiles | 8,858 | 66 | 8,135 | 64 |
| Jewellery and Silverware | 8,725 | 67 | 8,524 | 60 |
| Other Textile Products | 8,373 | 68 | 7,842 | 67 |
| Broom, Brush and Mop | 8,273 | 69 | 7,991 | 66 |
| Veneer and Plywood | 8,267 | 70 | 7,251 | 74 |
| Miscellaneous Wood Products | 8,204 | 71 | 7,389 | 72 |
| Other Furniture | 8,190 | 72 | 7,790 | 68 |

| INDUSTRY (OR GROUP) | TOTAL VALUE ADDED PER EMPLOYEE | | TOTAL VALUE ADDED LABOUR + CAPITAL (x) | |
|---|---|---|---|---|
| | Dollars | Rank | Dollars | Rank |
| Planing Mills | 8,189 | 73 | 7,764 | 69 |
| Bakery Products | 7,945 | 74 | 7,271 | 73 |
| Sporting Goods and Toys | 7,843 | 75 | 7,523 | 71 |
| Household Furniture | 7,298 | 76 | 6,985 | 75 |
| Cotton and Woollen Mills | 7,255 | 77 | 6,550 | 77 |
| Wooden Boxes | 7,134 | 78 | 6,835 | 76 |
| Other Knitting Mills | 6,714 | 79 | 6,345 | 79 |
| Hosiery Mills | 6,536 | 80 | 6,119 | 82 |
| Coffins and Caskets | 6,371 | 81 | 6,172 | 81 |
| Foundation Garments | 6,340 | 82 | 6,172 | 82 |
| Women's Clothing | 6,076 | 83 | 6,005 | 83 |
| Leather Products | 5,986 | 84 | 5,776 | 84 |
| Other Clothing | 5,517 | 85 | 5,388 | 85 |
| Fish Products | 5,500 | 86 | 4,763 | 87 |
| Men's Clothing | 5,360 | 87 | 5,259 | 86 |
| ALL MANUFACTURING | 11,325 | -- | 9,470 | -- |

(x) Denominator comprises:
-- average annual number of employees in the industry for the 1966-68 period, plus
-- industry's capital consumption estimated at 10% of industry's capital stock. Capital stock consists of net value
in current dollars of all fixed assets (buildings, machinery and equipment).
A man-year equivalent is assumed to be equivalent to the average annual wages and salaries in the Machinery Group
plus 20% of the difference between average yearly earnings of the Machinery and Transportation Equipment Groups
to allow for mobile capital equipment produced by the latter.

There is a very high and significant correlation (0.9) between the two rankings of the 87 industries shown in table 4. Despite this, the introduction of capital as an input has altered the ranking of a number of industries greatly. It is to be noted, however, that in the top fourteen industries only two were seriously affected and that there were only minor changes in the last twenty-two. The two industries affected in the top fourteen were petroleum refining which fell from second to twenty-third and cement manufacturers, third to forty-ninth. Other industries which fell significantly in rank when capital was added to the inputs were pulp and paper mills (16 to 50), iron and steel mills (18 to 30), fertilizers (21 to 70), smelting and refining (24 to 51) and synthetic textiles (62 to 78).

When capital is included as an input in the productivity measures, it is found of course that they are all lowered in proportion to the industry's capital intensity. Moreover, it reduces the variation around the mean level. In the case of the distribution of the industry measures of value-added per employee, 66 of the 87 industries were in the range $5.5 thousand to $13.5 thousand. When capital is included in the calculations, 79 of the industries fall in this range.

The top six and the bottom six performers, as indicated by the composite measure of productivity, are set out below:

| Top Performers | Bottom Performers |
| --- | --- |
| Distilleries | Foundation Garments |
| Soap & Cleaning Compounds | Women's Clothing |
| Breweries | Leather Products |
| Toilet Preparations | Other Clothing |
| Tobacco Products | Men's Clothing |
| Pharmaceuticals | Fish Products |

Not one of these industries produces durable goods, and hardly any of the leaders can be considered oriented towards advanced technology.

The main difference between the top and bottom performers appears to result from the top performers producing either a narrower range of products or products which are amenable to flow production requiring little labour per unit of output, and the bottom performers producing either a greater range of products or products which require a substantial input of labour relative to capital.

In other words, the differences in productivity appear to result from differences in capital intensity, specialization, scale economies and the availability and use of capital equipment suitable for flow production. These in part are dependent on the nature of the product as well as the industrial structure. It appears too, from an examination of the twelve industries, that the bottom performers are likely to have small establishments and to be highly competitive. Conversely the top performers tend to have larger establishments and as they supply branded goods to be perhaps less competitive in terms of price. They are, however, likely to spend more on advertising and sales competition and this itself will raise their value added. Because of this last factor the productivity measures for the above leaders possibly exaggerate their ability to pay higher returns to labour and capital. However, as much of these selling costs are undoubtedly of a competitive, defensive nature, not necessarily incurrable to supply the products in total, one can perhaps assume safely that the outlays which these producers' customers are prepared to pay for are the equivalent of factor payments rather than materials and services.

For the 87 industries, as with the 20 major groups, there was a strong correlation between value added per man-hour and average hourly-earnings, and between value added per employee and wages and salaries per employee. These relationships are shown in detail in chart form on pages 11 and 18 of the

Statistical Handbook. In the case of the comparison of value added per employee and wages and salaries per employee, it can be seen that up to a value added per employee of $14,000 per annum, the correlation is very high and includes 63 of the 87 industries. Above this value added figure there is no observable correlation. Despite the overall correlation between the levels of productivity and earnings, as will be seen in a later section of this report, over the period 1961 to 1969 there was only a minor correlation between increases in labour productivity and increases in earnings. A near perfect positive correlation between output per man-hour and real hourly earnings exists at the overall national level and also appears at the level of manufacturing as a whole, as seen on page 56 of the Statistical Handbook.

E. Inter Industry Comparisons of Labour Productivity Growth

Productivity statistics are most often used for studying the changes

which occur over time in the quantities of labour and/or real capital

required to produce some given volume of output. Such figures indicate

the relative rates of advance in productivity and which industries are

improving their ability to either cut product prices, or at least reduce

price increases, or raise factor remuneration, particularly wages and

salaries. The overall competitiveness of the different industries,

however, also depends on their level of productivity and a variety of

market conditions.

In this section, only the increases which have occurred in labour

productivity will be examined; for the lack of adequate capital stock

data at present disallows the preparation of similar series for capital

and total factor productivity.

Time series for labour productivity in Canadian manufacturing are

published by Statistics Canada for total manufacturing only. As a

consequence it has been necessary to prepare approximate measures for the 87

industries from the data that is available. Simply, indexes of labour

productivity have been derived from the division of the indexes of indus-

trial production by the indexes of total employment. As some of the indexes

of production are estimated in part at least from the observed changes in

employment, the derived indexes of productivity may not always in fact

measure accurately the changes in productivity.

The relative increases in the indexes of labour productivity which

occurred between 1961 and 1969 are set out for the 87 industries in the

Statistical Handbook. As with the levels of productivity, there is a

great range of values. Over the period, motor vehicles and parts recorded

the greatest increase, one of 99.0 percent, while fertilizers, which is at
the bottom of the list, had a decline of 11.9 percent. The following table
shows how the changes are distributed. The mean increase is 29.7 and the
distribution is positively skewed:

### Distribution of Percentage Increases
### in Productivity Indexes, 1961 to 1969

| Percentage Change | Number of Industries |
|---|---|
| 60 to 99 | 8 |
| 50 to 59 | 8 |
| 40 to 49 | 9 |
| 30 to 39 | 15 |
| 20 to 29 | 18 |
| 10 to 19 | 17 |
| -12 to 9 | 12 |

When the ranking of the productivity increases is compared with the
ranking of the productivity levels, it is found that although there is some
tendency for those experiencing the fastest growth in productivity to also
have high levels of productivity, there is only a weak correlation (0.27)
between the two series as a whole. Set out below are the industries which
had extreme values for both the level of and growth in productivity. The
strongest are those with both a high level and a high growth rate. The
weakest have the opposite characteristics.

### Industries with extreme values of
### both levels of and growth in productivity

(A) High level, high growth

    Distilleries (4)
    Petroleum refineries (8)
    Industrial chemicals (8)
    Motor vehicles & parts (10)
    Wineries (26)

(B) High level, low growth

    Other petroleum & coal products (75)
    Cement manufacturers (78)
    Pulp & paper mills (82)
    Ready-mix concrete (84)
    Publishing only (86)

(C) Low level, high growth

    Miscellaneous transportation (68)
    Other primary textiles (71)
    Synthetic textiles (72)
    Other furniture (83)
    Other knitting mills (99)

(D) Low level, low growth

    Planing mills (156)
    Other clothing (156)
    Sporting goods & toys (157)
    Hosiery mills (160)
    Leather products (170)
    Fish products (171)

The bracketed numbers in the preceding table are the sum of the respective industry's two rankings, where the lowest possible number is (2) and the highest is (174).

From a mere inspection of these groups one can only guess at the causes of their differences. It appears easier to explain the differences in levels than the differences in the rates of productivity growth. For analytical purposes, it appears best to explain levels and increases separately.

Our studies show that labour productivity tends to be higher in the more capital intensive and less diversified industries. The level is undoubtedly also related to the average quality of the labour and management and the nature of the technology employed in the industry.

If more time series data were available on capital stock, specialization and length of production runs, and on the quality of labour, it would be possible to evaluate the causes of differences in productivity growth. However, the changes must result from differential changes in the factors which explain the differences in levels. For example, labour productivity will tend to rise faster in those industries which improve their technology and raise their capital intensity fast, increase the length of their production runs, concentrate production in the more productive lines and units, improve the quality of their factors of production relatively fast, and which benefit perhaps from relative declines in unit material costs. Most of these changes are likely to occur in those industries which are experiencing or are capable of developing a growing volume of sales. This would tend to occur in industries with a high price elasticity and/or income elasticity of demand for their products, in industries which are otherwise capable of expanding the size of their markets, perhaps from demographic changes, and in industries which have opportunities for introducing cost-reducing technologies.

## (4) COSTS AND PRICES

Costs reflect conditions both external and internal to a firm or industry. The external factors include the prices, availability and quality of labour, materials, components, capital goods and other inputs, as well as government taxes and subsidies. The internal factors, which are often closely interrelated with the external ones, reflect the degree of scale and specialization, the nature of the technology, the efficiency with which resources are combined and used, and the morale and motivation of the labour force.

As part of their efforts to cut or avoid unnecessary costs, business management attempts to maximize the output from, or productivity, of all factors. The pressure to cut costs is particularly great in price-competitive markets. If external costs are rising and cannot be passed on in higher product prices, productivity increases are the only way to keep costs down and profits up. In slow growth or static industries, productivity increases and lower unit costs may be the only way to expand sales. In fast growing industries there may be no such pressure to reduce unit costs, particularly if there are barriers to the entry of new firms. However, if the growth of the industry allowed economies to be gained, productivity increases would be observed as an accompaniment of the growth process. Conversely, if dis-economies were associated with the growth process and input prices were forced up in addition, unit costs could rise over time.

A partial breakdown of the costs of manufacturing industries is provided by the 1969 Census of Manufactures. If other costs shown in the Corporation Financial Statistics for corporations classified to manufacturing industries are added to the above, a fairly accurate indication is obtained of the overall structure of costs, as set out below:

## Costs as Percentage of Total Revenues in 1969

| Item | Manufacturing Establishments | Corporations Classified to the Manufacturing Industries |
|------|------------------------------|----------------------------------------------------------|
| Cost of materials, supplies and goods for resale | 55.3 | |
| Cost of fuel and electricity | 1.9 | |
| Salaries and wages (exc. fringe benefits) | 23.6 | |
| Capital cost allowances | | 3.3 |
| Income tax liabilities | | 2.9 |
| Profits after taxes | | 4.1 |

They show that a very high proportion of total costs are accounted for by purchases of materials and supplies from other Canadian and foreign suppliers, and that barely one-third of total costs are internal to the firms or plants. Salaries and wages are some 24 percent of total costs and 55 percent of value added. It can also be seen that on average the cost of the input of fixed capital is only a minor proportion of total cost although it is about 14 percent of the cost of labour.

If the percentages in the two columns are added it will be found that some 9 percentage points have not been accounted for. This represents an estimated 8 percent of costs devoted to external services such as advertising, auditing, legal and consultant fees, communication charges, maintenance, rent, insurance, royalties, patent fees and interest charges, and an unexplained residual.

Before examining the structure of costs in 87 manufacturing industries, it might be helpful to examine some material from a study by the Economic

Council of Canada on the cost differences between Canadian and U.S. manufacturing.[1] On page 29 of the report there are some rough estimates of the cost differences existing in 1965. These are set out below:

<div align="center">

**Comparative Material and Factor Prices**
**Canada and the United States, 1965**
(U.S. = 100)

</div>

| | | |
|---|---|---|
| 1. | Average hourly earnings | 81.0 X |
| 2. | Machinery and equipment prices | 125.6 |
| 3. | Long-term corporate bond yields | 123.2 |
| 4. | Selected material prices | 120.0 |

X  Confirmed by our own data for 1967 which shows 81.1.

If these figures are approximately correct they show some of the reasons for manufactured product prices being higher in Canada. It can be appreciated too that as important as the lower wage levels are in Canada, as salaries and wages constitute only some 24 percent of costs in manufacturing, they do not fully offset the effects of the higher cost of materials and supplies which is more than one-half of total costs.

Our own studies comparing total manufacturing in 1967 in Canada and the United States show that material costs were 57.9 percent of shipments in the former and 53.6 percent in the latter.

For the sake of conceptual purity, the comparisons should be made in terms of "production" rather than "shipments" but for the international comparisons this was not possible. The analytical conclusions are not affected by this theoretical shortcoming. For instance the 57.9 percent figure in the above paragraph would read 57.6 percent, if the calculation were based on

1. p. 28 "Scale and Specialization in Canadian Manufacturing", Staff Study No. 21, Economic Council of Canada.

"production" rather than "shipments". This means that value added as a percentage of shipments was lower in Canada than in the U.S.A. Also, as payroll costs as a percentage of value added were 51.3 percent in Canada relative to 50.5 percent in the United States (the reverse relationship held true in 1963) the proportion of total shipments, left over to cover other costs, including profits and the on-average higher capital costs, was smaller. When one divides the total costs of materials by the total employment, it is found that the ratio in Canada is identical to that in the United States. However, as material prices are higher in Canada than in the United States, this shows that less materials, in quantity terms, are used per worker than in the United States. This is one of a number of factors associated with lower labour productivity in Canada.

The cost data for 1969 from the Census of Manufactures are of limited use as they show only the cost of materials, wages and salaries, and value added less wages and salaries. Despite this they do provide some indication of the cost structure in each industry and allow inter-industry comparisons.

The following table summarizes the variations which occurred among the 87 industries:

## Distribution of 87 Industries in 1969

| Costs | Percentages of Shipments | | | | | |
|---|---|---|---|---|---|---|
| | 0-20 | 21-40 | 41-60 | 61-80 | 80+ | Weighted Average |
| Materials & Components | 1 | 14 | 61 | 10 | 1 | 55.3 |
| Value Added | 2 | 8 | 66 | 11 | | 43.8 |
| Wages and Salaries | 18 | 64 | 5 | | | 23.0 |
| Value Added less Wages & Salaries | 38 | 44 | 5 | | | 20.8 |

These figures show that 55 percent of the total costs in manufacturing as a whole were incurred purchasing materials and components from other

suppliers. The percentages for 61 industries were very close to this figure. Meat products, with 82 percent, has the highest ratio. The lowest was cement manufacturers with a percentage of 15.5. With materials and components accounting on average for such a large proportion of total costs, one would expect changes in unit material costs to have a considerable influence on industrial selling prices.

It follows that there is also a close grouping of the value added to shipments ratios around the mean of 43.8. In this distribution, engraving and allied industries have the highest ratio, one of 78.5 percent, while meat products is of course the lowest with 17.8 percent. This variation in the value added - shipments ratios is sometimes a factor helping to explain differences in productivity and profitability and can influence considerably the effective tariff protection which an industry receives.

On average, wages and salaries formed only 23 percent of shipments in manufacturing. As can be seen from the table, in five industries this ratio exceeded 40 percent. These were engraving and allied industries, communications equipment, machine shops, aircraft and parts, and publishing and printing.

Value added less wages and salaries shows the amounts paid for outside services, depreciation, interest, rent, profits, and direct taxes, etc. These items in total are almost as large as the payments of wages and salaries. Those industries with relative large percentages are likely to be highly capital intensive, perhaps highly profitable, or have to cover relatively high service costs, such as advertising. Five industries in this category also had ratios of over 40 percent of shipments. They were distilleries 58.9, cement manufacturers 52.8, breweries 51.7, toilet preparations 43.8, and pharmaceuticals 42.9. Their ranks in terms of value added per employee were 1, 3, 4, 10 and 11. That is, they appear to have

a relatively high labour productivity. However, all these industries, other than cement manufacturers, tend to spend relatively large amounts on outside selling costs and this no doubt exaggerates to some extent their productivity figures.

Average wages and salaries, which is highly correlated with value added per employee, indicates several things. It shows the cost of a typical employee, the ability of an industry to pay high wages and salaries; and suggests that those industries where the average is higher, labour is likely to be both more productive and more highly trained. The salaries and wages per employee for each of the 87 industries is recorded on pages 19-20 of the Statistical Handbook. The table below shows the distribution of the industrial averages:

| Average Salaries and Wages in Dollars, 1969 | | | | |
|---|---|---|---|---|
| 3,500-5,000 | 5,000-6,500 | 6,500-8,000 | 8,000-9,500 | Weighted Average |
| 14 | 35 | 30 | 8 | 6,418 |

Petroleum refineries paid the highest average wage in 1969 - $9,372, fish products the lowest - $3,709. The difference or range between them is considerable and if they both grew at the same rate over time this absolute difference would also increase. There is a strong tendency in our economy for the more poorly paid workers to up-grade their training and to seek out better paid jobs. Various programs of the government help them to do this. However, their ability to do this also depends on the ability of the relatively high-wage paying industries to expand their sales, output and employment profitably.

The Statistical Handbook also shows for 87 industries the changes which have occurred in the indexes of industrial production, employment, average

wages and salaries, unit labour costs, unit material costs, and industrial selling prices during the period 1961-1969. These variables are closely related and an analysis of their behaviour provides some insight into the forces determining an industry's performance and the processes of industrial development.

The table below shows for each of these variables the distribution of the 87 industries on the basis of different percentage changes. The weighted mean change is also shown. This shows that real industrial production rose most, reflecting a rise in employment as well as productivity. The major part of the production increase had its source in the factors which raised labour productivity. Average wages and salaries rose over 50 percent over the period; this increase is not directly comparable with the increase in productivity, for one is in current and the other in constant values. The relatively large increase in average wages and salaries is put into clearer perspective by deriving the changes in unit payroll costs. Unit payroll costs rose less steeply than unit material costs, although this may have resulted in part because of the impossibility of including fringe benefits in labour costs. In most industries, too, as we have seen, material costs are a much larger proportion of total costs than payroll costs. The rise in industrial selling prices was less than that in the two major costs shown and suggests that the period overall resulted in some decline in profitability.

Dispersions of Percentage Increases in Selected Variables for 87 Industries

| | 1961 to 1969 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -25 to 0 | 1 to 25 | 26 to 50 | 51 to 75 | 76 to 100 | 101 to 150 | 151+ | Weighted Mean |
| Industrial Production | 4 | 12 | 24 | 16 | 13 | 14 | 4 | 71.0 |
| Employment | 11 | 38 | 23 | 8 | 6 | | 1 | 25.2 |
| Labour Productivity | 4 | 38 | 32 | 10 | 3 | | | 36.6 |
| Average Wages & Salaries | | 3 | 43 | 38 | 3 | | | 53.5 |
| Unit Payroll Cost | 19 | 40 | 22 | 5 | 1 | | | 11.8 |
| Unit Material Cost | 9 | 41 | 26 | 8 | 2 | 1 | | 18.0 |
| Industrial Selling Prices | 10 | 62 | 12 | | | | | 16.3 |

The main sources of labour productivity growth were noted in an
earlier section, but over long periods of time studies show that the
growth in labour productivity tends to occur most in those industries
recording a rapid increase in output and an accompanying increase in
capital intensity. Such productivity increases and output increases
interact, of course, each one assisting the other. Output growth,
however, which is a proxy variable for more immediate causes of pro-
ductivity growth, such as better management, fuller utilization of
capacity, more productive machinery and equipment, increased speciali-
zation and other scale economies, explains a significant proportion of pro-
ductivity growth. Over the period 1961 to 1969 there was a rank correlation
coefficient of +0.62 between increases in production and productivity. It
will be remembered that correlation coefficients range from -1 to +1, +1
being a perfect positive correlation.

For more specific information, the industries which had extreme
values and rankings of both changes in production and labour productivity
are set out in four groups below. The bracketed figures show the rankings
of increases in production and productivity.

(A)  High rate of increase in both production and productivity.

| | | | |
|---|---|---|---|
| Truck Bodies | ( 1, 24) | Industrial Chemicals | (13,  2) |
| Motor Vehicles & Parts | ( 2,  1) | Wineries | (14, 19) |
| Commercial Refrigeration | ( 3, 15) | Misc. Transportation | (15, 18) |
| Communications Equipment | ( 4, 23) | Distilleries | (16,  3) |
| Small Appliances | ( 6, 14) | Boiler & Plate | (17, 17) |
| Radio & T.V. Receivers | ( 9,  4) | Primary Textiles | (18,  5) |
| Synthetic Textiles | (10, 10) | Pharmaceuticals | (20, 22) |
| Ind. Elec. Equipment | (12,  9) | Agricultural Implements | (22,  8) |

(B)  High rate of increase in production but low rate of increase
     in productivity.

| | | | |
|---|---|---|---|
| Machine Shops | ( 7, 60) | Ready-Mix Concrete | (19, 70) |
| Other Textile Products | (11, 63) | | |

(C) <u>Low rate of increase in production but high rate of increase in productivity.</u>

Petroleum Refineries      (50,  6)

(D) <u>Low rate of increase in production and productivity.</u>

| | | | |
|---|---|---|---|
| Soft Drinks | (71, 79) | Planing Mills | (80, 83) |
| Sporting Goods & Toys | (72, 82) | Publishing & Printing | (82, 84) |
| Engraving & Allied | (74, 74) | Other Petrol. & Coal Prod. | (83, 67) |
| Fish Products | (75, 85) | Leather | (84, 86) |
| Hosiery Mills | (78, 80) | Other Clothing | (85, 71) |
| Cement Manufacturers | (79, 75) | Fur Goods | (87, 76) |

It can be seen that there are very few industries located in groups (B) and (C). The three in (B) have experienced a rapid increase in sales and output but at least during the period covered here they have not been able to exploit many opportunities for more capital-intensive methods, economies of scale or new production technologies. In the case of (C), the one industry, petroleum refineries, has raised labour productivity greatly but without much expansion in output.

The industries in (A), on the basis of the two variables examined, may be considered the most successful, but it should be remembered that relative positions can change and a continuation of past performance cannot be projected into the future on the basis of this information alone. One has to remember, too, that a small percentage increase in an industry which already has a relatively high volume of output and a high level of productivity can have a stronger effect than larger percentage increases in relatively small, low productivity industries. For example, cement manufacturers and other petroleum and coal products appear in group (D) although in terms of level of productivity they are third and eighth respectively.

It is of interest to examine in more detail the relationship between changes in production and product prices. Once again the data being compared, even though for 87 industries, is still highly aggregated and not always applicable to particular firms or products. However, the comparisons indicate aggregate tendencies and are worth making. Here, again, we will examine only those industries recording extreme values and rankings of changes in both production and prices. The four groupings are:

(A) Relatively fast increase in production but slow increase in prices.

| | | | |
|---|---|---|---|
| Truck Bodies | ( 1, 66) | Other Textile Products | (11, 51) |
| Motor Vehicles & Parts | ( 2, 70) | Ind. Elec. Equipment | (12, 75) |
| Commercial Refrigeration | ( 3, 79) | Industrial Chemicals | (13, 85) |
| Communication Equipment | ( 4, 63) | Wineries | (14, 69) |
| Other Manufacturing | ( 5, 77) | Misc. Transportation | (15, 53) |
| Small Appliances | ( 6, 84) | Distilleries | (16, 57) |
| Radio & T.V. Receivers | ( 9, 83) | Boiler & Plate | (17, 71) |
| Synthetic Textiles | (10, 87) | Other Primary Textiles | (18, 61) |

(B) Relatively fast increase in production and prices.

| | | | |
|---|---|---|---|
| Machine Shops | ( 7, 22) | Ready-Mix Concrete | (19, 12) |
| Other Machinery | ( 8, 20e) | Misc. Elec. Equipment | (30, 18) |

(C) Relatively slow increase in production and slow increase in prices.

| | | | |
|---|---|---|---|
| Foundation Garments | (54, 74) | Hosiery Mills | (78, 86) |
| Misc. Wood Products | (63, 45) | Cotton & Woollen Mills | (81, 54) |
| Soap & Cleaning Compounds | (65, 65) | Other Petrol. & Coal Products | (83, 81) |
| Breweries | (75, 76) | Other Clothing | (85, 42) |
| Coffins & Caskets | (73, 40) | Fertilizers | (86, 60) |

(D) Relatively slow increase in production but fast increase in prices.

| | | | |
|---|---|---|---|
| Smelting & Refining | (43, 2) | Fish Products | (75, 6) |
| Saw Mills | (52, 1) | Tobacco Products | (76, 16) |
| Meat Products | (53, 11) | Bakery Products | (77, 14) |
| Woman's Clothing | (60, 19) | Cement Manufacturers | (79, 24) |
| Broom, Brush & Mop | (68, 9) | Planing Mills | (80, 3) |
| Soft Drinks | (71, 7) | Leather Products | (84, 17) |
| Sporting Goods & Toys | (72, 10) | Fur Goods | (87, 15) |
| Engraving & Allied Products | (74, 8) | | |

What do these different relationships or categories imply about the industries listed under them? The main possibilities are:

(A) Real demand rising relatively fast, partly in response to relatively slow rise in prices. Unit costs falling relatively and/or a high degree of price competition. Possibly experienced higher profitability during period. Thirteen of the sixteen industries in this group experienced relatively high rates of increase in labour productivity. Only one had a relatively low increase in labour productivity, other textile products, and this suggests it was in a highly competitive market.

(B) Real demand rising relatively fast, despite relatively large increase in prices. Unit costs rising both relatively and absolutely and perhaps little price competition. Appear capable of maintaining profitability. Also appears to be area in which cost-reducing technologies would be most beneficial.

(C) Real demand rising relatively slowly despite relatively small increase in prices. May be high degree of price competition, perhaps foreign.

(D) Real demand rising relatively slowly, partly as result of relatively large increase in prices. Productivity increases relatively low and cost pressures high. Perhaps little price competition.

When the real demand for an industry's products is rising relatively fast, particularly when its product prices are also rising fast and it pays relatively high returns to the factors of production, there is strong reason for the movement of resources into those areas.

When the real demand for an industry's products is increasing at only a slow pace, it is more important that it lowers unit costs and prices, if only relatively, to expand demand. The degree of expansion depends on the price-elasticity of demand. Such situations are not likely to result in substantial increases in wage rates and profits, unless labour costs are only a small proportion of total cost and material costs rise slowly.

The changes which have been taking place in sales and prices are particularly useful indicators for evaluating the market strength of an industry. Also, as there is considerable negative correlation between

the changes in selling prices and productivity, there is some indication

of the changes which are taking place in the supply conditions. It is

also important to consider that changes in government policies, foreign

as well as Canadian, and also changes in the market can occur suddenly

and result in some shifting from one category to another.

A closer examination of the relationship between changes in produc-

tivity and changes in prices is very significant from the point of view of

the fight against inflation and for improved competitiveness.

As the correlations show, industry selling prices generally rose less

or actually fell in those industries experiencing the more rapid increases

in productivity. The following table shows this in greater detail and

provides data for each of 84 industries. The inverse relationship between

productivity increases and price changes is particularly striking when the

distributions of industries in the top and bottom quartiles are compared.

# Table 5

## RELATIVE INCREASES (OR DECREASES) IN PRODUCTIVITY AND INDUSTRY SELLING PRICES

| OUTPUT PER PERSON \ PRICES | INCREASE OVER 20 P.C. | INCREASE 10-20 P.C. | INCREASE 0-10 P.C. | DECREASE |
|---|---|---|---|---|
| **FOURTH QUARTILE** <br> **114.2-199.0% INCREASE** | Meat Prod. | Distilleries <br> Struct.Steel <br> Agric.Impl. <br> O.Furniture <br> Grain Mills <br> Misc.Transp. | Motor Veh. <br> O.Prim.Tex. <br> Ind.El.Eq. <br> Rubber <br> Comm.Refrig. <br> O.Chemicals <br> Boiler <br> Wineries <br> O.Knitting <br> Pharmaceut. | Ind.Chemicals <br> Radio & T.V. <br> Petrol.Ref. <br> Synth.Text. <br> Small Appl. |
| **THIRD QUARTILE** <br> **126.0-141.4% INCREASE** | Smelting <br> Broom,Brush <br> Sawmills <br> Veneer <br> Wood.Boxes | Iron Works <br> Paint <br> Coffins <br> Dairy Prod. <br> Breweries <br> Comm.Print. <br> Met.Stamping <br> Clay Prod. <br> Cotton Mills <br> Glass <br> Wire | Communic.Eq. <br> Truck Bodies <br> Major Appl. <br> Heating Equip. <br> Soap | |
| **SECOND QUARTILE** <br> **116.2-125.5% INCREASE** | Jewellery <br> Misc.Elec. <br> Tobacco <br> Concrete <br> W.Clothing <br> Bakery <br> Mach.Shops <br> M.Clothing | Other Food <br> Fruit & Veg. <br> O.Non-Met. <br> Scient.Instr. <br> Misc.Metal <br> H.Furniture <br> O.Tex.Prod. <br> Misc.Wood <br> Paper Mills | Iron & Steel <br> Found.Garm. <br> Toilet Prep. <br> Other Mfg. | |
| **FIRST QUARTILE** <br> **88.1-114.5% INCR.(DECR.)** | Hardware <br> Ready-Mix <br> Engraving <br> Cement <br> Fur Goods <br> Soft Drinks <br> Sport.Goods <br> Plan.Mills <br> Fish Prod. <br> Leather | O.Clothing <br> Office Furn. <br> Batteries <br> Paper Boxes <br> Iron Found. <br> Other Paper <br> Publ.& Print. <br> Fertilizers | Other Petrol. | Hosiery Mills |

A correlation analysis of the variables already examined in this section has produced some interesting results which the following coefficients summarize.

### Rank Correlations of Percentage Changes in Listed Variables For 87 Industries for the Period 1961 to 1969.

| Correlated Variables | Correlation Coefficients |
|---|---|
| Industrial Production & Employment | + .813 |
| Industrial Production & Labour Productivity | + .622 |
| Industrial Production & Selling Prices | - .412 |
| Labour Productivity & Selling Prices | - .481 |
| Labour Productivity & Average Wages & Salaries | + .121 |
| Labour Productivity & Unit Payroll Cost | - .849 |
| Labour Productivity & Unit Material Cost | - .510 |
| Unit Payroll Cost & Selling Prices | + .572 |
| Unit Material Cost & Selling Prices | + .486 |

They show that:

(1) As already noted, productivity and employment tend to rise faster in the more rapidly growing industries, or alternatively, relatively fast increases in productivity may be at least part of the cause of relatively fast increases in production and employment.

(2) Selling prices tend to rise less quickly or even decline in those industries experiencing the more rapid increases in labour productivity and production.

(3) There is little tendency over the nine year period for increases in average earnings to be proportional to increases in the measure of labour productivity in individual industries, notwithstanding the near perfect correlation observed for manufacturing as a whole and for the whole economy.

(4) There is high inverse correlation between changes in productivity and unit payroll costs, and a fairly high positive correlation between unit payroll costs and selling prices.

(5) There is a fairly high inverse correlation between changes in productivity and unit material cost, and a noticeable correlation between unit material cost and selling prices.

It is also interesting to observe that during the sixties, in manufacturing at least, there was a tendency for employment to rise more quickly in those industries experiencing the more rapid increases in labour productivity and vice versa. This contradicts the often held belief that productivity increases

would usually lead to lower levels of employment. If the volume and sales were not rising concurrently, productivity increases could reduce employment, but in the expanding market, which resulted in part from the increased price competitiveness allowed by the productivity increases, this did not in fact occur. Among the 22 best productivity performers, only one reported a reduction in employment. In the remaining 65 industries 10 were in this category.

## (5)  PROFITABILITY

In a free-enterprise or mixed-enterprise economy profit is the primary reward paid by society to enterprises for supplying the goods and services which it demands.  When one ignores market imperfections and externalities, the rate of profit indicates to what extent society is prepared to cover costs of, and to pay an extra reward to, the suppliers.  In the short-run, profits (which are the difference between revenues and costs) can vary considerably, as they reflect fluctuations in demand, the development of new products or markets, and changes in competition, costs, etc.  It is necessary to keep this in mind when analyzing profit data and to analyze data for a number of years rather than one.

The main source for profit data is "Corporation Financial Statistics". This is a Statistics Canada publication based on the financial statements of corporations filed with their income tax returns.  The analysis is based on a broad sample of corporations, which is then expanded to represent all corporations.  These figures are not strictly comparable with the establishment data as the corporations are included in those industries in which most of their sales occur, with the result that the industrial figures may be either over or under stated relative to their counterparts in the census of manufactures.

In section four of the Statistical Handbook, before-tax and after-tax profits are shown as percentages of total equity, equity and long-term debt together, and total assets.  The figures are given for 87 industries and are averages for 1966-68.  The top and bottom five industries in each profit ranking (before tax) are shown below:

## Before Tax Profit as a Percent of

| Total Assets | Total Capital | Equity |
|---|---|---|
| | (Top Five Industries) | |
| Distilleries (26.8) | Distilleries (55.7) | Distilleries (58.7) |
| Toilet Preparations | Commercial Refrigeration | Commercial Refrigeration |
| Commercial Refrigeration | Breweries | Wooden Boxes |
| Breweries | Toilet Preparations | Breweries |
| Pharmaceuticals | Publishing Only | Sporting Goods & Toys |
| | (Bottom Five Industries) | |
| Aircraft & Parts | Major Appliances | Major Appliances |
| Major Appliances | Cement Manufacturers | Batteries |
| Fur Goods | Coffins & Caskets | Coffins & Caskets |
| Cotton & Woollen Mills | Cotton & Woollen Mills | Cotton & Woollen Mills |
| Fish Products (1.0) | Fish Products (2.0) | Fish Products (3.1) |
| Ranges (25.8) | (53.7) | (55.6) |

Six industries appear in all three profit categories, three in the top five (Distilleries, Commercial Refrigeration, and Breweries) and three in the bottom (Fish Products, Cotton & Woollen Mills, and Major Appliances). The spread of profit rates can be seen from the ranges to be considerable. The top and bottom performers also tend to have a high and low productivity ranking. Overall, however, we found a rank correlation of only 0.46 (out of a possible maximum of 1.0) when the profit on total assets ranking was correlated with the value added per employee ranking of individual industries.

In an attempt to make the profit data more comparable between industries and with the establishment data, we are presently preparing adjusted profit data for the 87 industries. This has already been done for the 20 major groups and the results will be examined here.

When examining the corporation financial statistics it is necessary for our purposes to adjust the figures to ascertain the profitability of the goods and services said to be encompassed by a particular industrial category.

To do this, we have excluded all income not derived from the sale of goods and services, such as investment income. On the expenses side, items have been excluded which do not appear to have been necessary to supply the goods and services. It would be better for our purposes to have included depreciation at replacement rather than book cost, but such an adjustment was not possible. Income taxes have been added back onto profit. Local taxes have been deducted as a business expense. Neither income nor expenses contain sales or excise taxes.

One significant adjustment has been made to the expenses incurred to obtain more comparable figures. Interest payments have been added back onto profits and in one case six percent, and another ten percent of the total operating assets has been deducted therefrom as a measure of the opportunity cost of, or income foregone on, the capital used in the industry. This adjustment considers the cost of using equity and retained earnings as well as loan capital and provides a more realistic picture of profitability.

One might argue that different rates should be used for different assets; however, it is believed that until further analysis has been carried out in this area the assumption of six or ten percent will provide a useful approximation and will enable us to obtain a good idea of the relative cost of capital to the different industries. In addition, the total assets shown in the corporation financial statistics have been reduced by the value of the assets not absolutely necessary for supplying the goods and services contained in the sales figures. The assets exluded are the investments in affiliates and other investments, mortgages and loans.

By making these adjustments it was possible to derive more suitable measures of profit and total assets. Having done that, it was possible to prepare two measures of the rate of profit. From the viewpoints of economic strategy or overall resource allocation, the rate of return on equity is not

overly useful. Neither is the rate of return on sales, particularly as different industries contain different ratios of material inputs (including fuel and electricity) to sales. We have related the adjusted operating profit to (1) adjusted total assets and (2) value added. The first measure provides a measure of the net financial return to total assets in the industry while the second measures the return on the value of additional resources, including entrepreneurship, used in the production process by that industry. This second measure is not well known but is considered important because it measures the return to all the factors and not capital only. It has to be remembered too that in some industries the return to assets may be high simply because labour intensive methods are used - this may indicate the direction in which capital should move but not necessarily labour and other inputs as well. Similarly, a monopoly or overly pro-tected producers might earn a high return on capital because supply is restricted. In this case, however, the return on value added would also likely be high and this would indicate that there is some scope for an expansion in that industry.

The following table sets out for the 20 major groups the rates of profit (P) on total operating assets (TA) and on value added (VA). As previously described, there are two sets of calculations - one based on a 6 percent, and another based on a 10 percent charge on the assets used in the business. In both sets of calculations, it is found that P/TA and P/VA are closely correlated, particularly when the higher charge for capital is used. When, on the basis of the 6 percent charge for capital, the two rates are compared, it is found that the greatest differences in rank were in petroleum and coal products (+8), paper and allied products (+7), and printing and publishing (-7).

Table 6            CANADIAN MANUFACTURING CORPORATIONS

PROFITABILITY[1], AVERAGES 1966-68

| Industry Groups | At Cost of Capital 6% | | | | At Cost of Capital 10% | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Profit / Total Operating Assets | | Profit / Value Added | | Profit / Total Operating Costs | | Profit / Value Added | |
| | Percent | Rank | Percent | Rank | Percent | Rank | Percent | Rank |
| Food and beverages | 8.6 | 2 | 12.0 | 4 | 4.6 | 2 | 6.4 | 2 |
| Tobacco products | 6.9 | 3 | 21.6 | 1 | 2.9 | 3 | 9.1 | 1 |
| Rubber products | 4.8 | 8 | 6.9 | 13 | 0.8 | 8 | 1.2 | 8-9 |
| Leather products | 2.2 | 18-19 | 2.4 | 19 | -1.8 | 18-19 | -2.0 | 17 |
| Textile mills | 2.2 | 18-19 | 4.1 | 16 | -1.8 | 18-19 | -3.3 | 20 |
| Knitting mills | 3.5 | 13-14 | 4.7 | 15 | -0.5 | 13-14 | -0.7 | 12-13 |
| Clothing | 1.4 | 20 | 1.4 | 20 | -2.6 | 20 | -2.5 | 18 |
| Wood products | 2.3 | 17 | 4.0 | 17 | -1.7 | 17 | -3.0 | 19 |
| Furniture & fixtures | 2.6 | 16 | 3.1 | 18 | -1.4 | 16 | -1.8 | 16 |
| Paper and allied products | 3.5 | 13-14 | 9.1 | 7 | -0.5 | 13-14 | -1.4 | 15 |
| Printing, publishing & allied products | 10.8 | 1 | 8.7 | 8 | 6.8 | 1 | 5.5 | 3 |
| Primary metals | 6.0 | 4 | 15.0 | 2 | 2.0 | 4 | 5.0 | 4 |
| Metal fabricating | 4.7 | 9-10 | 7.0 | 12 | 0.7 | 9-10 | 1.0 | 10 |
| Machinery | 5.9 | 5 | 10.4 | 5 | 1.9 | 5 | 3.3 | 5 |
| Transportation equipment | 4.7 | 9-10 | 8.2 | 9-10 | 0.7 | 9-10 | 1.2 | 8-9 |
| Electrical products | 3.3 | 15 | 4.9 | 14 | -0.7 | 15 | -1.0 | 14 |
| Non-metallic mineral products | 3.7 | 12 | 7.5 | 11 | -0.3 | 12 | -0.7 | 12-13 |
| Petroleum and coal products | 4.3 | 11 | 12.8 | 3 | 0.3 | 11 | 0.8 | 11 |
| Chemicals and chemical products | 5.8 | 6-7 | 10.1 | 6 | 1.8 | 6-7 | 3.1 | 6 |
| Miscellaneous | 5.8 | 6-7 | 8.2 | 9-10 | 1.8 | 6-7 | 2.6 | 7 |
| Total | 5.0 | | 9.0 | | 1.0 | | 1.8 | |
| Range | 9.4 | | 20.2 | | 9.4 | | 12.1 | |

1. As defined in text; assets measured in terms of depreciated book values.

When the profit rates in the table were compared with the rates calculated on the basis of the unadjusted data, it was found that in the case of each group the rates were all lower in the adjusted figures. For example, unadjusted before-tax profits as a percentage of total assets was 8.1 percent for manufacturing as a whole, whereas in the table the nearest comparable figures are 5.0 percent and 1.0 percent.

In the table, the rates of profit are of course lowered when the capital charge is raised. In nine groups, the profits are in fact transformed into losses. P/TA is lowered by four percentage points in each group (this follows from the identical percentage increase in costs of four percent of total assets) and their rankings are unaltered. In the case of P/VA, it is lowered proportionally to the group's capital intensity; this alters the rankings and narrows the dispersion of rates. The drop was greatest in tobacco products (which however remained the most profitable), petroleum and coal products, paper and allied, and primary metals. The least affected were printing and publishing, and clothing.

When comparing the ranking of the groups by value added per employee on an establishment basis with the two rankings of adjusted profitability in the table, we found that the rank correlation coefficients were about 0.6 for P/TA and 0.8 for P/VA. These correlations may be high in part because the ranks rather than the basic data were correlated. However, when the adjusted profit data has been prepared for 87 industries, a more thorough statistical test of this and other relationships will be made.

## (6) FOREIGN TRADE

Highly detailed and up-to-date statistics on commodity exports and imports are made available by Statistics Canada. As these data, however, are classified on a commodity basis and not by industry, they are not readily comparable with our other data. In the report entitled "Indicators of Canadian Manufacturing Performance, 1966-68 levels and 1961-70 Trends", put out for the twenty major groups by the Productivity Branch in 1971, a preliminary attempt was made to express the trade figures on the basis of the Standard Industrial Classification. Further work is being done to prepare the trade figures on an S.I.C. basis for the 87 industries examined in this report, but until this is completed the analysis will be confined to the 20 major groups.

World trade expanded greatly in the sixties, particularly in manufactured products. Canada participated in this expansion and experienced substantial increases in both exports and imports. The former grew more rapidly but in volume their expansions were roughly equal. Exports of manufactured products increased as a proportion of total exports and rose more quickly than manufacturing output in total. This increase in the export of manufactured outputs, which underpinned the growth of the manufacturing sector during the period, arose to a great extent from some special factors, including the devaluation of the Canadian dollar in 1961, which made Canadian exports more price competitive, and various specific international trade and production arrangements.

When allowance is made for tariffs and the other institutional factors, the figures on exports and imports indicate in which commodities Canada has either some competitive advantage or disadvantage. The way in which they change over time also provides some indication of the changes which are occurring in Canada's competitive position.

In turn, these changes cause or reflect changes in the growth and structure of output and therefore the employment and allocation of resources. The interactions between trade and industrial growth are significant. When a growth in exports leads or accompanies a growth in the domestic market, it is likely to be stronger and longer, mainly because the exports earn some at least of the foreign currency necessary to finance the increase in imports which always accompanies a domestic expansion. If domestic demand rises without an accompanying increase in exports, imports will rise and tend to slow down the expansionary forces.

In 1970, exports of manufactured goods exceeded imports by $186 million. This compared favourably with 1964 (the first year for which trade data on an industry basis are available) when there was an adverse balance of $858 million. The big exporters in 1970 were transportation equipment (32.1%), primary metals (17.7%), paper and allied (16.4%), food and beverages (7.2%) and wood products (6.5%). In all of these, exports exceeded imports and in all except the first they were resource-based industries. It can be seen, too, that these few groups accounted for 80 percent of Canada's manufactured exports. On the import side, transportation equipment again headed the list with a percentage of 30.1 This was followed by machinery (15.8%), electrical products (8.2%), miscellaneous (8.1%), chemicals and chemical products (6.6%), and primary metals (6.3%). The largest adverse balances occurred in machinery, miscellaneous, electrical products, textiles, chemicals, and metal fabricating. Full details of the volume and structure of exports and imports in 1970 are shown in table 7 below:

## Table 7

## VOLUME AND STRUCTURE OF FOREIGN TRADE [X]

### 1970

| | Exports $ millions | % of Total | Imports $ millions | % of Total | Balance of Trade $ millions |
|---|---|---|---|---|---|
| Food & beverages | 903.3 | 7.2 | 595.7 | 4.8 | 307.6 |
| Tobacco products | 56.4 | .4 | 9.8 | .1 | 46.6 |
| Rubber products | 32.8 | .3 | 141.6 | 1.1 | - 108.8 |
| Leather products | 27.2 | .2 | 111.4 | .9 | - 84.2 |
| Textiles | 101.3 | .8 | 503.4 | 4.1 | - 402.1 |
| Knitting mills | 6.9 | .1 | 78.7 | .6 | - 71.8 |
| Clothing | 66.8 | .5 | 126.1 | 1.0 | - 59.3 |
| Wood products | 810.7 | 6.5 | 106.9 | .9 | 703.8 |
| Furniture & fixtures | 34.8 | .3 | 63.0 | .5 | - 28.2 |
| Paper and allied | 2,063.4 | 16.4 | 126.9 | 1.0 | 1,936.5 |
| Printing, publishing & allied | 30.0 | .2 | 258.4 | 2.1 | - 228.4 |
| Primary metals | 2,222.9 | 17.7 | 778.5 | 6.3 | 1,444.4 |
| Metal fabricating | 204.6 | 1.6 | 533.0 | 4.3 | - 328.4 |
| Machinery | 616.3 | 4.9 | 1,950.2 | 15.8 | -1,333.9 |
| Transportation Equipment | 4,037.4 | 32.1 | 3,722.1 | 30.1 | 315.3 |
| Electrical products | 537.7 | 4.3 | 1,019.6 | 8.2 | - 418.9 |
| Non-metallic mineral products | 95.5 | .8 | 224.5 | 1.8 | - 129.0 |
| Petroleum and coal products | 87.6 | .7 | 206.2 | 1.7 | - 118.6 |
| Chemicals and chemical products | 440.5 | 3.5 | 820.3 | 6.6 | - 379.8 |
| Miscellaneous manufacturing | 189.9 | 1.5 | 1,004.1 | 8.1 | - 814.2 |
| Total | 12,566.0 | 100.0 | 12,380.4 | 100.0 | 185.6 |

X Preliminary data, subject to revision

## Table 8

### PERCENTAGE INCREASES

### IN VALUE OF EXPORTS & IMPORTS [X]

### 1964 to 1970

| | Exports | Imports |
|---|---|---|
| Food and beverages | 39.2 | 64.1 |
| Tobacco products | 46.9 | - 4.9 |
| Rubber products | 121.6 | 130.6 |
| Leather products | 76.6 | 143.8 |
| Textiles | 119.7 | 23.6 |
| Knitting mills | 13.1 | 200.4 |
| Clothing | 357.5 | 166.0 |
| Wood products | 35.2 | 33.5 |
| Furniture & fixtures | 461.3 | 73.6 |
| Paper and allied | 50.8 | 52.7 |
| Printing, publishing & allied | 200.0 | 85.2 |
| Primary metals | 94.4 | 52.6 |
| Metal fabricating | 224.8 | 80.9 |
| Machinery | 113.6 | 51.2 |
| Transportation equipment | 746.1 | 268.2 |
| Electrical products | 172.0 | 135.4 |
| Non-metallic mineral products | 92.5 | 34.8 |
| Petroleum & coal products | 262.0 | 55.9 |
| Chemicals & chemical products | 57.3 | 71.7 |
| Miscellaneous manufacturing | 115.1 | 60.8 |
| Total | 133.5 | 98.4 |

X Preliminary data, subject to revision.

When one looks at the table showing the percentage increases in exports and imports between 1964 and 1970, it can be seen that the fastest growing sector was transportation equipment with a 746 percent increase in exports and a 268 percent increase in imports. Exports also grew rapidly in furniture & fixtures (461.3%), clothing (357.5%), petroleum & coal products (262.0%), metal fabricating (224.8%), and in printing, publishing and allied (200.0%).

Imports also expanded relatively fast in knitting mills (200.4%), clothing (166.0%), leather products (143.8%), electrical products (135.4%), and rubber products (130.6%). Of these, knitting mills and leather products appear weakest as they did not also mark up fairly large increases in exports.

In the next table in this chapter imports have been shown as a percentage of the Canadian market and exports have been shown as a percentage of Canadian shipments. The percentages for the twenty major groups are given for 1964 and 1970. The changes which occur over this short period are significant as they indicate (1) whether Canada is losing out in the domestic market to foreign competitors and (2) whether the manufacturing industries are becoming more or less export oriented. In total both percentages have risen to indicate that Canada has become, in the manufacturing sector at least, more closely related through trade with other countries. This has in some cases led to increased specialization and scale and increases in productivity.

It is useful to arrange the 20 groups into four categories on the basis of whether they have a high or low import ratio $\dfrac{\text{Imports (I)}}{\text{Canadian Market (CM)}}$

and a high or low export ratio $\dfrac{\text{Exports (E)}}{\text{Canadian Shipments (CS)}}$

Table 9

IMPORTS AS A PERCENTAGE OF THE CANADIAN MARKET

AND EXPORTS AS A PERCENTAGE OF CANADIAN SHIPMENTS

1964 and 1970

| | Imports as Percentage of Canadian Market | | | Exports as Percentage of Canadian Shipments | | |
|---|---|---|---|---|---|---|
| | 1964 | 1970 | Change | 1964 | 1970 | Change |
| Food and beverages | 6.2 | 7.3 | 1.1 | 10.6 | 10.7 | 0.1 |
| Tobacco products | 3.2 | 2.1 | -1.1 | 11.0 | 10.8 | -0.2 |
| Rubber products | 13.0 | 19.8 | 6.8 | 3.5 | 5.4 | 1.9 |
| Leather products | 12.8 | 23.1 | 10.3 | 4.7 | 6.8 | 2.1 |
| Textiles | 26.0 | 25.9 | -0.1 | 3.8 | 6.6 | 2.8 |
| Knitting mills | 8.8 | 17.3 | 8.5 | 2.2 | 1.8 | -0.4 |
| Clothing | 4.6 | 9.6 | 5.0 | 1.5 | 5.3 | 3.8 |
| Wood products | 9.1 | 8.8 | -0.3 | 43.0 | 42.3 | -0.7 |
| Furniture and fixtures | 7.3 | 8.6 | 1.3 | 1.3 | 4.9 | 3.6 |
| Paper and allied | 5.8 | 6.6 | 0.8 | 50.6 | 53.6 | 3.0 |
| Printing, publishing & allied | 12.5 | 14.8 | 2.3 | 1.0 | 2.0 | 1.0 |
| Primary metals | 26.7 | 30.5 | 3.8 | 44.9 | 55.6 | 10.7 |
| Metal fabricating | 12.4 | 15.2 | 2.8 | 2.9 | 6.4 | 3.5 |
| Machinery | 62.0 | 64.4 | 2.4 | 26.8 | 36.4 | 9.6 |
| Transportation equipment | 27.1 | 70.7 | 43.6 | 14.9 | 72.4 | 57.5 |
| Electrical products | 22.3 | 32.1 | 9.8 | 11.6 | 19.9 | 8.3 |
| Non-metallic mineral products | 16.1 | 16.5 | 0.4 | 5.4 | 7.8 | 2.4 |
| Petroleum and coal products | 8.7 | 10.6 | 1.9 | 1.7 | 4.8 | 3.1 |
| Chemicals and chemical products | 23.9 | 27.2 | 3.3 | 15.6 | 16.7 | 1.1 |
| Miscellaneous manufacturing | 46.9 | 46.7 | -0.2 | 11.1 | 14.2 | 3.1 |
| Total | 19.7 | 27.4 | 7.7 | 17.4 | 27.7 | 10.3 |

| (1) | (2) |
|-----|-----|
| Low $\dfrac{I}{C\,M}$, High $\dfrac{E}{C\,S}$. | High $\dfrac{I}{C\,M}$, High $\dfrac{E}{C\,S}$ |
| Paper and allied products<br>Wood products | Transportation equipment<br>Machinery<br>Electrical products<br>Primary metals<br>Chemicals |

| (3) | (4) |
|-----|-----|
| Low $\dfrac{I}{C\,M}$, Low $\dfrac{E}{C\,S}$ | High $\dfrac{I}{C\,M}$, Low $\dfrac{E}{C\,S}$ |
| Tobacco products<br>Food and beverages<br>Furniture and fixtures<br>Petroleum and coal products<br>Non-metallic mineral products<br>Metal fabricating<br>Printing, publishing & allied<br>Clothing | Miscellaneous manufacturing<br>Textiles<br>Leather products<br>Knitting mills<br>Rubber products |

Only two industry groups appear in category (1). They are resource based and appear highly competitive in the international market. Their ratios have changed very little since 1964.

In (2) are those groups which have both high import and export ratios. This suggests that there is a high degree of inter-country specialization in different commodities within each group. That is, Canada is competitive in some commodities but not in others. In this category there have been some large increases in the ratios since 1964. Transportation equipment, machinery and primary metals recorded significant increases in their export orientation.

It is difficult to interpret category (3). The groups in it have both a low import ratio and a low export ratio. This suggests that the goods which they produce are not easily traded, perhaps because of the nature of the product, tariffs, quotas and private market arrangements, or that Canada

cannot compete greatly abroad but is able to hold its own domestically. An unexpected member of this category is petroleum and coal products, which in time may move into category (1). All of the groups, other than tobacco products, increased both ratios over the six years. The export ratios rose relatively fast within the category in clothing, furniture and fixtures, metal fabricating, and petroleum & coal products. In clothing, however, there was an even greater increase in the import ratio.

Although the groups in category (4) may be considered the weakest performers with high import ratios and low export ratios, all of them except knitting mills increased their export ratios over the period by two or three percentage points. Leather products, rubber products and knitting mills also recorded, however, substantial increases in imports as a percentage of the Canadian market.

In an initial attempt to evaluate the extent to which I/CM and E/CS are influenced by a group's level of productivity we correlated the rankings of the former with the ranking of both value added per employee and value added per total factor input (average 1966-68). The results show that there is little or no correlation between I/CM and either labour productivity or total factor productivity, and that there is a small positive correlation (.388 and .367) between E/CS and these two measures of productivity. This result is as one might expect because trade depends more on inter-country differences in productivity than inter-industry differences within a country. However, even a successful exporter must pay the going rates of pay, etc. in its own country and if its productivity fails to rise in step with that of the other industries, its unit costs will rise and it may become less competitive abroad. For example, in the case of wood products and paper and allied products, although they are two of Canada's most important exporters, they have a relatively low level of total factor productivity. Both of them could be hurt over time if the more productive

# Table 10 — DISTRIBUTION OF 20 MAJOR GROUPS IN MANUFACTURING BY LEVEL OF PRODUCTIVITY AND TRADE PERFORMANCE

| Level of Productivity[1] Avg 1966-68 | Relative trade performance in 1970 | | | |
|---|---|---|---|---|
| | High $\frac{E}{S}$ Low $\frac{I}{D}$ | High $\frac{E}{S}$ High $\frac{I}{D}$ | Low $\frac{E}{S}$ Low $\frac{I}{D}$ | Low $\frac{E}{S}$ High $\frac{I}{D}$ |
| 14,605 | | | Tobacco products | |
| 11,994 | | Chemicals | | |
| 11,763 | | Transportation equip. | | |
| 11,483 | | Machinery | | |
| 10,327 | | | | Rubber products |
| 9,856 | | | Non-metallic mineral products | |
| 9,801 | | | Food & beverages | |
| 9,628 | | | Metal fabricating | |
| 9,376 | | | Printing, publishing & allied | |
| 9,180 | | Primary metals | | |
| 9,152 | | Electrical products | | |
| 8,968 | | | Petroleum & coal products | |
| 8,960 | | | | Miscellaneous |
| 8,702 | Paper & allied | | | |
| 7,750 | Wood products | | | |
| 7,384 | | | Furniture & fixtures | |
| 6,928 | | | | Textiles |
| 6,146 | | | | Knitting mills |
| 5,776 | | | | Leather producers |
| 5,711 | | | Clothing | |

1. Value Added/Employees and Fixed Capital

industries were able to pay higher wages and salaries and bid labour away from them. This would be more harmful to wood products than paper and allied products, for the latter is highly capital intensive and this allows it to pay higher wages without raising unit costs and prices considerably.

Table 10 sets out for the 20 major groups a comparison of productivity levels and both export and import performance. A similar table has also been prepared for a three-digit S.I.C. breakdown and is available on request. These tables are useful in that they allow one to make an initial evaluation of an industry's trade vs. productivity performance and relative position.

The more detailed tables, for 125 industries, confirm the findings of table 10;there is no simple relationship between value added per employee and relative trade performance. This is evident from the summary table below;

### Productivity and Trade Performance in 1969
#### (125 Industries)

| Value added per Employee | High $\frac{E}{S}$ Low $\frac{I}{D}$ | High $\frac{E}{S}$ High $\frac{I}{D}$ | Total High $\frac{E}{S}$ | Low $\frac{E}{S}$ Low $\frac{I}{D}$ | Low $\frac{E}{S}$ High $\frac{I}{D}$ | Total Low $\frac{E}{S}$ |
|---|---|---|---|---|---|---|
| Quartile 4 ✱ | 5 | 5 | 10 | 16 | 5 | 21 |
| " 3 | 2 | 4 | 6 | 22 | 3 | 25 |
| " 2 | 4 | 3 | 7 | 20 | 4 | 24 |
| " 1 | 2 | 2 | 4 | 24 | 4 | 28 |

✱ The productivity measure falls in value from Quartile 4 to 1.

The five industries with the top productivity and most favourable trade ratios were distilleries, breakfast cereal manufacturers, manufacturers of mixed fertilizers, pulp and paper mills, and copper and alloy rolling, casting and extracting - all of which tend to be resource based. The four industries in the opposite corner of the above table were sporting goods and toys, leather tanneries, cordage and twine and rubber footwear manufacturers.

The above data shows that the relative significance of the various forces at work in this area are far from clear, and that international industrial performance and the determinants of competitiveness still require further study, comparative analysis and thought.