STAFF STUDY No. 21

Scale and Specialization in Canadian Manufacturing

by

D. J. Daly, B. A. Keys and E. J. Spence

Prepared for the
Economic Council of Canada

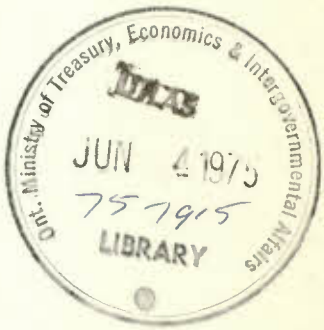
SCALE AND SPECIALIZATION IN CANADIAN MANUFACTURING

by D. J. Daly, B. A. Keys and E. J. Spence

Staff Study No. 21

Economic Council of Canada

March 1968



This is one of several studies prepared as background papers for the Fourth Annual Review of the Economic Council of Canada. Although these studies are published under the auspices of the Council, the views expressed in each case are those of the authors themselves. A list of other Council publications appears at the end of this Study.

Available by mail from the Queen's Printer, Ottawa,
and at the following Canadian Government bookshops:

HALIFAX
1735 Barrington Street

MONTREAL
Æterna-Vie Building, 1182 St. Catherine St. West

OTTAWA
Daly Building, Corner Mackenzie and Rideau

TORONTO
221 Yonge Street

WINNIPEG
Mall Center Bldg., 499 Portage Avenue

VANCOUVER
657 Granville Street

or through your bookseller

Price $1.75 Catalogue No. ~~EC22-1268~~ EC22-1/21

Price subject to change without notice

ROGER DUHAMEL, F.R.S.C.
Queen's Printer and Controller of Stationery
Ottawa, Canada
1968

Table of Contents

ACKNOWLEDGMENT

Grateful appreciation is expressed on behalf of the Economic Council of Canada to the many business executives whose co-operation made this Study possible and who provided the authors with information on costs, prices and some of the factors contributing to company operations and performance. Without this co-operation and assistance, this Study could not have been possible.

Valuable assistance was received also from officials of the Dominion Bureau of Statistics, the Department of Industry, the Department of Trade and Commerce and the Tariff Board.

Helpful comments on an earlier draft of this Study were provided by H. E. English, Harry G. Johnson and Ron Wonnacott.

Arthur J. R. Smith
Chairman

PART I

INTRODUCTION

This Staff Study developed out of a need to explore more intensively and systematically some areas of secondary manufacturing in Canada. Initially this interest arose from the estimates of the size of the current account deficit at potential output in 1970, as indicated in the First Annual Review of the Economic Council. Subsequently, interest in this field was intensified in the context of the Council's developing analysis of the sources of economic growth -- and particularly in relation to the fundamental question about why the wide disparity in productivity levels has persisted between Canada and the United States.

As a first step the Economic Council arranged a small technical conference on the Competitive Position of Canadian Industry at the Seigniory Club at Montebello, Que., on September 26 and 27, 1964. About 35 persons attended from government departments, universities, and the Economic Council. Three papers were discussed, which had been circulated in advance of the meeting. 1/

1/ These included H. E. English, Industrial Structure in Canada's International Competitive Position, Private Planning Association, Montreal, 1964; Ronald J. Wonnacott and Paul Wonnacott, "The Competitive Position of Manufacturing in Canada and the United States in the Event of Free Trade" (Confidential Draft manuscript) -- recently published with modifications as Part I of Ronald J. Wonnacott and Paul Wonnacott, Free Trade Between the United States and Canada, the Potential Economic Effects, Cambridge, Harvard University Press, 1967; and R. E. Olley, The Cost Position of Canadian Manufacturing (mimeo.).

Scale and Specialization

The discussion at the conference indicated the importance of and interest in this area, and further work was planned.

It was decided that some interviewing of selected Canadian companies be initiated to accumulate more evidence on, and views about, the competitive position of Canadian manufacturing. Professor E. J. Spence (now at York University) was retained as a consultant, and he conducted a series of interviews in the spring and summer of 1965, and again in the summer of 1966. These interviews provide the basis of most of the industry material in Part III of this Study. In addition, B. A. Keys and D. J. Daly carried out a number of interviews in 1966, and all three made some further cross-checks in 1967 as this material was being revised for publication.

This Study is part of a continuing program of research on productivity by the Economic Council. The broader analytical and statistical framework for this program has been heavily influenced by the work of E. F. Denison,[1/] and has included special emphasis on factors affecting productivity differences among Canada, the United States and Western European countries.

1/ Edward F. Denison, The Sources of Economic Growth and the Alternatives Before Us, New York, Committee for Economic Development, January 1965, Supplementary Paper No. 13; Edward F. Denison assisted by Jean-Pierre Poullier, Why Growth Rates Differ: Postwar Experience in Nine Western Countries, Washington, The Brookings Institution, 1967; Economic Council of Canada, Second Annual Review, Ottawa, Queen's Printer, 1965, Chapters 3 and 4; Gordon W. Bertram, The Contribution of Education to Economic Growth, Staff Study No. 12 of the Economic Council of Canada, Ottawa, Queen's Printer, 1966; D. J. Daly and D. Walters, "Factors in Canada-United States Real Income Differences", International Review of Income and Wealth, December 1967, pp. 285-309.

One key result from the use of the Denison framework to analyze the differences in real national income per employed person between Canada and the United States is that most of the difference reflects a significantly lower level of output in relation to total factor inputs in Canada. Factor inputs consist of labour (the most important factor), capital and natural resources used in the process of production. In 1960 (selected to facilitate comparisons with the comparable material for the United States and Northwest Europe in the Brookings study), the level of net national product (i. e. , value of output) per employed person was about 21 per cent lower in Canada than in the United States. Very little of this lower productivity could be explained by differences in the quantity of other factors used in conjunction with labour in the production process. There were, of course, differences in individual factors, but these were largely offsetting. Canadian income per employed person was supported by longer hours worked, a high proportion of male workers, a somewhat higher stock of construction and inventories, and a significantly higher quantity of agricultural land and mineral resources. On the other hand, in Canada compared with the United States there was a lower level of formal education in the labour force, a lower stock of dwellings, and a lower stock of machinery and equipment in certain broad industry groups. However, as indicated above, the overwhelming part of the difference in real output per employed person reflected a significantly lower level of output in relation to total factor inputs in Canada than in the United States. 1/

1/ D. J. Daly and D. Walters, ibid. Table 17 of that paper indicates that, of a difference of 21 percentage points in national income per employed person between the two countries, less than 2 points are attributable to factor inputs and about 20 percentage points are attributable to differences in output in relation to input. In other words, the difference is due not to significant differences in the quantities of labour and capital used in Canada, but rather in the way we have used these basic resources.

Scale and Specialization

About a decade ago, John H. Young examined one factor contributing to this difference, namely the cost of the Canadian tariff with special reference to manufacturing.[1] He measured this cost by the higher prices of manufactured products in Canada than in the United States (very largely reflecting, he claimed, the effect of the Canadian tariff) and the lower level of purchases associated with these higher prices. He estimated these costs at 4 1/2 to 5 1/2 per cent of GNP in 1955. This indicates an important source of real income difference between the two countries, but other large questions remain, especially in the light of the results summarized in the previous paragraphs. Are there other costs of the Canadian and world tariff structures in addition to those measured by Young? Or are there other factors, either measurable or more intangible, that might explain the large remaining difference?

A recently published study by the Wonnacotts comes up with estimates of the costs of tariffs approximately double Young's estimates.[2] One reason for the higher estimate (for 1958) is that it includes an estimate of the effect of the cost to Canada of the U. S. tariff, as well as the Canadian tariff.[3] In estimating the cost of the

---

1/ J. H. Young, Canadian Commercial Policy, Ottawa, Queen's Printer, 1957.

2/ Wonnacott and Wonnacott, op. cit.

3/ The costs of tariffs in other countries might also be included if the full costs of world tariffs were being explored. Their study was primarily oriented to the economic effects of free trade between the United States and Canada, which is the key part of tariff costs to Canada in the light of the dominant role of the two-way flow of trade between the two countries. It might be noted that the increased importance of duty-free access for Canadian products in U. S. markets by the time the Kennedy Round reductions have taken place will reduce the cost of the U. S. tariff from the 1958 level.

Canadian tariff, the costs to the consumer are essentially based on Young's earlier estimate. However, in addition to the costs to the consumer, the Wonnacotts also include an estimate of the cost of the tariff on the production side, based on 14 important manufacturing sectors. For each industry, they examine the value of output and the differences in prices of outputs (goods produced) and inputs (labour, materials, capital) between the two countries. Some of the factors contributing to higher prices and lower productivity in Canada than in the United States would persist, of course, after free trade -- including distance from markets, transportation costs, higher costs of machinery and equipment, and higher costs of long-term borrowing. They estimate these separately for each industry. The differences that would disappear with free trade are the costs of the tariff on the production side. Their estimate of the total costs of the U. S. and Canadian tariffs to Canada in 1958 is 10 1/2 per cent of real GNP,[1/] roughly double the earlier Young estimate.

The developing analysis being undertaken by the Wonnacotts, which was made available to the Council staff on a confidential basis, had an important influence on the nature of the Council's work in this field. In particular, it became increasingly apparent that the statistical results of the Wonnacotts' work pointed strongly to the probability that substantial evidence would exist in many companies, on the basis of their own operations and experience, that tariffs would have a significant effect on their costs, degrees of specialization in production and levels of output per employed person. The Council interviews were therefore focused on assembling basic facts on the productivity and cost differences between comparable products in the United States and Canada. The frequent emphasis in these interviews on the influence of specialization and diversification on these productivity and cost differences is

---

[1/] Wonnacott and Wonnacott, op. cit., p. 298.

discussed further in later parts of this Study. This Study can be viewed as a companion study to the Wonnacotts', looking at a closely related issue, but based on different sources of information. It summarizes and develops the basic factual information on the differences in levels of real output per employed person in manufacturing between Canada and the United States.

Part II of the Study reviews the main findings as a whole. Some broad measures of the factual differences in value, price and volume are included in Section 1. In Sections 2 and 3 some of the main reasons for these differences are reviewed in the light of earlier work, available statistical data, and the company interviews. Section 4 deals with the influence of production runs on unit costs, and considers why companies do not specialize more now if it would reduce costs. Section 5 summarizes some of the evidence for other countries in this same area. Section 6 considers the influence of tariffs and the exchange rate on these topics, and points up the influence of the high cost and price structure for manufactured products on Canadian trade in those products.

Part III reviews the results of the company interviews for the nine broad industry groups covered. The latter comprised chemicals, steel, wire and cable, fine paper, rubber tires, consumer appliances, radio and television, textiles and garments. At this stage in the work, no attempt was made to explore the manufacturing aspects of natural resource items for export (such as newsprint and base metals), or the agricultural and food-processing segments of manufacturing. The farm implement industry is currently under study by a Royal Commission, and the automobile industry was undergoing special and substantial changes at the time of this Study, in the wake of the Automobile Agreement with the United States. Apart from these exclusions, the industries were selected to be fairly representative of secondary manufacturing.

In some cases, the industries covered here are also those being covered in various investigations by the Atlantic Studies Program of the Private Planning Association of Canada. Early drafts of some of the latter have been helpful in relation to this Study, and have contained information and analysis generally consistent with the results from our work. Additional relevant information for selected Canadian industries is contained not only in the previously mentioned study by R. J. and P. Wonnacott, but also in a study by Eastman and Stykolt which assesses interrelationships, for selected industries, between the tariff, plant size, and the degree of competition. 1/ Some references to these studies are included in later parts of this publication.

An Appendix shows detailed statistical data on cost comparisons for similar items in the two countries based on data provided by companies covered in this survey.

This publication points up the need and potential advantages of greater scale and specialization as a factor in raising productivity levels in a large segment of Canadian manufacturing. It is recognized that the present distribution of plants and product diversity arose out of important geographic, transportation, market and tariff influences and cannot be changed easily or quickly. However, the potential benefits in terms of increased productivity, lower prices, and higher real incomes are sufficiently large to justify active consideration of the appropriate transitional steps by both governments and business firms.

1/ H. C. Eastman and S. Stykolt, The Tariff and Competition in Canada, Toronto, Macmillan, 1967.

PART II

THE MAIN FINDINGS

Some Facts on Manufacturing Productivity and Costs

One of the objectives of this work has been the examination of the available information on the differences in levels of real output per employed person in manufacturing between Canada and the United States. In this section, some of the facts on value, price and volume differences will be explored.

The Royal Commission on Canada's Economic Prospects had examined a number of aspects of this question a decade ago, including quantity data from some industries and value and price data from others. They concluded that "these various methods of approach to man-hour comparisons of secondary and manufacturing productivity in Canada and the United States suggest that our net output is no less than 35-40 per cent below that in the same sector of the American economy".[1/] Further work is under way in the Council to re-examine the evidence for the current period, but preliminary results suggest orders of magnitude roughly similar to those reached a decade ago.

What has been done thus far with more current data can provide only a very rough indication of the differences in the volume of output per employed person between

---

1/ D. H. Fullerton and H. A. Hampson, Canadian Secondary Manufacturing Industry, Ottawa, Queen's Printer, 1957.

Canada and the United States, even for total manufacturing. These comparisons are based on two types of material: census information on net value added in the two countries, and evidence about the prices of manufactured products in the two countries. No recent work has been done on physical output of individual products, although material is available for certain more standardized products.

Net value added per employee in manufacturing as a whole in the United States was $11,843 (U.S.) in 1963. The comparable figure for Canada was $9,086 (Canadian), 23 per cent lower. Similar comparisons have been made for about 150 individual industries within manufacturing. These show very marked variations in the relative levels of net value added per employee for individual industries in the two countries. There are a few cases in which the Canadian figures are somewhat above those in the United States, and also some cases in which the Canadian figures are very substantially below those in the United States.

However, it is very important to note that a number of studies have consistently pointed out that prices and costs of manufactured goods are higher in Canada than in the United States. For example, an Appendix to John Young's study for the Royal Commission on Canada's Economic Prospects provided considerable information on this subject -- information relevant to the estimation of the cost of the Canadian tariff to the consumer. Although much of the basic data related to prices at the consumer level, adjustments were made for differences in taxes and trade margins to arrive at estimates of differences in prices at the factory level. The evidence indicated a fairly general pattern of higher prices of manufactured products (excluding foods).[1/] More

---

1/ Young, op. cit., Appendix A, pp. 163-233.

recently, Professor A. E. Safarian obtained some material on costs as part of a comprehensive study of foreign ownership of Canadian industry. In the course of this study, as indicated by the author, "the companies were asked, as part of the larger questions at the end of the questionnaire, to compare their unit costs of production for their major comparable products with those of the parent company abroad, at the current rate of exchange and at normal volume of operations".[1/] He obtained results for 173 companies, and about two-thirds of the companies and two-thirds of the industries reported unit costs as being typically higher in Canada.[2/] A study by the Dominion Bureau of Statistics for May 1965 indicated that, on the average, prices of manufactured products at the consumer level were about 10 per cent higher than in the United States. For this latter study, Canadian price data were initially matched with data in the U. S. Bureau of Labor Statistics. For some items that were included in the Canadian Consumer Price Index but not in the comparable U. S. specifications, special pricing in selected U. S. cities was done by DBS staff. A summary of this consumer price study with all the problems and

---

1/ A. E. Safarian, Foreign Ownership of Canadian Industry, Toronto, McGraw-Hill, 1966, p. 201, and Question 4(b), p. 326. The questionnaire was mailed late in 1960, and the results relate to the period before the devaluation in 1962.

2/ Ibid., p. 216. See Chapter 7, "Comparative Costs of Production", pp. 201-217.

qualifications is available from DBS.[1/] These results were fairly similar to those obtained in the Gordon Commission study a decade earlier.

Information on total manufacturing costs was obtained from a number of Canadian companies as part of our Study. The general results can be noted here, with details available in the Appendix Table. Of the 31 items compared there, 18 had total costs 20 per cent or more higher than the same item in the United States, and eight cost 35 per cent more to produce in Canada. On the other hand, only five products were produced at a lower cost in Canada. (All of these comparisons are based on the domestic currencies of the two countries.) Although the group of commodities is relatively small, the results should not be regarded as a completely random sample. The companies, in fact, regarded them as fairly representative of their total output. These results, together with those of the three other independent studies, therefore, appear to leave no doubt that the prices of manufactured products are generally higher in Canada than in the United States; the only uncertainty is in the extent of the difference for total manufacturing.

These comparisons of prices of manufactured products in the two countries can be combined with the differences in the value of output per employed person to give a general order of magnitude of the difference in the volume of output of manufactured goods per employed person in the two countries. Depending on

---

1/ Prices Division, Comparative Consumer Price Levels in the United States and Canada, Ottawa, Dominion Bureau of Statistics, mimeo., 1967.

the price comparison used, differences in volume of output per employed person of 30 and 36 per cent were obtained.[1/]

[1/] This is based on the usual definition used in index number comparisons over time or over space that value = volume x price. In this particular case

$$\text{Volume } \frac{(\text{Can.})}{(\text{U. S.})} = \frac{\text{Value } \frac{(\text{Can.})}{(\text{U. S.})}}{\text{Price } \frac{(\text{Can.})}{(\text{U. S.})}}$$

(with all ratios on a per-person-employed basis). The value differences in 1963 were 76.7, while the price differences would be about 1.10 on the basis of the Young and DBS price comparisons, and about 1.20 on the basis of the company returns to this survey.

It should be noted that what would be desirable would be a price comparison of net value added for Canadian manufacturing. In the absence of any such information, we have had to use data on price comparisons of manufactured products that may partially reflect costs of materials from nonmanufacturing industries or from other countries. Since the Appendix data suggest costs are about the same as the median differences in total costs, it is not likely that any bias from this necessary short-cut is large.

This result suggests a somewhat smaller difference than was suggested by the Fullerton-Hampson study of a decade ago, but it seems preferable to suggest that the orders of magnitude are similar, pending further work on recent Canadian data.

Scale and Specialization

It might be noted that our purpose thus far is to make a comparison of the volume of output per employed person in Canada and the United States. The value and price comparisons for manufacturing are made in the separate domestic currencies of the two countries and a consistent volume comparison is obtained without considering the difference in exchange rate between the two countries. An allowance for the exchange rate differential is, however, relevant to an assessment of the competitive position of Canadian manufacturing in relation to U. S. manufacturing, and the exchange rate is taken into account later in Section 6 of this part of the Study.

A difference in real output (i. e., volume of output) per employed person in manufacturing between Canada and the United States of about one-third is both large and significant. This is a wider gap than in average hourly earnings between the two countries. In 1965, average hourly earnings in U. S. manufacturing were $2.61 (U. S.) compared to $2.12 (Canadian), 19 per cent below the U. S. level. Since the size of the productivity gap is larger than the earnings gap, these data are consistent with the examples in the Appendix which show higher labour costs per unit of output in Canada in spite of lower wage rates. The lower output per worker thus frequently more than offsets the lower hourly earnings per worker.

The gap in real output per employed person in manufacturing is wider than the gap for the economy as a whole. For the whole economy in 1960, the difference was 21 per cent based on U. S. price weights, or 23 per cent based on Canadian price weights.[1/] There must be

---

[1/] Daly and Walters, op. cit., p. 290.

other nonmanufacturing industries in which the Canadian-U. S. differences are less than one-fifth to offset the wider gap in manufacturing. Further research would be necessary to explore this area and identify the industries with smaller differences in real output per employed person.

The material in Chapter 4 of the Second Annual Review and later work by D. Walters on a comparison of economic growth in Canada and the United States confirm that the appreciably lower level of output in relation to input in Canada has persisted for several generations.

In this section, a comparison for total manufacturing has been made. Angus Maddison has made an earlier comparison for a number of individual industries within manufacturing. This follows the methods used by Rostas in making a comparison of manufacturing productivity between the United States and Britain.[1/] Maddison found the levels of output per wage-earner in manufacturing in Canada in 1935 between 33 and 47 per cent below the United States but higher than in Britain.[2/] Also, he found that the Canadian-U. S. gap generally narrowed between 1935 and 1947.

1/ L. Rostas, Comparative Productivity in British and American Industry, Cambridge, Cambridge University Press, 1948. Rostas made this comparison for manufacturing as part of a check on the aggregative comparison of productivity built up from national expenditures and prices by a summation for the major industrial sectors. See also Paige and Bombach, A Comparison of National Output and Productivity of the United Kingdom and the United States, Paris, OEEC, 1959, for a comparison of the industry and expenditure approaches.

2/ Angus Maddison, "Productivity in Canada, the United Kingdom and the United States", Oxford Economic Papers, new series, October 1952, pp. 237-238.

In summary, this section has brought together a range of factual evidence that indicates that average levels of output per person employed in Canadian manufacturing are significantly below the comparable levels in the United States. Even though average levels of wage rates are significantly lower for total manufacturing, average levels of prices and costs of manufactured products are moderately higher in Canada. In the next two sections some of the main reasons for these differences will be explored.

Size and Structure of Manufacturing

There has been general awareness that the size and structure of Canadian manufacturing has been one of the influences contributing to the differences in productivity (volume of output per employed person) between the two countries. In this section, the various meanings of size, including scale of operation and specialization of production, will be reviewed and some of the evidence from this and other studies will be introduced.

The term "economies of scale" is a rather loosely used phrase in much economic analysis. In some discussions it appears to be used almost synonymously with, or even as a substitute for, the "size of the market". In other discussions it has been variously used to denote the "size of firm" or "size of plant" or "size of production runs". In most of this discussion, the size of market refers to the market for a particular product. Clarification of the differences between these various concepts of "scale" is therefore necessary as a prerequisite for any analysis of scale and specialization in manufacturing. Attention is focused on the following four concepts of scale:

size of market;
size of firm;
size of plant;
size of production run and capacity of equipment.

Size of Market

Although a large part of the output of goods and services in Canada is consumed within the Canadian economy, and although the size of the domestic Canadian market is frequently cited as being highly relevant to the economies of scale established, the domestic market is not in fact a very meaningful concept to denote the size of market for particular products and services turned out by individual Canadian producers. For one thing, a large part of the output of such producers is consumed in the localities and regions within which they are situated and not really in a "national market" -- especially in the case of construction and most segments of the service industries, but also in the case of some materials and more highly processed goods. Also, to a very large extent, the goods markets which are served by Canadian producers are part of international markets. Large volumes of manufactured, mineral and agricultural goods are exported or imported; indeed, roughly two-fifths of Canada's total output of goods is exported, and a roughly similar proportion of all goods consumed is imported. The extent of trade is influenced by many factors -- such as transport costs, tariffs and the cost of labour, capital and materials used in production.

In the case of manufacturing, imports have historically exceeded exports of manufactured products by a substantial margin. But in recent years, exports of manufactured products have grown dramatically, and this sector of the economy is rapidly becoming more closely linked to international markets. The main manufacturing region in Canada stretches from Windsor to Quebec City, a distance of about 600 miles. This area is close to the heavily populated, high-income industrial

triangle of the United States, covering the area between Boston, Chicago, and Washington, D. C. Physical proximity, lower wage rates, and the current Canadian exchange rate have permitted a growing number of efficient Canadian plants to penetrate this much larger market and to expand their market potential substantially.

To the extent that scale and specialization are factors in productivity performance, the size of market is an important consideration, for it will affect the potential size of firms and plants and the possibilities for specialization and long production runs. What is important to place in proper perspective, however, is that the size of the market varies for different products and is a highly elastic concept, influenced by many diverse factors such as geography and transportation costs, market concentration as reflected in regional and urban agglomeration, tariff and other trade barriers, production costs, and marketing policies and practices.

Size of Firm

Among the larger manufacturing firms in both Canada and the United States, a firm or a company usually consists of a number of plants. In the United States there exist, of course, many giant firms which are substantially larger than the largest firms in the same industries in Canada, and the average size of manufacturing firms is larger in the United States.

But, in most manufacturing industries in the United States, a great number of relatively small firms also exist and grow side by side with relatively large firms. At least partial evidence of this fairly pervasive phenomenon of large numbers of relatively small firms is indicated by the fact that, in 16 out of 22 manufacturing industries, production is significantly more concentrated among the larger companies in Canada than in the United States.

The influence, if any, of the size of firm on productivity differences is very uncertain. Larger firms may be able to achieve various types of economies which may influence productivity, but they may also experience various types of inefficiencies. These questions of the size of company and degree of concentration will receive further study in future work by the Economic Council.

Size of Plant

Size of plant can be measured in several ways -- number of employees, capacity, sales, value added, etc. Various methods of averaging can also be used -- weighted and unweighted arithmetic means, geometric means, etc. Since there are important variations in plant size, future work by the Council will examine what effect such variations might have on productivity levels, and differences in such levels between Canada and the United States.

The average size of plant has been examined for a number of industries in both Canada and the United States. Two conclusions are suggested by these comparisons. One is that the size of plant for a number of industries in Canada is smaller than in the comparable industry in the United States. This conclusion is based on the weighted arithmetic means for the individual industries in the two countries.[1/] Second, there is considerably greater

1/ In our initial work some experimentation on measurement was done by fitting the log normal distribution to the 1963 Census of manufacturing data for both countries. This gives results similar to the use of an unweighted geometric mean, which reduced the influence of the relatively larger number of big U. S. plants drastically so that the average size was reduced down to, or even below, the comparable Canadian industry. This is the basis of the comment on page 153 of the Fourth Annual Review. Further work and discussion indicate that other measures of averaging give markedly different results for the Canada-U. S. comparisons, and future work by the Council will examine this topic more fully.

diversity in the size of establishment in the United States, with typically more smaller plants than in comparable Canadian industries, but also usually with a number of larger plants. The wide variation in sizes of plant observable in the United States has suggested to a number of observers that the economies of scale in plant size are not too great, but this, too, is an area requiring further study. The initial working assumption in this Study has been that size of the establishment is probably not a dominant factor in the differences in productivity between the two economies. What does appear to be highly relevant is how production is organized within a plant of a given size -- in particular, the size of production runs and the degree of specialization or diversification of production.

Size of Production Run and Capacity of Equipment

The size of the production run refers to the number of items of a specific commodity that are produced on a given machine or assembly line without change-overs. The capacity of equipment refers to the quantity of product that can be produced from processing equipment in a given period of time. In general, the range of manufactured products made in Canada does not appear to be much more limited than that produced in the United States. However, this rather similar range is produced by a significantly smaller number of Canadian plants and firms, so that the range of items produced in a typical plant is usually substantially larger in Canada.

> "... The most widely accepted hypothesis concerning the discrepancy in productivity in manufacturing between Canada and the United States holds that the small size of the Canadian market for manufactured goods necessarily results in sub-optimal scale for plants and firms, with a consequent loss of productivity. Those who argue from the small size of the Canadian market show that

> runs of single products in Canadian factories are shorter than in their counterparts in the United States, with the result that much more time is used in change-over for each unit of output. The machinery used in Canada is often less efficient because indivisibilities in the use of the most efficient methods of production can be overcome only at higher scales of production than exist in Canada. Furthermore, the most automatic equipment, which is sometimes the most efficient, is also the most costly to reset when a change in the size or style of a product is required. The alternative sometimes adopted in Canada of using less-efficient or less-fully automatic equipment is to acquire equipment which is most efficient and to bear the cost of conversion and resetting, or of keeping the machinery idle for part of the time when runs are insufficiently long to operate it continuously."[1/]

A number of studies have suggested that in Canada there is a general pattern, across a wide range of secondary manufacturing industries, of greater diversification of products and typically shorter production runs in Canadian plants vis-à-vis U. S. plants.[2/] It is this concept of the size of production runs which is the subject of special emphasis in this Chapter. Such short runs usually result in inefficiencies in the use of both labour and capital as a result of some combination of a number of factors -- frequent change-overs requiring the halting of production to adjust or clean machinery and equipment, more "down time" to move different models or types of products

---

[1/] Stefan Stykolt and Harry C. Eastman, "A Model for the Study of Protected Oligopolies", Economic Journal, Vol. 70, June 1960, pp. 336-347.

[2/] See following page for this footnote.

2/ Fullerton and Hampson, op. cit., especially pp. 61-93 and 147-162; F. A. Knox (in association with C. L. Barber and D. W. Slater), The Canadian Electrical Manufacturing Industry, Canadian Electrical Manufacturers' Association, 1955, pp. 43-52; Bruce Wilkinson, Canada's International Trade: An Analysis of Recent Trends and Patterns, Private Planning Association, Montreal, 1968, pp. 109-131. For a discussion of efficient capacity along the lines developed by Bain in the United States, see Eastman and Stykolt, The Tariff and Competition in Canada. A recent article by Berry provides new evidence on the marked degree of product specialization at the plant level, and yet a marked degree of diversification at the company level. In 1965, about 1,000 large companies operated 16,000 plants and 87 per cent of them produced three products or less. See Charles H. Berry, "Corporate Bigness and Diversification in Manufacturing", Ohio State Law Journal, Vol. 28, No. 3, Summer 1967, reprinted as Brookings Reprint 139, pp. 402-426, esp. pp. 417 and 424.

through production lines, less specialization in labour functions, slower speeds of machines than they are capable of achieving under long sustained production runs, and seasonal or other periods of slack.

Unfortunately, no readily available statistical information exists on the extent of specialization and diversification in manufacturing in the two countries. In the past, this has precluded good analysis about the effects of the length of production runs on costs and productivity for the United States and Canada. As a basis for this Study, it was therefore necessary to accumulate additional basic information. This was accomplished through the interviews with business firms in Canada aimed at gathering new information of both a quantitative and qualitative nature on the effect of production specialization and the length of production runs on costs, productivity and competitiveness. When the survey was originally designed, a fairly wide variety of industries was selected, in the expectation that important differences would be found between one type of industry and another in respect of the influence of production runs. However, on the basis of the information which has been collected, the limited extent of specialization has turned out to be not only an important, but also a pervasive, factor adversely affecting costs and productivity in manufacturing in Canada.

Many factors have apparently combined to produce and maintain this relatively limited extent of specialization within Canadian manufacturing plants. Among these have been:

-- Canada's commercial policy, which was historically designed, to a considerable extent, to foster a wide diversity of manufacturing activity in Canada;

-- tariffs and other trade barriers in foreign countries which have inhibited greater specialization in Canadian manufacturing on the basis of larger markets (foreign plus domestic);

-- fears and risks, even in situations in which greater penetration of foreign markets would have been economically feasible on the basis of greater specialization under existing conditions, that foreign trade barriers would be raised to prevent successful expansion of sales to these markets;

-- various factors inhibiting flows of products within Canada, including some policies and practices of provincial and municipal governments having "compartmentalizing effects" on the production and marketing of various goods;

-- production and marketing conceptions and practices, at least in some areas of production, favouring a relatively wide diversification of product lines rather than greater specialization of production;

-- uncertainty about the applications of restrictive trade practices policies, tending to restrain greater rationalization and specialization in Canadian manufacturing; and

-- factors tending to limit the infusion of new initiatives towards greater specialization in the economic system via the activities of smaller and new firms (such firms, for example, encounter relatively much greater difficulty in getting access to financial resources in Canada than in the United States,

especially in the form of long-term funds and equity resources).

Other factors, such as management differences, were also mentioned, but it is still not possible to assess the relative importance of the different influences in a completely satisfactory manner. It is planned to examine these other areas and their interrelations as part of future work by the Council.

In the light of this initial review of the structure of industry and markets, we consider next the influence of these factors on costs.

Principal Cost Factors in Manufacturing

In turning to the relative importance of various elements of costs to the manufacturer, it is important to realize the very high proportion of total costs accounted for by purchases of materials and components from other Canadian and foreign producers. These purchases account for about two-thirds of total costs in Canadian manufacturing (Table 1), reflecting the tremendous volume of intercompany purchases and sales that take place in modern, complex, interdependent production processes.

The share of total costs that are internal to the firm or plant are only about one-third of total costs in manufacturing. These internal costs consist of payments for labour and capital -- the factors that correspond roughly to "net value added" in manufacturing. Direct labour costs represent only slightly over one-fifth of total gross costs, and capital costs represent only about a tenth of the total (Table 1). When purchases from other industries are excluded, however, direct labour costs represent a substantial proportion of net value added in manufacturing -- in fact close to two-thirds of the latter.

Table 1

Distribution of Manufacturing Costs, Canada, 1949

	Producers' Prices (Millions)	Per Cent Distribution	Comparable Rows in Input-Output Table
Purchases from Primary Industries	1,661	13.9	1- 6
Purchases from Manufacturing	2,515	21.0	7-36
Purchases from Other Domestic Industries	2.012	16.8	37-43
Purchases from Abroad	1,584	13.2	44
Indirect Taxes less Subsidies	167	1.4	45-46
Sub-total	7,939	66.3	47

Wages, Salaries and Supplementary Labour Income	2,609	21.8	48
Investment Income	933	7.8	49
Net Income of Unincorporated Business	160	1.3	50
Capital Consumption Allowance	332	2.8	51
Gross Domestic Product at Factor Costs	4,034	33.7	52
Total Input	11,973	100.0	53

Source: Supplement to the Inter-Industry Flow of Goods and Services, Canada, 1949, Ottawa, Dominion Bureau of Statistics, 1960, Table 1 inside back cover. The last column shows the rows in that table which have been combined.

Scale and Specialization

These general patterns of costs are also reflected in the U. S. input-output table.[1] The importance of material costs also emerged in the study undertaken by the National Industrial Conference Board, covering 45 similar products produced in both the United States and Canada.[2]

It might also be noted that a number of studies have pointed out the relatively small importance of interest charges in relation to total costs and revenues. For example, in 1960 total interest payments by manufacturing firms in Canada (covering bond, mortgage and other interest paid) totalled $213 million, compared with total revenues of almost $25 billion.[3]

A comparison of individual items of costs per unit of output between Canada and the United States is made more complicated by the marked differences in prices of materials and factors facing the individual manufacturer in each country. Some rough indications of these differences can be seen in Table 2. The difference in the costs of labour and machinery and equipment are particularly marked.

---

[1] Survey of Current Business, Washington, U. S. Government Printing Office, November 1964, Table 2, pp. 22-25. Industries 14 to 64 cover manufacturing.

[2] T. R. Gates and F. Linden, Costs and Competition: American Experience Abroad, New York, National Industrial Conference Board, 1961, p. 22.

[3] D. J. Daly, "The Scope for Monetary Policy -- A Synthesis", in Conference on Stabilization Policies, Economic Council of Canada, Ottawa, Queen's Printer, 1966, p. 6, and sources referred to in footnote 1, p. 6.

The cost of an hour of labour time in Canada relative to a unit of machinery and equipment is thus about two-thirds of its cost in the United States, a very significant difference. In the United States, there has been a major decline in the cost of machinery and equipment compared to labour over the last four decades or so.[1/]

Table 2

Comparative Material and Factor Prices,

Canada and United States, 1965
(U. S. = 100)

1.	Average hourly earnings in manufacturing	81.
2.	Machinery and equipment prices	125. 6
3.	Long-term corporate bond prices	123. 2
4.	Selected materials prices	120.

Source: 1. Average hourly earnings of male workers in manufacturing from establishment data. No allowance for differences in education have been made.

2. D. J. Daly and D. Walters, op. cit., Appendix Table.

3. Based on Moody's AAA and McLeod Young Weir industrial bond yields.

4. Based on median difference of material costs from responding companies in Appendix Table.

[1/] W. E. G. Salter, Productivity and Technical Change, Cambridge, Cambridge University Press, 1960, pp. 35-38, especially the tables on p. 37.

Scale and Specialization

The cost of labour relative to machinery in Canada in 1965 was in about the range that prevailed in the United States about 25 years earlier.[1/] In discussing the possible effects of this difference in costs in the two countries, a recently published study notes:

> "Three choices are open to firms in a Canadian industry as they seek to invest in plant and equipment that will minimize the costs of production at a given scale. The first is to incur the fixed costs of designing based on present knowledge and appropriate to Canadian relative factor prices. The second is to adopt the United States techniques even though they are not exactly suited to domestic factor prices owing to the higher price of labour relative to capital in the United States. The third is to adopt the old techniques of the United States which are appropriate to present Canadian relative factor prices, but are based on a backward state of knowledge.[2/]

If the costs of designing were low, these differences in machinery and labour costs would be reflected in a lower quantity of capital per worker in Canada than in the United States. However, the interviews with manufacturers frequently referred to machinery being imported, and the import statistics indicate a significant import content in machinery and equipment. Furthermore, a

---

1/ This is based on changes in average hourly earnings in the United States and changes in the implicit price index of producers' durable equipment from the U. S. Survey of Current Business along the lines used by Salter. The ratio of hourly earnings to producers' durable prices was about the same in the United States in 1939 as in Canada in 1965.

2/ Eastman and Stykolt, The Tariff and Competition in in Canada, op. cit., pp. 44 and 45, et seq.

fairly careful comparison of the stock of capital in Canadian and U. S. manufacturing suggests about the same quantity of machinery and equipment per employed person, and an even larger quantity of construction in Canada.[1/] It is possible, however, that machinery is kept in use for a longer period in Canada, contributing thereby to the continued operation of older and less efficient machinery than being employed currently in the United States.

A significant number of companies were able to provide us with estimates of manufacturing costs for the same item in both Canada and the United States, with a breakdown between material costs, labour and overhead costs per unit of output. Details for 31 items are shown in the Appendix Table. Of these items, over half had total costs 20 per cent or more higher than the same item in the United States, and 25 per cent had costs that were more than 35 per cent higher in Canada. On the other hand, only five products were produced at lower cost in Canada.[2/]

1/ Daly and Walters, op. cit., Table 14. This is based on gross commercial capital stock per person employed and takes account of the differing Canadian-U. S. price relatives. Later calculations by D. Walters on a net stock basis tend to raise the Canadian estimates relatively even more. See also Wonnacott and Wonnacott, op. cit., pp. 182-188.

2/ All of these comparisons are based on the domestic currencies of the two countries, which is appropriate when using these data for value, price and quantity comparisons for the two countries as developed in Part II, Section 1. On the other hand, if the comparisons are to be used for comparison of the competitive position in the two countries, consideration would also have to be given to the differences in the exchange rate, transportation costs and tariff and other trade barriers. The emphasis of this Study is limited to the former objective, although Section 6 raises some of these other issues.

Scale and Specialization

In the interviews, some of the reasons for the marked differences were explored. The following are some of the more frequently encountered reasons provided; more detail is provided in the individual industry write-ups in Part III of this publication.

The Canadian tariff was frequently mentioned as an important factor contributing to the higher costs of manufactured products in Canada than the United States. This occurred particularly in discussions of the costs of materials and components and the costs of machinery and equipment.

As already noted, the cost of purchased materials and components represents a very high proportion of total gross costs in Canadian manufacturing, and for most individual manufacturing industries and products. The laid-down price from the United States or some other country provides an upper limit on the price that a Canadian manufacturer could consistently charge. This upper limit is the foreign price, plus transport costs, plus tariff, allowing for an adjustment for the exchange rate.[1/]

A number of examples have been encountered where Canadian manufacturers' prices are lower than this upper maximum. Primary steel is an example in which there has been a major narrowing between Canadian and U. S. prices in recent years, with the Canadian price now less than the U. S. landed price. Some of the fine papers also sell below this maximum. Automobile prices were below this maximum, especially in 1964,[2/] and further examples are encountered in the recent study by Eastman and Stykolt.[3/] Furthermore, prices of manufactured products

---

1/ Eastman and Stykolt, op. cit., pp. 22-25.

2/ Wonnacott and Wonnacott, op. cit., Chapter 13.

3/ Eastman and Stykolt, op. cit., Part II.

in Canada have not increased by the full extent of the devaluation that took place between 1960 and 1962. These examples should caution one against thinking that all products are priced right up to the maximum laid-down price from other countries. It might be noted that a number of firms mentioned that prices of products based on Canadian natural resources are sometimes higher to Canadian purchasers than to U. S. buyers, even for similar quantities. Examples in this category include aluminum and copper rod, and are referred to in Part III.

A number of companies emphasized the relatively high costs of machinery and equipment in Canada, in discussing overhead costs. There were a number of examples of differences in the range of 20 to 35 per cent higher costs for similar capital items in Canada than in the United States. The factors generally cited for the higher costs in Canada were the Canadian tariff and sales tax. The Canadian tariff rate varies depending on whether a comparable item is ruled "made in Canada" or not, and whether the supplying country is entitled to the British Preferential or the Most Favoured Nation rate. Before the Kennedy Round, duties ranged between 10 and 20 per cent of import value with a number of MFN rates of 22.5 per cent.[1/] This is one of the areas subject to major reductions as part of the Kennedy Round of tariff negotiations. The Canadian reductions of duty on machines were effective January 1, 1968, with an undertaking that the average level of Most Favoured Nations' duties (net of remissions) will not exceed 9 per cent. The British Preferential rate is 2 1/2 per cent (also with provision for duty remission for machines not available from Canadian sources). Virtually all machinery and equipment was also subject to a federal sales tax for a few years, but this has now been removed. These reductions in both tariffs and sales tax

---

[1/] H. E. English, op. cit., pp. 21-28, especially Table 8.

should contribute to a significant reduction in the disparity in prices of such goods between Canada and the United States.

Another important factor emphasized by many companies was the wide range of products produced, and the short runs to which this product diversity contributed. This was reflected in the discussion of high costs for materials and components, output per worker and overhead costs. This factor is related partly to the influence of the tariff, which makes it both possible and profitable to produce a wider range of products than would be feasible with levels of manufactured goods prices closer to those prevailing in the United States. Short production runs involve frequent changes in production scheduling for individual products, which lower the volume of output that can be achieved with a given machine and a given number of workers. In some cases, machines and equipment are purchased for short runs, and this raises these fixed costs per unit of output produced. These short runs contribute to less effective and efficient use of labour and capital in production, by affecting many aspects of the way in which production is organized, including the ordering, scheduling and storage of the wide range of items produced. Recent work on production costs has emphasized the improvements in productivity through "learning by doing", but the diversified production pattern in much of Canadian secondary manufacturing limits the scope for this. Many of the companies interviewed were aware of these tendencies, both in their supplying firms in Canada and their own operations. In the light of the emphasis on these matters in the interviews, a fuller discussion of the effects of specialization on productivity and costs is included in Section 4, with some discussion of why such production practices persist, and how tariff reductions could facilitate and encourage greater specialization.

The size of equipment and size of plant were also mentioned in some interviews, but these were generally given less emphasis than the effects of tariffs and

specialization. The size of equipment was indicated in some of the interviews to be a significant factor affecting efficiency in the fine paper, steel, and chemical industries. Efficient plant size has been given considerable emphasis by Eastman and Stykolt. They have compared actual plant size for selected industries (with regional breakdowns where appropriate) with the plant size that would give the lowest average cost, and frequently found the capacity of Canadian plants to be below the optimum.[1/] Another recent article uses data from engineering studies to explore the effect of scale of installed plant and other equipment on average cost, indicating that important economies of scale emerge from this type of data.[2/]

In addition, a number of other factors emerged in the interviews conducted for our Study or in discussions of earlier drafts of it. High seasonality in some parts of Canadian manufacturing affects costs. For example, in the case of cement and building materials, higher manufacturing costs emerge if production is concentrated in the summer months, and greater capacity is necessary to meet the seasonal peaks in demand. In the case of manufacturing production as a whole, the over-all size of seasonal variations appears to be about twice as large

---

1/ Eastman and Stykolt, op. cit., passim. Only a few industries in the Council survey were also covered in their volume. These included consumer durables and rubber tires; cross-references to these are included in the industry notes later in this Staff Study. In the steel and newsprint groups, their studies were very thorough, but emphasized primary steel and newsprint in which Canadian output is specialized rather than steel products and fine paper in which production is more diversified and short runs are more common.

2/ John Haldi and David Whitcomb, "Economies of Scale in Industrial Plants", Journal of Political Economy, August 1967, pp. 373-385.

in Canada as in the United States. In some cases it was also indicated that plant costs are higher in Canada than in the United States, apparently mainly as a consequence of the greater severity of Canada's winter climate. The degree to which production is operating close to designed capacity is also a factor. Productivity typically declines if low demand is reflected in production being curtailed below efficient operating levels. Higher costs of borrowed funds were also mentioned by several companies as a factor contributing to higher overhead costs in Canada (see Table 2, p. 29). Although higher interest rates generally prevail on long-term borrowing in Canada, interest charges typically only amount to a fraction of 1 per cent of total costs of manufacturing, and this difference in interest rates does not appear to be an important consideration as a general rule. (There has not yet been any study of differences in equity costs in manufacturing in the two countries, and little discussion of this occurred in the interviews.)

Census data in the two countries indicate that the level of formal education of managers is lower in Canada than in the United States, but this evidence and its significance in the performance of management requires further study. It has also been suggested that differences in attitudes and the "tempo" of work may be factors, but that these are perhaps not independent from other factors such as training, managerial know-how, degree of mechanization, and length of production runs.

In brief, although there appear to be some interesting and significant differences in the quantity and quality of productive resources employed in the two countries, the results to date suggest that the lower levels of productivity in manufacturing (and the higher levels of total costs per unit of output) in considerable part reflect the way in which production is organized -- diversification, scale of operation, mechanization, technology, efficient use of resources, management, morale, and attitudes.

The statistical measures should not be taken as a reflection on the energy, basic ability or enthusiasm of Canadians.

In summary, the interviews turned up a number of factors that were considered to contribute to the higher levels of costs and prices and lower levels of output in relation to inputs in the production of manufactured products in Canada compared with the United States. Although this Study has concentrated on manufacturing, these results also have implications for other sectors of the economy.

The higher prices for manufactured products have, in turn, implications for other industries. For example, the resource industries (including forest products, metals and petroleum) have to pay more for their purchases of manufactured items. This becomes an item in their costs, and may limit their ability to compete with producers of the same product in the United States who pay less for inputs of manufactured products.

This Study was designed to shed light on the relative costs of producing goods in Canada and the United States. There are, in addition, other elements of the total cost structure that, although not covered by this inquiry, should be borne in mind. One of these is the cost of physically distributing the product from the manufacturing plant to its point of consumption; the other is the cost of such sales stimulants as advertising and direct selling.

While manufacturing facilities are highly concentrated along a narrow band close to the U. S. border between Windsor, Ontario, and Quebec City, the Canadian market is scattered throughout the commercially developed portion of the country that extends about 4,000 miles from east to west, and some 100 miles north of the U. S. border.[1/]

[1/] T. C. Taylor in I. A. Litvak and B. E. Mallen (eds.) Marketing: Canada, Toronto, McGraw-Hill, 1964, p. 43.

Scale and Specialization

Expensive distribution facilities such as warehouses and branch offices are thus required to provide service to far-flung centres of population that are not large enough to make optimal use of such installations. In addition, long hauls result in high freight charges. Per unit costs climb as a result of such conditions.

Advertising messages must be tailored to Canada's bicultural nature. Regional differences in tastes and needs make an appeal that is effective in one area inappropriate in another. One newspaper or television announcement in New York City can reach a group of people almost as large as the entire Canadian population. These factors combine to contribute, with others, to relatively high selling costs in Canada.

While they are not directly connected with the production costs that form the focal point of this Study, sales and distribution costs are very probably higher in Canada than the United States, and thus contribute to higher selling prices for manufactured products to the consumer.

Although the interviews for this Study have helped to shed light on the factors affecting productivity performance, it is important to emphasize that much still remains to be learned about the relative importance of different factors, and about how these act and interact together to bring about changes in productivity levels in manufacturing in the two countries. There is a need for considerable further study in this field. It is also important to note that the effects of other industries on the over-all cost and competitive position of manufacturing have not been explored. Transportation and selling costs on both material inputs and outputs may have some relevance to the competitive situation in manufacturing industries. These interrelations of various influences within manufacturing, and their relation to other industries, have not been explored systematically in this initial Study.

The Influence of Production Runs on Unit Costs

Earlier parts of this Study have dealt with factual comparisons of costs in Canadian and U. S. manufacturing companies, and have suggested some reasons for such differences. An important source of data was the cost accounting records of the companies. In this section, attention is shifted from the current records of costs to what would happen to Canadian costs with greater specialization. The appraisal of costs under such circumstances requires the knowledge of management analysts, engineers, and others able either to draw on relevant past experience of other companies in Canada or abroad, or to visualize operations under significantly changed conditions. We were unable to obtain as much firm evidence on the quantitative effects of specialization and longer runs under different conditions as we were able to obtain on accounting records of present costs. On the other hand, there was almost universal recognition of the importance of this question and widespread agreement that longer runs would narrow the productivity differences between Canada and the United States to a significant degree.

Before turning to the factual evidence, it is useful to summarize some of the work by economists on this question of specialization. It might be noted that there is only a limited amount of discussion of length of run and specialization in current work in economic theory (either in work on cost curves and supply curves or in international trade), but there has been a general recognition of the importance of this point since the latter part of the eighteenth century. It has naturally been given more emphasis by those economists who were interested in using the tools of economic theory to throw light on practical problems.

A recognition of the importance of specialization goes back to Book I, Chapter I, of the Wealth of Nations by Adam Smith:

"... The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is any where directed, or applied, seem to have been the effects of the division of labour....

"To take an example, from a very trifling manufacture; but one in which the division of labour has been very often taken notice of, the trade of the pin-maker; a workman not educated to this business (which the division of labour has rendered a distinct trade), nor acquainted with the use of the machinery employed in it (to the invention of which the same division of labour has probably given occasion), could scarce, perhaps, with his utmost industry, make one pin in a day, and certainly could not make twenty. But in the way in which this business is now carried on, not only the whole work is a peculiar trade, but it is divided into a number of branches, of which the greater part are likewise peculiar trades. One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on, is a peculiar business, to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into about eighteen distinct operations, which, in some manufactories, are all performed by distinct hands, though in others the same man will sometimes perform two or three of them....

"This great increase of the quantity of work, which, in consequence of the division of labour, the same number of people are capable of performing, is owing to three different circumstances; first, to the increase of dexterity in

> every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many."[1]

A similar recognition and emphasis on this point is given by Alfred Marshall in his Industry and Trade. He gives examples from steel, construction, munitions and aircraft engines for the United States that reflected a recognition of the importance of this point almost 50 years ago.[2]

However, a review of recent theoretical literature on the firm and industry has thus far turned up very little recognition or emphasis on the relevance of this topic in the context of the modern industrial society. Moreover, discussions with a number of university teachers of economics has tended to confirm the fact that professional economists appear to be devoting little, if any, careful attention to this matter in the field of economic theory today. The area of product differentiation (which is related to specialization and diversification) has received considerable attention since the 1930's. However, the major interest of Edward Chamberlin and others who

---

[1] Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, New York, Modern Library edition by Random House, 1937, pp. 3, 4, 5 and 7. The quotation refers to specialization of function for different workers within a plant. For more complex products, some of this specialization now takes place in different plants.

[2] Alfred Marshall, Industry and Trade, London, Macmillan, 1919, pp. 221-228.

have been concerned with this subject has been on the effects of product differentiation on the position and shape of the demand curve for particular products. Chamberlin, for example, discusses the effects of product differentiation on advertising and selling costs, but does not really deal with the possibility of product differentiation raising the whole level of the production cost curve.[1/]

Over the last decade, an increased interest has emerged among a number of economists in California about the effect of length of run on costs. Some of this interest emerged out of the discussion of "learning by doing", and has been tested and developed in cost studies of individual firms in the airframe and other local industries. Learning by doing helps throw light on why there can be a persistent long-term growth in output, using essentially the same levels of inputs of labour and capital.[2/] Alchian and Hirshleifer have carried this further in making a sharper distinction between the effects of the total volume of output of a product over an extended period, and the quantity produced in a particular period of time, or the rate of output. A central point is that marginal cost increases with the rate of output, but declines with a higher volume of output. This basic distinction is illustrated with examples from costs for bookprinting, airframes, telegraph companies, electric power, airlines, hotels, quantity discounts and size of shipments.[3/]

1/ Edward Chamberlin, The Theory of Monopolistic Competition, Cambridge, Harvard University Press, Third Edition, 1938.

2/ K. J. Arrow, "Economic Implications of Learning by Doing", Review of Economic Studies, 1962, pp. 155-173.

3/ A. Alchian, "Costs and Outputs" in M. Abramovitz and others, The Allocation of Economic Resources: Essays in Honor of B. F. Haley, Stanford, Stanford University Press, 1959; and Jack Hirshleifer, "The Firm's Cost Function: A Successful Reconstruction?", Journal of Business, July 1962, pp. 235-255.

These same notions on costs have been related to "progress functions", which have been used in engineering cost studies in particular firms.[1] Professor Keachie has used these ideas as a basis of a pamphlet designed to help small firms estimate costs for tendering, etc., which contains an extensive bibliography in the field.[2] This Study contains a number of examples of cost reductions associated with increases in the size of orders and the length of production runs. All of these studies throw light on the relationships between quantities produced and manufacturing costs, and thus clarify and put in a broader perspective the factual material on specialization and length of run for Canadian manufacturing. The main point of this discussion is that there is a good deal of evidence and analysis to support the views of Canadian businessmen about the cost implications of product diversification or specialization, and that there has been a long and respectable history in economics on this subject.

In the interviews conducted for this Study, considerable evidence was accumulated about differences in costs for a significant number of individual commodities. The factual evidence on the higher level of manufacturing costs and prices in Canada than in the United States was summarized in the previous section. The interviews also explored with businessmen why costs were higher in Canada. Short runs were claimed to be a major factor in many companies in a wide range of industries. The particular factors in different industries are discussed in Part III. In a number of companies some discussion took

---

1/ L. E. Preston and E. C. Keachie, "Cost Functions and Progress Functions: An Integration", American Economic Review (A. E. R.), March 1964, pp. 100-107.

2/ E. C. Keachie, Manufacturing Cost Reduction Through the Curve of Natural Productivity Increase, Berkeley, University of California, Institute of Business and Economic Research, 1964.

place about what would happen to the levels of output (with the same labour and machinery as currently being used) if production runs could be more specialized and longer. A substantial number of company officials concluded that, in such circumstances, output could be increased and that the extent of increase would be appreciable -- in some cases, even dramatic. One steel official indicated an example of a particular product for which output could triple if the length of the typical U. S. production run could be produced in the existing Canadian facilities with the same labour force. Another example of an indicated tripling of output emerged in an interview with officials of a firm producing paper products.

These results raised a new type of question. It was quite apparent that the Canadian company officials were aware, both in general terms and in detail, with the techniques used in the United States, and that there were no engineering or technical problems that prevented the same production procedures being used by the Canadian firm. Why did Canadian firms not specialize more, on their own initiative, and benefit from the reductions in costs that would follow from this?

One consideration is that these dramatic increases in productivity for particular products may have a relatively modest impact on the total costs of that firm. This would arise in the cases in which the costs of producing a particular item within a firm are a small part of total costs. This occurs if the purchases of materials and other services from other industries have a significant effect. For example, for a firm in which internal costs were 30 per cent of total costs, a <u>doubling</u> of productivity, even for all products of that firm, would only reduce the total costs by 15 per cent, assuming that prices of materials remain unchanged. The data from the input-output matrix summarized in Table 1 illustrate the general importance of such purchases from other industries. This discussion suggests that one firm acting in

isolation to achieve greater specialization and increased productivity is likely to have only a limited influence on its total costs.

A further consideration is the extent of the effect of productivity improvement, along with lower levels of production costs, on sales. If the lower level of costs is passed on to the buyer, the extent of the effect on sales will depend on the elasticity of the demand for that product. It is not easy to judge the elasticity of demand for a product, and it requires a view about the response of competitors to price cuts initiated by the firm shifting to more specialization. It is conceivable that if the demand curve is fairly inelastic, the price reductions necessary to sell the additional output arising from specialization could be greater than the associated reductions in cost. Some of the companies appeared to have this sort of result in mind. In other words, the attempt to cut costs by specialization could result in lower, rather than higher, profits. The extent of this result is uncertain, of course, but it is clear that the change would involve problems and risks for the initiating firm. One can understand why the firm may be cautious to move out of an assured and profitable situation under these circumstances.[1/] It is conceivable that a number of firms in an industry might agree to specialize to reduce costs, but we have not encountered any examples of this. Some businessmen have observed that this would involve agreements in the domestic market and are uncertain whether this would be regarded as a restraint on competition under Canadian law.

It should be noted that the situation could be quite different in a situation of a substantial, across-the-board,

---

1/ For a fuller discussion of these questions for the automobile industry, see Wonnacott and Wonnacott, op. cit., pp. 235-245.

multilateral reduction in tariffs. The company would then have less choice as to whether it would specialize and reduce the range of products it is producing. The reduction of tariff rates would tend to encourage a lowering in prices of manufactured products, and some lines that become less profitable would be dropped. At the same time, improved access to export markets would broaden the opportunities for expanding the production and sale of relatively more profitable lines. In addition, it would no longer be a situation in which one firm would be acting alone; as all his suppliers of materials would also be moving in the same direction, the total cost of the product would be reduced by the cost reductions in materials inputs as well. Furthermore, the cumulative effect of increased productivity levels and price reductions for manufactured products would have a stimulative effect on the demand for manufactured products. In other words, the desire to remain profitable would provide a greater incentive to become more productive with tariff reductions than with a continuance of the high tariff rates on manufactured products that Canada has had historically. In fact, the past level of high effective tariff rates has made it both possible and profitable to produce items using much more labour and capital than were being used by comparable U. S. plants. In the light of the importance of the tariff in the company interviews, this will be discussed more fully in the next section.

Much of the preceding discussion has dealt with the effects of greater specialization by individual firms on the productivity gap between Canada and the United States. The conclusion from the Study as a whole is that this would lead to a narrowing of the gap. This has important implications for trade in manufactured products and the balance of payments. At present, the generally higher level of prices of finished manufactured products in Canada than in the United States tends to limit the export of such products to a limited range of items. Manufactured end products are a much smaller share of Canadian exports than in other industrialized countries, but their importance

has grown significantly in the 1960's, partly due to the devaluation in the early 1960's and a number of special influences. On the other hand, imports of a wide range of products take place, even with a high level of effective tariff rates and the value of the Canadian dollar that has prevailed since 1962. A greater degree of specialization in manufacturing would increase the two-way flow of trade, but a narrowing of the price and productivity differences between the two countries would operate in the direction of a greater stimulus to exports than to imports of manufactured products. The extent of tariff reductions by the United States and other countries as part of the Kennedy Round reductions will make access for manufactured products by Canadian producers to foreign markets much more open than previously. High costs and prices and low productivity in Canadian manufacturing could still continue to be an important limiting factor on further increases in exports of manufactured products.[1/] Bearing in mind the large excess of imports over exports in manufactured products, a narrowing in the price and productivity differences could have important implications for the structure and even the level of the Canadian deficit on merchandise trade and on the balance of payments as a whole.

Evidence on Specialization for Other Countries

In the light of the emphasis on intra-industry specialization that emerged in this study of Canadian and U. S. manufacturing, some review of the literature relating to Europe was begun. It is intended to be illustrative, rather than exhaustive, and to indicate the potential relevance of these ideas to other situations. The discussion will be limited to material published since the Second World War.

1/ See Wonnacott and Wonnacott, op. cit., Chapter II, pp. 167-213, for a discussion of the wage, price and exchange rate implications of free trade between Canada and the United States.

Scale and Specialization

At the end of the Second World War, the British Productivity Council was organized with the co-operation of the United States to assist in the spread of information and adoption of techniques that were being used in the United States. About 70 teams were organized, primarily in manufacturing, with a few on agriculture and building. Most of the teams were organized on an industrial basis, but there were about 20 specialist teams in such fields as materials handling and training. A book was prepared by Graham Hutton, developing the broad implications for Britain of the experience of the productivity teams in comparing American and British industrial efficiency. Hutton has summarized the effects of simplification, standardization and specialization as follows:

> "Mass-production, smooth 'long-runs', assembly-line methods, pre-planning of production, high utilization of machinery, quick writing-off and replacement of equipment -- all these conditions of low unit-costs demand in their turn three special factors. These are Simplification, Standardization, and Specialization. They are the three charmed 'S's' of high productivity. They are equally applicable to materials, to machines, to motive power, and (through training, and breaking-down of tasks and skills) to men: indeed, to management as well as to work-people. As so many of the A. A. C. P. Teams refer enthusiastically to the effect of these 'three S's' in achieving the peaks of American productivity, it is worth first examining them in connection with the highest possible utilization of machines and equipment. 1/

1/ Graham Hutton, We Too Can Prosper: The Promise of Productivity, published for the British Productivity Council, London, Allen and Unwin, 1953, p. 96 and ff. For an example of similar emphases in a particular industry report, see British Productivity Council, Industrial Engineering, London, 1954, p. 28.

A study has also been undertaken by Dr. Easterfield on the effects of standardization "with a view towards estimating the economic effects of reduction in variety and increase in batch size or length of production run.... In the cases studied (a firm of dyers, a firm of engineers, two sets of costing for cotton cloth, and experience of aircraft production during the war), increase in size of order and concentration on a smaller range of products has in all cases led to an increase of output per man and a decrease in costs."[1/]

Marvin Frankel discussed the effects of specialization in comparing the contrasts between British and American productivity in manufacturing:

> "...Where, for a given product group, a highly differentiated market structure has evolved, realization of high productivity levels will prove difficult. There are two facets to this problem. First, although firms (or plants) might specialize, each producing one or a few varieties of a product, the profusion of varieties might result in markets for each firm that would be too small to justify the use of highly laborsaving techniques. There would, in this situation, be more firms in the industry than would be required with a more uniform product structure. Second, although the market for each firm might be reasonably large, a need by each to manufacture a product in several different forms could likewise restrict the use of laborsaving methods. The result in both cases would be relatively low output per worker.

1/ T. E. Easterfield "Standardization as an Aid to Productivity", Productivity Measurement Review (OECD), June 1962, p. 6.

Scale and Specialization

> "The problem of product differentiation is relevant not only to markets for final products but equally to intermediate producers' markets. If the demand for semiprocessed raw materials, for components, or for machines is structured and variegated rather than reasonably standardized, the suppliers of these items will experience the same handicaps as suppliers of finished consumers' goods."[1/]

Professor Verdoorn dealt with this same area in discussions at an international conference:

> "Professor Verdoorn suggested that differences in production methods between America and Europe lay not so much in the size of the firm or of the plant, as in the length of the individual production run. The diversity of technical processes carried out in the same plant was much smaller in America than in Europe. Apart from static effects on productivity, the length of the production run also had a dynamic influence. According to the 'learning' or 'manufacturing progress' curve, productivity per man-hour increased as a function of total accumulated output since any process started. Many processes showed a 20 per cent gain in productivity if accumulated output doubled. The diversity of processes in an American plant was much smaller than in Europe so that, even with equal total output per firm, the length of the average production run would be much greater. This

---

1/ Marvin Frankel, British and American Manufacturing Productivity, Urbana, University of Illinois Bulletin, 1957, pp. 72-73 et. seq.

> fact might well account for a considerable part of the differences in productivity. "[1]

Bela Balassa has studied the scope for intra-industry specialization in trade in manufactures among the European Economic Community as tariffs were reduced between 1958 and 1963:

> "The results point to the importance of intra-industry specialization in trade among industrial countries and provide support to the hypothesis that trade liberalization would result in intra-industry rather than interindustry specialization.... It would appear that the difficulties of adjustment to freer trade have been generally overestimated." [2]

He pointed out that bankruptcies have declined and unemployment has been low during the period of tariff reductions.

Herb Grubel has also emphasized the importance of intra-industry specialization in the European Economic Community.[3] He shows that the tariff reductions within the EEC have been reflected in an increased two-way flow of trade between individual countries at a fine level of international trade in manufactured products and draws some policy implications from the results:

---

[1] In E.A.G. Robinson, (ed.) Economic Consequences of the Size of Nations, London, Macmillan, for International Economic Association, 1960, p. 346.

[2] Bela Balassa, "Tariff Reductions and Trade in Manufactures among the Industrial Countries", A.E.R., June 1966, pp. 471-472.

[3] Herbert G. Grubel, "Intra-Industry Specialization and the Pattern of Trade", C.J.E.P.S., August 1967, pp. 374-388.

> "The models of intra-industry specialization presented above have some interesting implications for a variety of problems in international adjustment and politics. First, trade liberalization among countries with similar resource endowment and levels of development is likely to lead to only relatively minor quality or style specific capital losses by workers and capitalists. As an industry reacts to foreign competition as described in our model, it is normally relatively easy to shift skills and machines into producing the new lines of product as compared with the situation where inter-industry specialization requires shifting these resources into entirely new kinds of employment....
>
> "Second, the basic model of intra-industry specialization implies that the traditional measures of price elasticities seriously underestimate the increases in trade following multilateral trade liberalization." 1/

These references suggest that a number of studies of trade and productivity in European manufacturing have considered some of the same topics of specialization and diversification that have been covered in this Study of Canadian manufacturing. A common theme on the factual side is that greater product diversity contributes to higher cost and lower productivity. For those that deal with the tariff, the indications are that tariff reductions lead to increased intra-industry trade, increased productivity and generally only modest adjustments during the period of tariff reduction. This reflects a shift from the earlier analysis which put more

---

1/ Ibid., pp. 387-388.

emphasis on constant or increasing cost in manufacturing in studying European commercial policy.[1/]

The Influence of Tariffs and the Exchange Rate

Reference has been made in a number of preceding sections to some of the possible effects of Canadian tariffs. In the light of the emphasis given this factor as one that tends to increase costs and restrain productivity, and in view of the long history of the tariff in the development of Canadian manufacturing, some further discussion of the subject is appropriate. This discussion builds on

---

1/ For references to earlier studies by Viner, Scitovsky, Johnson and Meade, see E. F. Denison (assisted by J.-P. Poullier), op. cit., pp. 257-262; and Harvey Leibenstein, "Allocative Efficiency vs. 'X-Efficiency'", A. E. R., June 1966, pp. 392-415. The latter study is quite explicit in stating that "costs are constant within the relevant range" on page 395, an assumption frequently made. If costs can be significantly reduced by specialization, the effects of tariffs can be much greater than these studies suggest.

the interviews, and in addition incorporates points from other studies. 1/

A consideration of some of the effects of tariffs requires that a careful distinction be made between nominal and effective tariff rates. 2/ This is a crucially important distinction for the economic implications of tariffs. Nominal rates are simply the scheduled rates

---

1/ The following list of studies of the Canadian tariff is illustrative, but is not intended to be exhaustive. W. A. Mackintosh, The Economic Background of Dominion-Provincial Relations, Ottawa, Queen's Printer, 1940; O. J. McDiarmid, Commercial Policy in the Canadian Economy, Cambridge, Harvard University Press, 1946; Clarence L. Barber, "Canadian Tariff Policy", C. J. E. P. S., November 1955, pp. 513-530; Young, op. cit.; Stykolt and Eastman, "A Model for the Study of Protected Oligopolies"; English, op. cit.; Wonnacott and Wonnacott, op. cit.; Eastman and Stykolt, op. cit.; John Dales, The Protective Tariff in Canada's Development, Toronto, University of Toronto Press, 1967; and a number of studies sponsored by the Private Planning Association under the Atlantic Studies Program. The co-operation of the authors in making these studies available and discussing their results with staff members has been very helpful.

2/ The concept of effective protection was introduced into economic literature in 1955 by Barber, loc. cit. For a fuller discussion of concepts, estimates for Canada, and a full bibliography, see Special Study No. 9 cited below.

applied to goods which are imported into Canada. Effective rates measure the protection for an industry as it adds value to purchased inputs in processing its products, and takes account of differences in the tariff rates between the output and the inputs of that industry. If the nominal tariff rates on the finished product are substantially higher than the rates on the materials and components, the level of effective tariff can be quite high, especially if tariff-affected purchased inputs from other industries are a large part of total costs. Conversely, if the nominal rates on components and materials are high in relation to the rates on finished products, the effective tariff rates may be very low or even negative (the latter implying that producers may be operating under some disadvantage in relation to international competitors).

Quantitative estimates of effective tariffs have now been made for a number of countries.[1/] Two general

---

1/ W. M. Corden, "The Vernon Report: Reviews of the Report of the Committee of Economic Enquiry", Economic Record, pp. 129-148; W. M. Corden, "The Structure of a Tariff System and the Effective Protective Rate", J. P. E., June 1966; W. M. Corden, "The Effective Protective Rate, Uniform Tariff Equivalent and the Average Tariff", Economic Record, Vol. 42, June 1966; Giorgio Basevi, "The U. S. Tariff Structure: Estimates of Effective Rates of Protection of U. S. Industries and Industrial Labor", Review of Economics and Statistics, May 1966; G. Basevi, International Trade Restrictions and Resource Allocation in the United States, unpublished Ph. D. dissertation, University of Chicago, June 1965; R. Soligo and J. Stern, "Tariff Protection, Import Substitution and Investment Efficiency", The Pakistan Development Review, Summer 1965; Bela Balassa, "Tariff Protection in Industrial Countries: An Evaluation", J. P. E., December 1965. These references were helpfully provided by Professor Harry G. Johnson.

points emerge from the results to date. One is that the effective rates are significantly higher than the nominal rates for a large majority of specific manufactured products for all countries. Secondly, there is a considerable variation between the effective tariff rates for individual items.

A forthcoming study for Canada indicates that effective rates provided in Canada are fairly high, and substantially higher than nominal rates, for many manufactured products.[1/] This results from the typically lower tariff rates on raw materials and partially manufactured products than on finished products. The importance of imports as a source of supply is indicated by the extent of imported components and materials in Canadian manufacturing, and their importance in prices is illustrated by the influence of the landed price of imports (including the Canadian tariff) as an upper limit on the prices of similar products produced domestically. It should be noted that such estimates of effective protection give an indication of the levels of protection provided to individual industries, but some earlier examples suggested that the full extent of this protection has not always been used in Canada. Furthermore, more study and discussion of how the level of effective tariff rates affects prices, productivity and wages is still necessary.

The structure of tariffs may also have important effects -- particularly in the circumstances of generally much higher tariffs on highly manufactured goods in relation to raw materials, food, etc. Such a structure of tariffs influences the structure of relative prices, tending

---

1/ A forthcoming study prepared under the auspices of the Economic Council of Canada will provide some estimates of effective tariff rates in Canada. See James R. Melvin and Bruce W. Wilkinson, Effective Protection in the Canadian Economy, Special Study No. 9, Economic Council of Canada, forthcoming.

to produce a relatively higher level of prices of manufactured products than would otherwise have tended to prevail in relation to the prices of, say, foods and services. This pattern of relative prices tends to limit the market for manufactured products in relation to the market for other goods and services -- and therefore further restricts the extent of scale and specialization.

The effects of the tariff on the performance of manufacturing in the Canadian economy can be briefly recapitulated. The tariff leads to higher prices for materials, machinery and equipment (although the rates on the latter were reduced, effective January 1968) for a wide range of manufactured products. This makes it both possible and profitable for Canadian firms and plants to produce certain products in a wider range of sizes and qualities than would be possible with lower tariffs or free trade. The size of machinery and the size of plant that one might find it profitable to use in a small protected market could be less than in a larger and more competitive market. The effects of generally less machinery, smaller plant and more diversified product runs are reflected in a lower level of output in relation to inputs, as well as in higher prices of manufactured products, than in the United States. Also, under substantial effective tariff protection, the entry of new producers or the building of additional plants operated by existing firms may be reasonably easy.[1/] The workers in the protected industries need not be paid any more than other industries in Canada, and capital need not get a higher rate of return either. The effects of tariffs are thus likely to show up primarily in a lower level of output in relation to inputs than in the United States.

As long as significant effective tariffs persist, it is not profitable to shift towards more specialized and longer

---

1/ Eastman and Stykolt, op. cit.

production runs. In short, it is profitable for Canadian plants to be less productive than plants in the United States.

The results of the recent study by the Wonnacotts suggest that the effects of the U. S. and Canadian tariffs on the level of Canadian GNP are significant -- it is estimated that in 1958 Canada's GNP was about 10 1/2 per cent lower than it would have been in the absence of such tariffs.[1/] Since manufacturing is only a small part of the economy, the effects of the two tariffs on productivity differences between the two countries for manufacturing would appear to be very substantial.

The results of the Kennedy Round will lead to a significant reduction in the tariffs on industrial products for all the countries with which Canada trades. The reductions by the United States will be particularly significant for Canada, as a large part of the present exports will be entering the United States either on a duty-free basis or with quite low rates by the time the staged reductions have taken place early in the 1970's. Nominal rates in Canada will also be reduced, but it is likely that the reductions in effective rates will turn out to be less pronounced. These changes will provide improved potential access to foreign markets for Canadian manufacturers. However, the degree to which they can increase exports to the United States will be partly dependent on a narrowing in the cost and productivity differences between producers of similar products in the two countries.

It has long been recognized that the tariff increases the scope for monopolistic policies. The first anti-combines legislation was introduced shortly after Sir John A. MacDonald introduced substantial increases in tariff rates as part of the "National Policy" in the 1880's.

1/ Wonnacott and Wonnacott, op. cit.

The greater concentration of production among a small number of companies increases the risk of combination and agreements to set prices. The same limitations on price competition can occur, of course, without collusion, through such means as price leadership. The Combines Investigation Act provides for reductions in tariffs, and several investigations have recommended tariff reductions, but there have not, to our knowledge, been any instances in which tariffs have been reduced as a result of such recommendations. [1/]

The Exchange Rate

In the previous discussion of costs and average hourly earnings, Canadian data have been reported in Canadian dollars and U. S. data in U. S. dollars. All of the results of our survey relate to the period since the adoption of a fixed rate of exchange at $1.08 Canadian for $1.00 U. S. This brief section summarizes some of

---

1/ Lloyd G. Reynolds, The Control of Competition in Canada, Cambridge, Harvard University Press, 1940; Report of the Commissioner, Combines Investigation Act, Canada and International Cartels, Ottawa, King's Printer, 1945; Gideon Rosenbluth, Concentration in Manufacturing in Canada, Princeton, Princeton University Press, 1957; Stefan Stykolt, "Combines Policy: An Economist's Evaluation", C. J. E. P. S., February 1956, pp. 38-45; J. N. Wolfe, "Some Empirical Issues in Canadian Combines Policy", C. J. E. P. S., February 1957, pp. 113-121; and George W. Wilson, "Anti-Combines and Injury to the Public", C. J. E. P. S., February 1957, pp. 121-127; Stefan Stykolt, Economic Analysis and Combines Policy, 1965; Stykolt and Eastman, op. cit.

the implications of this exchange rate for prices and the competitive position of Canadian manufacturing.[1] Since this Study has been limited to the manufacturing sector, it has not been felt necessary to have a full discussion of the exchange rate and balance-of-payments aspects in this Study.

At the time of the devaluation of the Canadian dollar in the late spring of 1962, a number of prices of particular commodities responded sharply and quickly, with magnitudes of change roughly in line with the extent of the devaluation. These products were largely internationally traded items, whose prices are determined in the sensitive world markets for primary commodities.

On the other hand, prices of more highly processed manufactured products produced within Canada responded surprisingly little, bearing in mind the extent of the devaluation. These developments were pointed out in the Third Annual Review, pp. 95-97, on "The Effects of Exchange Rate Adjustments". The following sentences are especially relevant to prices of manufactured products:

> "...As long as there was a significant amount of slack in the economy as a whole, there was only a modest influence on prices and costs of items which were largely produced and consumed domestically. However, as the economy moved closer to full capacity, there was less scope to increase output rapidly from unutilized resources. The higher Canadian dollar prices of internationally traded items began to have a somewhat

---

[1] For a broader discussion of the post-war exchange rate history of Canada, see Paul Wonnacott, Canadian Dollar, 1948-62, Toronto, University of Toronto Press, 1965, and Royal Commission on Banking and Finance, Report, Ottawa, Queen's Printer, 1964, pp. 479-492.

> greater upward pull on costs and prices in other areas.... the surprising thing is not that prices in Canada rose relative to those in the United States, but that the extent of the relative rise in Canada took so long to develop and has been so moderate in relation to the initial devaluation."

The significant exchange devaluation over the period 1960-62 left Canadian secondary manufacturing in a very strong competitive position. The period from 1950 to 1962 of a higher value for the Canadian dollar had contributed to increased pressure on profit margins in a wide range of manufacturing. Increased pressures to drop low-profit items and increase productivity were experienced in many firms. These firms were ready to exploit the opportunities after the devaluation. Since devaluation, prices of manufactured products from other countries have become relatively more expensive to the Canadian producer, importer and consumer, compared with goods produced within Canada. On the other hand, a number of Canadian manufacturers have found it more profitable to export than previously, and this change has undoubtedly contributed to the dramatic and widespread increase in the volume of manufactured exports that has taken place over the last five years or so. Of course, part of the strength in exports of Canadian manufactured products in the 1960's reflects the vigorous and sustained growth in world markets over this period. Some special factors have also contributed to the over-all export upsurge -- such as the auto agreement and defence-sharing contracts. However, even after taking account of special factors, the Canadian manufacturing industry appears to have been in a generally stronger position to get a larger share of domestic and world markets than it has been for many decades (apart from the special circumstances of the immediate post-war period). However, now that a relatively high level of economic activity has prevailed for a number of years, the effects of devaluation are beginning to be reflected in more marked increases in prices and costs in Canadian manufacturing than in the United States.

PART III

INDUSTRY SURVEY

Our Study of manufacturing enterprises covered a total of eight industries including rubber, textile, paper, primary metals, metal fabricating, electrical products, petroleum and chemical. Reference to specific sub-groups such as household appliances, fine paper and steel will be noted in the text. Two major areas not covered are automobile and farm implement manufacturing. The picture in the automobile industry is influenced by the recent auto agreement, and the farm implement industry is currently under study by a Royal Commission. Also, processed agricultural and fisheries products are excluded.

Within the foregoing industries 44 companies were surveyed. In addition consultations were held with officials in the Department of Industry, the Department of Trade and Commerce, the Tariff Board, and industry trade associations.

In the discussions with company officials, particular attention was focused on the facts concerning comparisons of costs between Canada and the United States, the major reasons for differences, the effects of specialization on costs, and the influence of tariffs on costs, prices and specialization.

The reader's attention is drawn to a number of current studies sponsored by the Private Planning Association of Canada. For the most part they deal with the influence of trade liberalization on various specific industries or geographic regions. Of those which have particular relevance to this discussion of scale and

specialization is one published recently entitled Trade Liberalization and the Canadian Pulp and Paper Industry by W. E. Haviland, N. S. Takacsy and E. M. Cape. Two others in the course of preparation are Trade Liberalization and the Canadian Steel Industry by Jacques Singer, and Trade Liberalization and the Canadian Textiles Industry by Jacques Singer and Eric Sievwright.

Industrial Products

1. Chemicals

The chemical industry produces an enormous variety and complexity of products, and new ones are appearing continually. As a result, a very considerable amount of work is required before extensive conclusions can be drawn for the Canadian chemical industry as a whole. It does appear, however, that in spite of Canada having most of the basic raw materials to produce the complex range of chemical products which now enter commerce, the industry does not maintain, generally, any significant advantages in competing internationally except in the case of a few types of products. The industry, therefore, is oriented primarily towards serving the domestic market which in many instances is too small or too scattered to permit plants of the scale of the largest plants in the United States. This is particularly true because the domestic market frequently is being served by several plants.

An extensive study of Canadian chemical tariffs was completed recently by the Tariff Board in connection with Reference No. 120. While its focus was a review and possible revision of the Canadian tariff structure on chemicals, it was necessary for the Board to make a thorough examination of various aspects of the entire industry as background for eventual tariff recommendations.

The Tariff Board study points out that there are direct relationships between scale of operation, unit costs, and specialization of production, but these are not of the same order of importance for all products. For certain chemicals, particularly some plastics products, scale is not the overriding consideration and these products continue to be made in small plants. In these cases, specialization of production may be important, however.

The following excerpt from the Tariff Board report indicates the variety of factors and considerations which have come into play in establishing the existing structure of the Canadian chemical industry.

"Because of great distances, a policy of decentralization of plants to be near to centres of consumption is followed for some products and this policy naturally tends to result in relatively smaller plants. For many specialty products smaller plants may be more suitable and economical; for an integrated chemical complex larger plants will benefit from the greater volume if there are no offsetting diseconomies. However, optimum utilization of installed capacity plays an important part in the economies of production and failure to approach optimum utilization can be particularly serious in large plants. In this regard it is worth noting that economies of scale in producing some products are effectively lost by the presence of two, three or more producers each supplying part of domestic requirements, none of which has a significant export market. In some of these instances producers may be taking advantage of economies of scale abroad by importing an intermediate product and carrying out only finishing operations. At times, other factors such as favourable location may permit producers to remain competitive even though forgoing economies

> of scale; at times, they may be content with a lower rate of return on that product, or group of products, in order to establish a position in the market or to integrate more fully their process of production, use of materials or product lines. At times, however, it is the rates of duty that permit companies to produce and market the product domestically even at higher costs of production."1/

The Tariff Board in its report did not accept a number of recommendations from the industry for increases in rates of duty designed to increase its share of the Canadian market for various products. The Board took the view that higher rates of duty in many cases would not lead necessarily to an increase in scale or efficiency and its recommendations reduced rates for many products. Among the increases which were recommended, many were for products now entered free of duty but for which the Board regarded some moderate protection (usually not exceeding 10 per cent) as useful, particularly in circumstances in which the advantages of scale and specialization of production abroad might very well be significant. The most noteworthy example of moderate increases occurs for certain of the basic synthetic resins and plastics where specialization of production and long runs can serve to reduce costs significantly, and for many of which items production has begun in Canada only in the past 10 or 15 years. Their duty-free entry had reflected, to some considerable extent, their earlier unavailability from Canadian sources of production.

1/ Report by the Tariff Board, respecting Chemicals -- Reference No. 120, Vol. 4, Part II, Ottawa, Queen's Printer, pp. 25-26.

Many of the products or groups of products studied by the Tariff Board are produced in Canada in plants of smaller scale than in the United States. Few examples were found of production in larger plants in Canada. Similarly a large number of cases were cited in which higher costs in Canada were attributed to the small scale of operation. In many instances, costs were higher than they otherwise would have been because plants were operating below rated capacity -- a condition which was thought to be, if anything, even more prevalent in the United States. Shorter production runs and difficulties of achieving specialization in production were cited by many companies as significant contributing factors to higher costs in Canadian operations. For some of the smaller plants, however, any higher costs which they incurred were offset by locational advantages in serving a local market; others gained no such locational advantage because a large part of their market was within competitive range of U. S. plants.

An example of the difficulties of achieving greater specialization and longer production runs was cited for the synthetic detergent industry. One spokesman said:

> "This is brought about by the fact that Canadian consumers desire the same kind and type of products that are sold in the United States. This causes real complications in that we only have two synthetic towers producing 4 different synthetic formulations in four different colours. This means constant shut downs for clean-out as we change from one brand to the other, whereas in the United States an item like 'Tide' will be blown six days a week 24 hours a day on one colour, thus getting maximum efficiency and the lowest possible cost. "1/

1/ Transcript Vol. 141, p. 20972 (Ref. 120).

On the other hand a somewhat similar process of production is used to prill ammonium nitrate fertilizer. In this instance, Canadian production is very competitive, partly because of low cost materials but partly also because the prilling towers have long runs of a virtually homogeneous product which is then packaged only in a very small variety of standard containers. While the two processes of production bear certain basic similarities, the differences in variety of product and of package apparently contribute significantly to the higher costs of production in the case of the detergents. It is of course worth noting that a large portion of the fertilizer material is exported and gains the advantage of length of run, to a significant extent, by this export orientation.

A further significant characteristic of the Canadian chemical picture is the end-use tariff classification which permits free entry or provides special low rates of duty on certain chemicals for specified uses. This policy has been pursued to enable certain industries, often resource-based, to remain more competitive in export markets through access to materials at internationally competitive prices. In some instances, the practice serves to reduce further the domestic market for Canadian chemical producers, and forces those Canadian chemical producers who would supply these markets to do so at prices that reflect the availability of duty-free imports. In 1966, chemicals valued at some $206 million, representing approximately 37 per cent of total chemical imports, entered under end-use items, most of them duty-free. This represents approximately 10 per cent of the value of factory shipments of the Canadian chemical industry.

In recent years the Canadian chemical industry has enjoyed rapid development. The index of the physical volume of production for chemical and allied products increased by some 245 per cent from 1949 to 1965, compared with an increase of 155 per cent for total industrial production and 130 per cent for total manufacturing. The development of the industry has taken place

in products where both economies of scale and of specialization might be assumed to be particularly important, and also in products where smaller plants, some of which are highly specialized, are the typical centres of production.

With the finalization of Kennedy Round agreements the Canadian chemical industry is entering a new phase. Lower foreign tariffs, particularly in the United States and the European Economic Community, present important export opportunities. Revised Canadian tariffs will offer additional protection on basic synthetic resins and plastics, but lower rates across a broad range of other products will provide increasing competition in the Canadian market for chemicals. Hence it is anticipated that the tariff changes will result in some shifts in the structure of the industry. When recommending the new tariff schedules for chemicals it was the objective of the Tariff Board to encourage the Canadian industry to move in the direction of increased efficiency and to adopt a more international outlook towards its markets.

To provide better information on the current position and prospects of the Canadian chemical industry, a comprehensive study has been undertaken recently by the Chemicals Branch of the Department of Industry with the direct assistance and full co-operation of all sectors of the industry. While the study has been designed to provide facts on a wide-ranging basis, one of its main objectives is to determine in some detail the competitive position of the industry and the influence of factors such as scale and specialization on its ability to compete successfully on an international basis.

2. Steel

Since the mid-1950's, Canadian steel producers have developed into one of this country's most efficient

and internationally competitive manufacturing industries. A sustained increase in demand for Canadian steel has permitted close-to-capacity production rates much of the time. At the same time, steel company managements have pioneered new processes and operating methods and made large capital investments in new facilities. The new technological developments were favourable to medium-sized plants such as existed in Canada and were appropriate to the size of the Canadian market. These developments have resulted in operating efficiencies which permitted an increasingly competitive price structure. Lower prices, together with new facilities for producing types and sizes of steel products not formerly made in Canada, provided for substantial replacement of imports and the beginnings of a significant export market.

New techniques such as the use of more concentrated, pelletized iron as blast furnace feed, the injection of fuel (such as natural gas) into these furnaces, and the use of oxygen in open-hearth furnaces, have produced large increases in capacity and efficiency without involving appreciable capital expenditures. The use of the oxygen furnace in place of the open hearth, a move in which Canada played a leading role, results in significantly lower operating costs as well as lower capital investment. At present an estimated one-third of Canadian output is produced in the oxygen furnace compared with around 25 per cent in the United States.

In addition, encouraged by the accelerated depreciation allowances introduced by the Canadian government in the mid-1950's, very large capital expenditures have been made to modernize and expand steel-making facilities in Canada. These expenditures reached a recent level well in excess of $100 million a year by the four major integrated producers.

Price Experience -- As noted in the Tariff Board Report on Basic Iron and Steel Products which was published in 1957, at the time the Canadian steel industry embarked on its modernization and expansion program just over a decade ago, its mill prices were generally higher than those in the United States by 5-10 per cent. Price increases in both 1955 and 1956 were, however, lesser in Canada than in the United States and from 1957 to 1964 Canadian prices of steel products increased only slightly. At present, average steel prices are reported to be over 5 per cent lower in Canada than in the United States and on some items, notably hot-rolled sheets, Canada is regarded as one of the lowest-priced producers in the world. Prices on some steel products being imported from Europe and Japan are, however, lower than on comparable Canadian-made items. It is felt that this situation is due not to lower costs in the exporting countries but rather to strong pressures there to keep the steel mills operating, and resultant price policies that provide for much lower profit margins, if any, than in the Canadian steel industry.

The pricing record of Canadian steel producers seems to reflect deliberate policy to take advantage of their increased efficiencies and lowered costs. As noted above, the closing of the price gap with the United States, together with the installation of facilities to produce a wider range of Canada's requirements of steel products, has led to a considerable reduction in imports and constituted a significant factor in the ability of Canadian mills to operate at or near capacity much of the time. Imports are, however, still a significant factor in the Canadian economy, typically amounting to around 20 per cent of domestic consumption. They increased from 18.4 per cent in 1964 to 22.5 per cent in 1965, but leveled off at just over 20 per cent in 1966 and 1967. While imports of steel products into the United States have also increased in recent years, they currently amount to only some 10 per cent of U. S. consumption. At one time, price

competition in Canada on steel products was largely from the United States but recently Canadian pricing practices, particularly on certain standard products, are influenced more by European and Japanese prices.

The pricing policies of Canadian steel producers have also enabled Canadian mills to increase exports nearly fourfold from 1957 to 1964 and have placed Canadian secondary manufacturing industries, which use steel as a primary material, in a more competitive position.

Cost and Profit Experience -- Since a number of U. S. steel mills are using Labrador ore and Canadian mills still obtain part of their requirements from the Mesabi deposit, the main U. S. source of supply, there is little over-all difference in cost of this basic material between Canada and the United States. The Canadian industry has, however, progressed somewhat further in the use of pelletized iron and enjoys the economies of this process. On other basic raw materials such as coke and limestone, differences in cost are not considered to be of major significance.

In the labour area, though wage rates between Canada and the United States have been narrowing, published labour statistics indicate that average hourly earnings in the Canadian steel industry are still somewhat lower than comparable U. S. figures.

As to capital costs, one of the steel company executives estimated that new capital equipment for his industry has cost approximately 20 per cent more in Canada than in the United States due to (1) duty and exchange on imported items or duty-landed prices on domestic products, (2) the Canadian sales tax, and (3) higher interest rates on capital funds in Canada. These higher costs have been, however, approximately offset by lower labour costs and greater operating efficiencies.

Productivity -- The operating efficiencies are reflected in productivity figures that show output per employed person in the Canadian steel industry increased by 38.4 per cent from 1960 to 1965 while that of U. S. workers increased by only 29.6 per cent. Output per employed person in the Canadian steel industry increased from 159 tons in 1960 to 220 tons in 1965 while the increase in the U. S. steel industry was from 174 to 225 tons. Output figures for 1966 and 1967 were distorted by work stoppages and would, it was reported, be misleading. Steel officials believe, however, that further gains have been made in Canada in output per employee during 1966 and 1967 due mostly to factors such as increased use of pellets and improved steel-making facilities.

During the same general period of the late 1950's and early 1960's Canadian companies were investing much more heavily in new capital facilities than were U. S. companies. For example, from 1958 to 1965 the three largest Canadian steel companies spent over $3,600 per employee while in the United States the corresponding figure for the three largest companies was under $1,600. Beginning in 1967 and extending into 1968 this high rate of investment in new facilities in Canada has tapered off due to the completion of a number of major iron mine developments, some decline in the demand for steel, and the high cost of financing.

A further important element in the ability of the Canadian industry to compete successfully is the fact that steel-making in the primary stages is essentially a batch process where efficiency does not increase in proportion to size beyond minimum limits that have been reached by the largest Canadian producers. At the finishing stages where basic steel forms are converted into an almost endless variety of finished and semi-finished products, the size of runs appropriate to the domestic market begin to put Canadian mills at a disadvantage. In this connection, one management official

stated that for certain types of products produced by his company, he knew of no other mill in the world which manufactured as wide a range of products of these types.

Another executive mentioned, without providing specific figures, that on occasion when his company has produced long runs for the U. S. market, their profit margins reached levels they could not achieve when producing for the domestic market alone. The main disadvantage associated with short runs is the time lost making change-overs from product to product, and the wastage during the start-up on a new item. One of the smaller steel companies emphasized that its operating efficiency could be increased very substantially by developing longer runs. Most of the steel officials interviewed looked with favour upon reduction of trade barriers, both foreign (especially U. S.) and Canadian, as a basis for improved specialization, efficiency and competitiveness within the Canadian steel industry.

Since Canadian prices of basic steel products now are lower than those in the United States, the Canadian tariff has only a limited influence on imports from the United States. Correspondingly, the moderate U. S. tariffs do not offset the lower Canadian prices plus the exchange rate advantage.

3. Wire and Cable

This industry is comprised of a moderately small number of medium-sized firms supplying a Canadian market composed largely of electrical utilities, electrical appliance manufacturers, the construction industry and telephone systems.

Raw material is the dominant expense element, reaching as high as 80 per cent of total manufacturing cost. The most important raw material is metal rod, usually copper, steel or aluminum, to which is added,

in the case of electrical products, a comparatively small quantity of plastic, textile, or paint as insulation. Though the metal rod is usually of domestic origin, it is frequently priced to reflect the duty applicable to imported rod, approximating 8 per cent.

Canadian firms, nevertheless, frequently have production costs that compare favourably with similar U. S. manufacturers. The size and nature of the Canadian market, which is characterized by relatively substantial long-term purchase contracts, justifies efficient, high-speed, automated production equipment which results in moderate labour costs. Efficient utilization of productive capacity, accomplished in some cases by export sales, contributes to low unit overhead charges.

Consumer Products

1. Fine Paper

The most notable feature of the fine paper industry in Canada is the very wide variety of types and categories of paper manufactured. A typical company produces several hundreds of different weights, colours and grades. As an example of the extreme to which production is subdivided, one firm reported that it manufactures seven different shades of white envelope stock.

The largest of five principal fine paper manufacturers in Canada operates only 15 paper machines, and thus the wide range of products requires frequent shutdowns for change-over. Industry representatives estimated that manufacturing costs would be reduced by 12 to 15 per cent if the machines could be run as continuously as fine paper machines frequently are in the United States.

Canadian companies are able to tolerate these higher costs through the protection of tariffs ranging from 20 to 22 1/2 per cent on fine paper products. They

are, however, essentially restricted to the relatively small Canadian market with exports of fine paper amounting to only slightly over 10 per cent of production (compared with 92 per cent for newsprint and 47 per cent for wood pulp). The Canadian fine paper industry, comprising essentially the manufacture of printing and writing paper, is largely Canadian-owned. General cost comparisons are difficult because of the wide variations in operating costs from region to region in both Canada and the United States. Furthermore, data are scarce on the fine paper component of the broader pulp and paper industry. It is generally acknowledged, however, that Canadian producers enjoy the advantage of lower labour costs to offset to some extent the higher costs associated with the shorter runs.

Over-all price comparisons, too, tend to be inconclusive because of the wide range of products and the fact that some types of fine paper manufactured in the United States are not produced in Canada. Typically, however, Canadian prices on specific items tend to run 2 to 3 per cent below the duty-landed cost of comparable U. S. products.

One of the officials interviewed reported that significant progress had been made in recent years by his company through mechanization and automation. He acknowledged, however, that many opportunities remain for further improvements in productivity and efficiency.

Tariffs in both Canada and the United States are major factors in the lack of specialization in fine paper production in Canada. In addition, it is claimed that existing combines legislation rules out the practicability of any interindustry rearrangement of product lines towards specialization in the domestic market and the resultant increases in scale of operation.

The main problem to be solved in the establishment of freer trade on fine papers is in the area of marketing. In Canada, while a few of the fine paper jobbers are owned by paper manufacturers, the majority are independently owned and most of them carry the product lines of all the major manufacturers. In the United States, by contrast, 90 per cent of the jobbers in a major market, such as New York, may be owned by paper manufacturers. As a result, entry into such markets would have to be through the establishment of a new distributing organization which could be expected to be difficult and costly, or through affiliation with an established U. S. firm whose operations would complement those of the Canadian company. In the United States, fine paper firms are tending to establish their manufacturing facilities close to major markets and one Canadian executive expressed the opinion that a Canadian firm wishing to enter the U. S. market would find it advantageous to locate near a major market there rather than in Canada.

It was pointed out, also, by one of the officials interviewed, that highly specialized U. S. fine paper mills are operating close to the Canadian border and, in the event of lowering of tariff barriers, could immediately supply Canada's requirements of main fine paper items. Accordingly, industry representatives believe that in the event of a very substantial reduction of tariffs, the Canadian industry would require a number of years to develop its marketing arrangements and to adjust its production facilities to the scale and degree of specialization required to compete successfully with U. S. producers. They suggest that the most feasible procedure would involve immediate removal or reduction of U. S. tariffs, with the Canadian reduction being delayed for a specified number of years.

Scale and Specialization

2. Rubber Tires

Because of the availability of considerable information in this area from published sources, much of the following material is taken from such sources, supplemented by company interviews. The following industry description is from a recent publication directed primarily at the relationship of tariffs to competition in Canada.

> "Automatic tire-building machines and curing presses are built in small units and achieve lowest average costs on runs of 5,000 tires of a single type and size per day. Mechanical material-conveying and mechanical handling of the finished tires can also be installed in plants manufacturing 5,000 tires of a single type and size per day.... Not only must an efficient plant produce about 5,000 tires a day (or over one million tires a year), but the number of types of each tire must be very limited or else costs rise owing to the time and labour absorbed in changing over equipment from the production of one line to that of another. A plant with a total output of 5,000 tires a day could be efficient only it if produced fewer than fifty tires with different specifications.
>
> "A Canadian manufacturer whose plant made between 4,000 and 5,000 tires a day gave the following striking testimony in connection with the difficulties of installing the most modern type of mechanical handling equipment in a Canadian plant:
>
> > They (the tire manufacturers in the United States) have a merry-go-round which makes one size -- it is a conveyor which makes one size of tire only, they can adjust it to other sizes -- but they use that merry-go-round

> for those large volume sizes. We could never justify the merry-go-round because it would make in toto as many tires as we make per day in Canada, and we have on one market an average of 222 different types of tires -- therefore the American style is out. But they make as many 600 x 16 (tires) in a day as we make of all kinds of tires. Therefore they have been able to justify a merry-go-round, which is very efficient.

"From this evidence it is clear that Canadian producers are prevented from installing the most efficient equipment, not by the scale of their operations, but by their very diversified character.

"The following further testimony was given concerning the effects of non-specialized productions:

> We run more than five hundred sizes at our plant. Our change costs are tremendous, while some of our larger American plants may run only half a hundred sizes, and our runs are shorter. Then we have to shut down our machines and start them up again and get them running accurately to size, and we have to pay our men during that period of time, while they are tearing down a machine and building it up. And when you consider the multiplicity of sizes we have to run here as compared with larger factories in the United States, on restricted sizes, there is not a fair comparison which could be drawn. "[1]

---

[1] Eastman and Stykolt, The Tariff and Competition in Canada, op. cit., pp. 365-366.

Scale and Specialization

A recent trade publication indicates that similar conditions still persist in Canada:

> "Costs are higher and productivity poorer (in the Canadian tire industry) because the firm must turn out 1,700 sizes of tires in a single factory. Our employees must change sizes on the building machine three to four times a day whereas in a U. S. plant a run may be measured in months. "1/

As suggested by the foregoing, U. S. plants tend to be highly specialized with one plant manufacturing, for example, only truck tires, another only for direct shipment to automobile manufacturers. As a further illustration, one company has nine tire manufacturing facilities in the United States, only a single one in Canada. A typical U. S. tire plant of over-all size comparable to those of the major manufacturers in Canada is reported to produce only some 125 different types and sizes compared with the 1,700 mentioned above in a Canadian plant.

Among the companies interviewed, manufacturing costs ranged from 12 per cent higher in Canada than in parent U. S. plants on the highest volume passenger-tire sizes to as much as 38 per cent higher on other products manufactured. One company reported its over-all productivity as 23 per cent lower in its Canadian subsidiary. These factors have been offset to some degree by lower wages in Canada but the direct labour content in a typical tire is reported to be only around 10 per cent of the manufacturing cost.

1/ L. E. Spencer, President, The Goodyear Tire & Rubber Company of Canada Limited, quoted in Canadian Chemical Processing, January 1967.

3. Consumer Appliances

There are many manufacturers in the Canadian consumer appliance industry. Their major products are washing machines, dryers, refrigerators, ranges and freezers, as well as a variety of low-volume lines such as water tanks, immersion heaters, and space heating units. The dominant firms in the industry are subsidiaries of U. S. corporations.

All firms rely on an American affiliate, either parent or licensor, for product design and research. The amount of redesign and adaptation to suit Canadian conditions varies widely with both company and product. U. S. firms show a greater tendency towards vertical integration than do their Canadian counterparts.

Recent Trends -- During the past 10 years, several trends have become apparent in the United States. Many firms in the industry have been consolidated by acquisition or merger. Production facilities have become concentrated in the Midwest, and many branch assembly plants elsewhere have been closed or diverted to other activities.

Production equipment efficiency has improved markedly. Component production processes, as well as final assembly lines, though highly automated, now require very little shutdown time to effect the large number of change-overs made necessary by the numerous varieties in end-product. The over-all result has been a significant reduction in both production costs and selling prices, despite a sharp rise in material and labour costs, and significant improvements in product performance and quality.

Several Canadian firms share the view that the number of domestic producers of consumer appliances will be reduced substantially in the next decade. Merger

or failure are expected to end the existence of the others as independent entities.

Canadian Conditions -- In the view of firms operating in the industry, the Canadian market is not sufficiently large in any major product line to permit Canadian costs to be reduced to U. S. levels.[1/] U. S. production runs are usually about 10 times as long as Canadian runs, and U. S. costs are about 85 per cent of Canadian costs, despite substantially higher wage rates there.

Only in the case of products for which the market is relatively small in both Canada and the United States would Canadian costs be close to U. S. levels. In such cases, the advantages of large-scale production are not available in either country. Examples of such products include wringer washers (for which the market is declining), space heaters and immersion heaters; in all these cases product improvements are infrequent.

Material costs are generally higher for Canadian firms in this industry. While reasons differ for individual companies, import duties, small-scale production by suppliers, and transportation costs are major contributing factors common to all manufacturers.

Two specific examples of major Canadian production may be of particular interest:

1/ Eastman and Stykolt, op. cit., particularly pp. 233 and 241-45. The conclusion of this study is that in the case of refrigerators and ranges, for example, a plant large enough to supply the entire Canadian market would be two-thirds of optimal size for refrigerators and four-fifths optimal size for ranges.

(a) An independent Canadian producer of automatic washers, manufacturing under licence, has costs 15 per cent higher than in the United States. This firm estimates that it would require 150 per cent of the existing Canadian market to bring costs into line with present U. S. costs while U. S. costs can be expected to drop still further due to technological improvements at the design stage.

(b) A major manufacturer of electric ranges with a large portion of the Canadian market is competitive on most lines, and exports some products to the United States. Electric ranges are much less common than gas ranges in the United States, due to comparative fuel costs. Few components on ranges are imported and the assembly techniques in the two countries are not greatly different.

One of the manufacturers interviewed is attempting to produce a distinctive Canadian product, in the hope that, with it, he will be able to capture a reasonable share of the U. S. market in due course. He feels that Canadian industry must develop its own designs if it is to remain viable and independent.

Some independent Canadian firms have strong views regarding the competence of Canadian management, which they feel is inferior to U. S. management. Others suggest that Canadian management is suited to its particular problems and that it had developed skills in the form of flexibility -- or in "making do" with limited tooling and equipment.

One of the more advanced Canadian firms has developed an engineering staff devoted to assisting its component suppliers. Material costs have been reduced

as a result of this exercise, but there is no apparent possibility of reducing total costs to U. S. levels as long as the firm is confined to the comparatively low-volume Canadian market.

Influence of Tariffs -- A number of Canadian firms indicated that the present tariff structure has contributed to a significant amount of product diversification. The result has been lower levels of productivity and higher prices than those prevailing in the United States.

Independent Canadian producers expressed concern about the availability of sales outlets in the United States, even if specialization in a limited range of products permitted reductions in their production costs per unit. Subsidiaries of U. S. corporations could sell a limited line of products through their parent organization.

There was a fairly wide range of views expressed in the interviews about how easy it would be for individual plants and firms to make the adjustment from present production practices to those that would be appropriate under conditions of freer trade.

4. Radio and Television

There are many similarities between this field and consumer appliances. Accordingly, many of the remarks about the latter are applicable also to radio and television.

Canadian radio and television sets are frequently of higher quality than U. S. products. Higher standards, as set by the Canadian Standards Association, reflect a need in Canada for superior performance because of the very wide viewing areas in this country. In addition, consumer tastes make it necessary to change superficial aspects of the design of the product. Such changes frequently affect costs, particularly when plastic or metal

cabinets are involved. Some part of the typical Canadian-American cost differentials is thus accounted for by differences in product quality.

Economies of large-scale production are not clearly visible at the assembly stage of radio and television products, due to the nature of the assembly process. They are, however, easily identifiable at the level of component manufacture, since many of the same components are used in different brands of receivers. U. S. component manufacturers, with the benefit of a market nearly 15 times the size of the Canadian market, enjoy markedly lower production costs. Lower U. S. material costs, thus achieved, frequently account for the entire difference in total costs, since Canadian labour and overhead charges in this industry are usually of the same order of magnitude as those prevailing to the south.

In this industry there is an extensive group of patented components available to all assemblers. Royalties, frequently based on volume, vary in each country.

Influence of Tariffs -- Firms in this industry suggest that a substantial reduction in foreign (especially U. S.) and Canadian tariffs would result in significant adjustments but not serious dislocations in the Canadian industry. Canadian sets in the lower price range might not be competitive, but the higher performance products might well sell at a price premium in the United States. U. S. subsidiaries suggest greater specialization would result, but marketing would take place through U. S. - affiliated sales organizations.

It is likely that a continuing high labour content in assembly, a relatively favourable cost picture in cabinets in Canada, and low inward transportation costs on most components (high value in relation to bulk and weight) would assist the Canadian industry in adjusting to substantial tariff reduction or elimination.

Scale and Specialization

While competition in the field of very high-priced, high-quality sound reproduction equipment is not based primarily on price, the demand in Canada is too small to permit reasonable production costs. Therefore, some penetration of the U. S. market is mandatory if the production of this sort of equipment is to be profitable to a Canadian producer.

It might be noted that in the case of some appliances, such as radios and television sets, Japanese products and components have become increasingly important in both the United States and Canada.

5. Textiles

The most striking characteristic of the textile industry is its diversity. It consists of a large number of dissimilar plants, housing a wide selection of machinery, producing many types of primary textile products and a great variety of end products ranging from woven yard goods to knitted sweaters.

The remarks that follow are based on the experience of organizations operating largely in the primary section of the industry, producing cotton yarns and fabrics. Included also are brief comments on woollen and worsted products, as well as synthetic materials.

Cost Structure -- Comparisons are made between raw materials, labour and overhead.

(a) Raw Materials

While the prices of raw cotton in Canada and the United States are basically similar, the cost to Canadian firms is increased by the rate of exchange on Canadian currency. Transportation, though not a major item,

is, of course, also higher on raw cotton coming into Canada, especially in comparison with southern U. S. mills. A further element of additional raw material cost is introduced by the scale of the typical Canadian operation. Cotton prices are based upon, among other things, fibre length. Since Canadian plants often find it impractical to stock all the available grades of cotton, they frequently must use a longer fibre, more expensive grade than is required by the specification to which they are working. The result is a minor cost increase.

(b) Labour

When both hourly wages and fringe benefits are considered, direct labour costs are essentially the same in Canada and the United States, although they vary considerably from mill to mill and also with the type of fabric being produced.

In the figures shown in the Appendix, which are for the production of unfinished gray goods, one mill stands out as a low-cost producer. This mill was built very recently using the latest equipment. Older installations show labour costs about 20 per cent higher than some prevailing in the United States.

The labour cost of the finishing and printing of fabrics is much less favourable in Canada. Short production runs, on equipment capable of high-output operation, are largely responsible for this situation.

(c) Overhead

On all three textile products for which data were obtained, overhead costs were approximately 50 per cent higher in Canada. Several factors appear to contribute to this difference:

-- Some U. S. mills produce a single fabric continuously. Their output is greater than the entire Canadian market for any single fabric, thus ruling out the possibility of a Canadian manufacturer producing under such conditions of scale and specialization if it is confined to the Canadian market. Canada's most efficient mills produce a dozen or more different varieties.

-- U. S. mills typically operate at closer-to-capacity production than do Canadian mills. In 1965 U. S. mills were reported to have operated at close to their optimum rate of output compared with around 90 per cent of optimum for Canadian operations.

-- Such fringe benefits as paid holidays and vacations are reported to be more generous in Canada than in the United States.

-- The greater variety of products and more frequent change-overs require more versatile supervision to handle such functions as production scheduling, inventory control and machine changes.

-- The Canadian climate requires more costly construction of plants and higher

heating and maintenance charges than in the United States, particularly in the southern States where the majority of the textile mills are located.

Influence of Tariffs -- The executives interviewed recognize that the Canadian textile industry would face some sizeable adjustment problems if tariffs were lowered substantially or removed completely. They maintain, however, that methods and facilities employed in the more modern Canadian mills would enable them to compete successfully with most U. S. mills. The adjustment to greater specialization would require some time -- possibly five years -- and in the process a considerable amount of the equipment now in use in Canadian mills would become obsolete. The industry representatives consulted in the interviews expressed considerably greater concern over the extent to which many imports of textiles enter Canada from overseas countries regardless, they maintain, of Canadian price levels.

The foregoing discussion centres around the spinning and basic weaving portion of the industry. The considerations discussed would relate to other parts of the cotton textile industry although there would be some technical differences. For example, the industry is generally considered to include knitting mills producing not only fabrics, but also finished garments. In this case, because of variations in sizes and styles, there are certain instances where the Canadian industry, which is characterized by relatively large plants, has already achieved a level of cost very nearly in line with the U. S. level. Also, wherever production has proceeded towards a multiplicity of lines with an element of styling, there are situations in which Canadian production has achieved satisfactory competitive levels of cost. However, most

of these situations are found in the fabric field, and are associated with export volume which has been achieved by entering foreign markets with a product of a particular design or styling which, for one reason or another, has not been produced in that market. But, by and large, the Canadian market does not offer the scale which is necessary to reduce costs to the level of those achieved in the United States and overseas. In worsted fabrics -- the raw material for the men's and women's garment industry -- there is a much higher element of style and variability required in production. As a result, the length of runs on any particular fabric is relatively short in every market, including the United States and Britain. Consequently, the Canadian industry does find itself competitive in some fabrics. There are two reasons for this. First, the Canadian manufacturers have produced exclusive styles. Second, the competing industries in the United States and Britain have not been able to achieve the same production efficiencies as they have for cotton fabrics. This is frequently the case in certain piece-dyed, relatively standard fabrics.

The same picture emerges in areas of production other than wool fibres, such as woollen fabrics, where the product is highly standardized.

The situation in the synthetic or man-made fibre branch of the industry is considerably more complex. Here, the variability begins with the fibres themselves and continues to the end products, which frequently have a high-fashion element, with almost limitless variety. Designs and styles are subject to sharp variations which make market forecasting in this area an extremely difficult undertaking.

As a result of this, mills in the synthetic fibre industry are constructed to achieve a very high degree of variability in production, and to minimize the cost of change-overs. Under such circumstances, Canadian mills cannot be designed to compete on a cost basis with U. S. mills. A minimum run of a fabric for the apparel industry in the United States may well be 25 times as large as in Canada, even though the U. S. run is considered to be short and in minimum quantity. Cost comparisons are not generally available or likely to be meaningful.

This industry is also very closely associated with technical developments in the chemical industry, since its raw materials, up to and including the yarn, derive directly from that industry. All of the technological factors that apply to the chemical industry, therefore, are also basic to the man-made fibre industry.

In a general review of the whole textile group, it should be noted that a considerable degree of specialization and rationalization has already been achieved in all branches of the industry, particularly in cotton. The fact is that there are only five producers of basic cotton textiles in Canada, and an analysis of their products indicates that there are generally not more than two mills producing any particular basic fabric. The market for domestic manufacturers is limited by the access provided under existing quota arrangements to about 50 per cent of domestic consumption. It is also subject to severe competition from countries that are prepared to select yarns or fabrics from time to time and price them without reference to cost in order to achieve a certain penetration into the Canadian market. This makes the commitment of resources to certain types of production particularly difficult.

With regard to exports, investigation indicates that none of the mills is inclined to construct plant capacity on a basis which requires export volume to provide

profitable operation. The mills frequently generate considerable export volume which tends to arise out of situations that are subject to rapid change in the country of destination. For example, the basic advantages in the United States in terms of scale tend to bring about the necessary expansion of capacity wherever a need develops. The position of the Canadian firm shipping to that market tends to be that of filling a need only for a year or at best two years. There are some exceptions to this where a continuing export volume has been developed, but these are almost invariably in particular types of fabric where the U. S. demand is relatively small although important to a Canadian mill.

6. Garments

The garment industry consists of a larger number of small, privately owned enterprises. Since entry into the business requires relatively little capital, changes in ownership and interruptions to the continuity of operation are frequent. Style change is a major factor affecting a large segment of the industry.

Due to the sporadic nature of many businesses in the industry, continuous series of useful data are sometimes difficult to find. For relatively standard items, such as men's garments, however, it is possible to secure comparative cost data between Canadian and U. S. companies. The following tabulations, for representative garments of the standard type, reveal the consistently higher cost of Canadian production.

These differences are in every respect typical of such standard fabrics as those used in shirts, slacks and standard knit-goods.

More highly styled materials would be relatively more expensive in Canada than the United States. The difference can reach the order of 60 to 70 per cent.

Table 3

Cost of Materials

Item	Canada (in $Can.) as a percentage of U. S. (in $U. S.)
Fabric (men's wear)	
a*	139
b	140
c	147
Yarn*	128
Fabric (outerwear -- men's & women's)	
a*	143
b*	134
c	125

* All or part synthetic.

Table 4

Direct Labour Costs

Item	Canada (in $Can.) as a percentage of U. S. (in $U. S.)
Men's Garments	
a	108
b	119
c	105
d*	109
e	115
Ladies' Garments	113

* Knitted.

Scale and Specialization

A consistent basis of allocating labour as direct is used in all cases. The hourly rates are said to be about comparable in each country expressed in the domestic currencies.

Table 5

Overhead Costs

Item	Canada (in $Can.) as a percentage of U. S. (in $U. S.)
Men's Garments	
a	142
b*	107
c	127
Ladies' Garments	192

* Knitted

Overheads include the extra elements of labour cost such as down time and training time due to product change, plus a reflection of substantially lower total volume over which to allocate fixed costs. Total overheads for typical firms in the United States are said to include significantly greater amounts for technical personnel and for equipment write-off costs. These are generally less per unit of output and contribute also to lower direct and indirect labour costs.

Canadian firms usually market their products under conditions that allow them about 20 per cent of the volume of their U. S. counterparts, even for the more standardized products. Canadian manufacturers, as a result, must use more versatile, less specialized machinery in

the productive processes, with attendant compromise in efficiency. There is also less specialization of jobs leading to higher training costs but still resulting in lower productivity.

Seasonal fluctuations in the demand for particular types of garment caused by Canadian climatic conditions, tend to aggravate the cost problems caused by the relatively small market in this country. In the United States, on the other hand, manufacturers can sometimes produce and sell summer wear throughout the entire year. Change-over time is thus reduced to a point not attainable by Canadian producers.

It would appear, however, that not all of the inefficiencies of production are caused by factors entirely beyond the control of the manufacturer. Industrial engineers and other production specialists are much less common in Canadian plants. As a result, practical measures to cut costs within the limits imposed by available volume, are frequently not adopted or even identified.

The question of the size of market required to allow production costs to be reduced to U. S. levels is difficult to answer. Intra-industry variations caused by differing degrees of dependence on seasonality and styling, for instance, result in widely differing opinions on the subject. However, there is some indication that a market of at least double the size of the one presently available to Canadian producers would be required, even for the more standard items, to establish cost patterns similar to those prevailing in the United States.

APPENDIX TABLE

Manufacturing Costs,

Similar Items from Canadian and U. S. Producers

Canadian figures ($Can.); U. S. figures ($U. S.)

	Material			Direct Labour			Overhead			Total			Material Costs as % of Total Costs	
Industry & Item	Can.	U. S.	Can. U. S. %	Can.	U. S.	Can. U. S. %	Can.	U. S.	Can. U. S. %	Can.	U. S.	Can. U. S. %	Can.	U. S.
Household Appliances														
1) Refrigerator	113.57	80.05	142	19.34	22.03	88	22.37	23.52	95	155.28	125.60	124	73	64
2) Refrigerator	70.16	46.67	150				39.12*	40.12*	98	109.78	86.77	127	64	54
3) Range	69.50	51.37	135				40.05*	43.62*	92	109.55	94.99	115	63	54
4) Automatic Washer	120.87	69.79	173				32.10*	41.80*	77	152.97	109.59	140	79	64
5) Automatic Washer	127.50	105.00	121	15.00	15.00	100	37.50	30.00	125	180.00	150.00	120	71	70
6) Wringer Washer	49.75	42.50	117	8.50	8.10	105	12.25	20.15	61	70.50	72.75	97	71	58
Radio & TV														
1) B & W TV	84.88	65.53	130	6.90	8.88	78	11.55	11.10	104	103.33	86.51	119	82	76
Electrical Equipment														
1) Motor	5.32	3.07	190	1.28	1.00	128	1.11	1.01	110	8.21	3.07	267	71	60
2) Motor	3.27	2.56	128				2.41*	2.00*	121	5.68	4.56	125	58	56
3) Lamp (per M)	31.57	24.78	127				44.86*	38.78*	116	76.43	63.56	120	41	39
4) Fl. Lamp (per M)	208.45	134.42	155				116.00*	138.45*	84		269.87	157	49	50
5) Meter	3.08	2.20	140				5.83*	4.64*	126	8.91	6.84	130	35	32
6) Outdoor Light	6.59	5.79	114	1.95	2.58	76	4.20	4.25	99	12.74	12.62	101	52	46

Misc. Metal Products													
1) Heater	74.21	53.03	140	5.98	8.95	67	17.80	19.62	91	97.99	81.60	120	76	65
2) Pole	27.93	30.16	93	7.03	6.75	104	13.14	20.25	65	48.10	57.16	84	58	53
3) Alum. Clip	4.78	4.43	108	5.17	1.70	304	10.34	5.10	203	20.29	11.23	181	24	39
4) Shank Hook	.40	.38	105	.12	.07	171	.22	.21	105	.74	.66	112	54	58
5) Boiler	6.17	5.51	112	1.23	1.62	76	1.96	3.16	62	9.36	10.29	91	66	54
6) Tank	6.64	7.05	94	1.22	2.07	59	1.99	4.03	49	9.85	13.15	75	67	54
7) Gas Pump	418.43	211.74	198	13.64	23.86	57	26.55	66.78	40	458.62	301.38	152	91	70
8) Heater	22.89	22.28	103	4.92	4.04	122	5.89	3.86	153	33.70	30.18	112	68	74
9) Control	28.94	25.38	114	4.38	4.29	102	5.34	4.72	113	38.66	34.39	112	75	74
Wire														
1) BX	55.36	41.28	134	5.49	4.48	123	16.47	13.44	123	77.32	59.20	131	72	70
2) TV	11.75	11.36	103	.53	.07	757	1.59	.21	757	13.87	11.64	119	85	98
3) ACSR	25.93	27.12	96	.89	1.21	74	2.67	3.63	74	29.49	31.96	92	88	85
Textiles														
1) Twill-Cotton (yd.)	.214	.191	112	.077	.080	96	.077	.051	151	.367	.321	114	58	60
2) Print-Cotton (yd.)	.079	.071	111	.057	.046	124	.053	.037	143	.188	.155	121	42	46
3) Sheeting-Cotton (yd.)	.219	.198	111	.222	.192	116	.191	.123	155	.632	.512	123	35	39
4) Synthetic (yd.)										.59	.40	148		
5) Synthetic (yd.)										.80	.58	138		
6) Synthetic (yd.)										.92	.55	167		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	

* Includes direct labour as well as overhead.

PUBLICATIONS OF ECONOMIC COUNCIL OF CANADA

	Author—Auteur
Annual Reviews	
First Annual Review: Economic Goals for Canada to 1970 (EC21-1/1964, $3.50)	Council—Conseil
Second Annual Review: Towards Sustained and Balanced Economic Growth (EC21-1/1965, $2.75)	Council—Conseil
Third Annual Review: Prices, Productivity and Employment (EC21-1/1966, $2.75)	Council—Conseil
Fourth Annual Review: The Canadian Economy From the 1960's to the 1970's (EC21-1/1967, $2.75)	Council—Conseil
Staff Studies	
1. Population and Labour Force Projections to 1970 (EC22-1/1, $.75)	F. T. Denton Y. Kasahara S. Ostry
2. Potential Output, 1946 to 1970 (EC22-1/2, $1.00)	B. J. Drabble
3. An Analysis of Post-War Unemployment (EC22-1/3, $.75)	F. T. Denton S. Ostry
4. Housing Demand to 1970 (EC22-1/4, $.75)	W. M. Illing
5. Business Investment to 1970 (EC22-1/5, $1.00)	D. A. White
6. Special Survey of Longer Range Investment Outlook and Planning in Business (EC22-1/6, $.25)	B. A. Keys
7. Canada and World Trade (EC22-1/7, $.50)	M. G. Clark

PUBLICATIONS DU CONSEIL ÉCONOMIQUE DU CANADA

Exposés annuels
Premier exposé annuel: Objectifs économiques du Canada pour 1970 (EC21-1/1964F, $3.50)
Deuxième exposé annuel: Vers une croissance économique équilibrée et soutenue (EC21-1/1965F, $2.75)
Troisième exposé annuel: Les prix, la productivité et l'emploi (EC21-1/1966F, $2.75)
Quatrième exposé annuel: L'économie canadienne des années 1960 aux années 1970 (EC21-1/1967F, $2.75)
Études préparées par le personnel
1. Projections de la population et de la main-d'œuvre jusqu'à 1970 (EC22-1/1F, $.75)
2. Potentiel de production, 1946 à 1970 (EC22-1/2F, $1.00)
3. Une analyse du chômage depuis la fin de la guerre (EC22-1/3F, $.75)
4. Demande d'habitations pour 1970 (EC22-1/4F, $.75)
5. Investissements privés pour 1970 (EC22-1/5F, $1.00)
6. Enquête spéciale sur les intentions et la programmation à moyen terme des entreprises privées (EC22-1/6F, $.25)
7. Le Canada et le commerce mondial (EC22-1/7F, $.50)

Staff Studies (continued)

8. Export Projections to 1970 (EC22-1/8, $.75)	J. R. Downs	
9. Federal Tax Revenues at Potential Output, 1960 and 1970 (EC22-1/9, $.50)	D. J. Daly	
10. National Saving at Potential Output to 1970 (EC22-1/10, $.50)	F. Wildgen	
11. Changes in Agriculture to 1970 (EC22-1/11, $.50)	J. Dawson	
12. The Contribution of Education to Economic Growth (EC22-1/12, $1.90)	Gordon W. Bertram	
13. Internal Migration in Canada, 1921-1961 (EC22-1/13, $1.60)	Isabel B. Anderson	
14. Interregional Disparities in Income (EC22-1/14, $1.75)	S. E. Chernick	
15. An Analysis of Interregional Differences In Manpower Utilization and Earnings (EC22-1/15, $1.00)	F. T. Denton	
17. Business Cycles in Canada (EC22-1/17, $2.25)	D. A. White	
18. Manpower Planning in Industry: A Case Study (EC22-1/18, $1.00)	B. A. Keys H. H. Wright	
19. Population, Family, Household and Labour Force Growth to 1980 (EC22-1/19, $1.00)	W. M. Illing Y. Kasahara M. V. George F. T. Denton	
20. Enrolment in Schools and Universities, 1951-52 to 1975-76 (EC22-1/20, $1.25)	W. M. Illing Z. Zsigmond	
*21. Scale and Specialization in Canadian Manufacturing (EC22-1/21, $1.75)	D. J. Daly B. A. Keys E. J. Spence	
22. Medium-Term Business Investment Outlook: 1967 Survey (EC22-1/22, $.35)	B. A. Keys	

Études préparées par le personnel (suite)

8. Projections des exportations jusqu'à 1970 (EC22-1/8F, $.75)
9. Rendement des impôts fédéraux dans l'hypothèse de la réalisation du potentiel de production 1960 et 1970 (EC22-1/9F, $.50)
10. L'épargne nationale dans l'hypothèse de la réalisation du potentiel de production pour 1970 (EC22-1/10F, $.50)
11. Changements dans le secteur agricole jusqu'à 1970 (EC22-1/11F, $.50)
12. Apport de l'éducation à la croissance économique (EC22-1/12F, $1.90)
13. Migration à l'intérieur du Canada, 1921-1961 (EC22-1/13F, $1.60)
14. Disparités interrégionales du revenu (EC22-1/14F, $1.75)
15. Analyse des différences interrégionales dans l'utilisation de la main-d'œuvre et le revenu gagné (EC22-1/15F, $1.00)
†17. Les cycles économiques au Canada (EC22-1/17F, $2.25)
18. La planification de la main-d'œuvre dans l'industrie (Étude de cas) (EC22-1/18F, $1.00)
19. La croissance de la population, du nombre de familles et de la main-d'œuvre, jusqu'en 1980 (EC22-1/19F, $1.00)
20. Inscriptions aux écoles et aux universités, 1951-1952 à 1975-1976 (EC22-1/20F, $1.25)
†21. Échelle et spécialisation dans l'industrie manufacturière canadienne (EC22-1/21F, $1.75)
22. Perspectives à moyen terme des investissements des entreprises: Relevé de 1967 (EC22-1/22F, $.35)

Staff Studies (continued)

*23.	Canadian Income and Growth in an International Perspective (EC22-1/23)	Dorothy Walters
*24.	Canadian Agricultural Productivity (EC22-1/24)	L. Auer

Special Studies

1.	Immigration and Emigration of Professional and Skilled Manpower During the Post-War Period (EC22-2/1, $1.50)	L. Parai
2.	A Survey of Labour Market Conditions, Windsor, Ontario, 1964: A Case Study (EC22-2/2, $.50)	G. R. Horne W. J. Gillen R. A. Helling
3.	Perspective on Canada's International Payments (EC22-2/3, $1.60)	David W. Slater
4.	Incomes Policies—Some Foreign Experiences and their Relevance for Canada (EC22-2/4, $1.75)	David C. Smith
5.	Price Stability and High Employment: The Options for Canadian Economic Policy: An Econometric Study (EC22-2/5, $3.25)	R. G. Bodkin E. P. Bond G. L. Reuber T. R. Robinson
6.	Canadian Labour Relations in an Era of Technological Change (EC22-2/6, $1.25)	J. R. Cardin
7.	Canadian Policies for Rural Adjustment: A Study of the Economic Impact of ARDA, PFRA, and MMRA (EC22-2/7, $2.25)	Helen Buckley Eva Tihanyi
8.	Science, Technology and Innovation (EC22-2/8, $1.50)	Andrew H. Wilson

Conference Papers and Reports

National Conference on Labour-Management Relations (1964)
(EC22-364, $2.00)

National Conference on Labour-Management Relations (1967)
(EC22-367, $2.00)

Études préparées par le personnel (suite)

†23.	Le revenu et la croissance du Canada, vus dans une perspective internationale (EC22-1/23F)
†24.	La productivité de l'agriculture au Canada (EC22-1/24F)

Études spéciales

1.	Immigration et émigration de spécialistes et de travailleurs qualifiés depuis la fin de la guerre (EC22-2/1F, $1.50)
2.	Relevé des conditions du marché du travail à Windsor (Ontario), 1964 (Étude de cas) (EC22-2/2F, $.50)
3.	Perspectives quant aux paiements internationaux du Canada (EC22-2/3F, $1.60)
4.	Politiques des revenus—certaines expériences à l'étranger et les conclusions à en tirer pour le Canada (EC22-2/4F, $1.75)
6.	Les relations du travail au Canada face aux changements technologiques (EC22-2/6F, $1.25)
†7.	Politiques canadiennes de rajustement rural: Étude des répercussions économiques des programmes ARDA, PFRA et MMRA (EC22-2/7F, $2.25)
†8.	La science, la technologie et l'innovation (EC22-2/8F, $1.50)

Documents et rapports de colloques

Colloque national sur les relations patronales-ouvrières (1964)
(EC22-364F, $2.00)

Colloque national sur les relations patronales-ouvrières (1967)
(EC22-367F, $2.00)

Conference Papers and Reports (continued)

Conference on Stabilization Policies, Report of the Conference at University of Western Ontario, August 1965
(EC22-665, $3.00)

Conference on International Trade and Canadian Agriculture, Banff, Alberta, January 1966
(EC22-766, $3.00)

Conference on Government Information Systems, Ottawa, October 5 and 6, 1967
(EC22-1168, $1.50)

Documents et rapports de colloques (suite)

Colloque sur les politiques de stabilisation, Rapport du colloque tenu à l'Université Western Ontario, août 1965
(EC22-665F, $3.00)

Colloque sur le commerce international et l'agriculture canadienne, Rapport du colloque tenu à Banff (Alberta), janvier 1966
(EC22-766F, $3.00)

Papers presented at Conferences on Productivity through New Technology

Modern Management (EC22-4/1, $.50)	G. G. Fisch
Practical Application of Data Processing in Small and Medium Manufacturing Companies (EC22-4/2, $.75)	H. S. Gellman R. C. Carroll
A Practical Approach to Automatic Production (EC22-4/3, $.50)	D. J. Clough J. W. Abrams R. W. P. Anderson
Advances in Metal Working (EC22-4/4, $.75)	J. Vande Vegte
Improving Material Movement Through the Manufacturing Cycle (EC22-4/5, $.50)	J. A. Brown B. D. Beamish
The Economic Justification of New Equipment (EC22-4/6, $.75)	C. G. Edge
New Technology in Materials and Processes (EC22-4/7, $.70)	J. Vande Vegte

Documents présentés aux Colloques sur la productivité par la nouvelle technologie

La gestion moderne
(EC22-4/1F, $.50)

Application pratique du traitement de l'information dans les petites et les moyennes entreprises industrielles
(EC22-4/2F, $.75)

Manière pratique d'envisager la production automatique
(EC22-4/3F, $.50)

Les progrès dans le travail des métaux
(EC22-4/4F, $.75)

L'amélioration du mouvement du matériel à travers le cycle manufacturier
(EC22-4/5F, $.50)

Justification économique du renouvellement de l'équipement
(EC22-4/6F, $.75)

Nouvelle technologie visant les matières premières et les procédés
(EC22-4/7F, $.70)

Other Studies and Reports		Autres études et rapports
Annual Report (1964) (EC1-1964, $.50)	John J. Deutsch	Rapport annuel (1964) (EC1-1964F, $.50)
Annual Report (1965) (Fo 1/1965, $.50)	John J. Deutsch	Rapport annuel (1965) (Fo 1/1965F, $.50)
Annual Report (1966) (EC1-1966, $.50)	John J. Deutsch	Rapport annuel (1966) (EC1-1966F, $.50)
Annual Report (1967) (EC1-1967)	John J. Deutsch	Rapport annuel (1967) (EC1-1967F)
A General Incentive Programme to Encourage Research and Development in Canadian Industry, A Report to the Economic Council of Canada (EC22-565, $.60)	Advisory Committee on Industrial Research and Technology – Comité consultatif sur la recherche industrielle et la technologie	Programme général de stimulation des travaux de recherche et de développement dans l'industrie canadienne, Rapport présenté au Conseil économique du Canada (EC22-565F, $.60)
A Declaration on Manpower Adjustments to Technological and Other Change (EC22-866, $.75)	Council – Conseil	Une déclaration au sujet de l'adaptation de la main-d'œuvre aux changements technologiques et autres (EC22-866F, $.75)
Towards Better Communications Between Labour and Management (EC22-967, $.25)	Council – Conseil	Vers une amélioration de la communication entre patrons et travailleurs (EC22-967F, $.25)
Interim Report—Consumer Affairs and the Department of the Registrar General (EC22-1067, $.25)	Council – Conseil	Rapport provisoire sur les affaires du consommateur et le ministère du Registraire général (EC22-1067F, $.25)
*forthcoming		†en préparation

Copies of the above publications may be obtained in English and French from the Queen's Printer, Ottawa. Payment should accompany orders to avoid possible delay in shipment.

On peut se procurer des exemplaires de ces publications, en anglais et en français, chez l'Imprimeur de la Reine, à Ottawa. Afin d'éviter les retards d'expédition, prière d'envoyer les chèques en même temps que les commandes.

Scale and Specialization in Canadian Manufacturing

by

D. J. Daly, B. A. Keys and E. J. Spence

Economic Council of Canada