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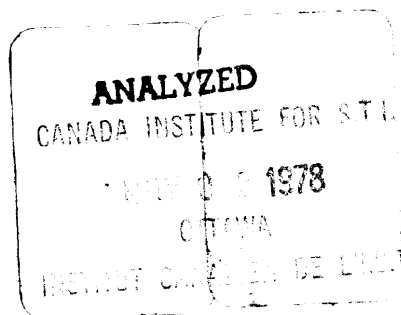
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The Weakest Link

A Technological Perspective
on Canadian Industrial
Underdevelopment

by John N.H. Britton
James M. Gilmour

assisted by
Mark G. Murphy



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ANALYZED

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on Canadian
Industrial Underdevelopment

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John N. H. Britton

John Britton, Professor of Geography at the University of Toronto, took his BA (1961) and MA (1963) degrees in geography from the Universities of Sydney and Melbourne. Then as a Commonwealth Scholar, he gained his PhD in economic geography from the London School of Economics and Political Science (1966). He has been teaching at the University of Toronto since 1968.

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James M. Gilmour

James Gilmour was born in Scotland in 1939. He attended school in Kilmarnock and then studied economics, geography, and economic history at Glasgow University, obtaining an MA in 1962. He immigrated to Canada in the same year and continued his studies at the University of Toronto where he obtained the degrees of MA and PhD. Both were in the field of industrial geography. In 1967 he joined the faculty of McGill University where his research interests centred around Canadian economic development, and the role of economies of scale in industrial location. In 1976, he took up an appointment at the Science Council of Canada where he is presently a Science Adviser.

Dr. Gilmour's publications include *The Spatial Evolution of Manufacturing: Southern Ontario, 1851–1891*, (University of Toronto Press, 1972), a study of the economic and spatial development of manufacturing in Ontario. He has written, with Arthur J. Cordell, *The Role and Function of Government Laboratories and the Transfer of Technology to the Manufacturing Sector* (Science Council of Canada, 1976). His current research interest is the role of technology in economic and industrial development, in particular the developmental implications of technology transferred from abroad.

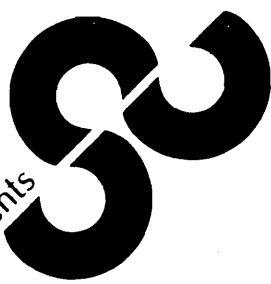


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Foreword

The Weakest Link has been researched and written by Dr. J. Gilmour and Dr. J. Britton as a contribution to a comprehensive review of Canadian industrial and technology policy currently being undertaken by the Science Council Industrial Policies Committee. This Committee, chaired by Mr. John Pollock, has already issued a report entitled, *Uncertain Prospects: Canadian Manufacturing Industry, 1971–1977*, and is currently reviewing possible policy initiatives designed to revitalize Canadian industry.

As the Britton-Gilmour study indicates “revitalization of industry” is not too strong an expression. It is now generally accepted that the Canadian manufacturing sector is not competitive, and the outward signs of that lack are loss of market position at home and abroad, serious trade deficits, and the inability to employ Canadian skills. It has yet to be fully understood that these difficulties spring not merely from short-term economic circumstance, but, more fundamentally, from defects in the structure of Canadian industry itself. These defects need to be addressed if we are to achieve a lasting recovery of our economic health.

It is recognized quite clearly that the manufacturing sector cannot be treated in isolation. In addition, we can find neither reason nor comfort in explanations which view the decline of manufacturing activity as the welcome advent of a post-industrial society.

As the Britton-Gilmour study shows, all sectors of industry — primary, secondary and service — are inextricably linked. But with manufacturing playing a pivotal role in the economy, its weaknesses will inevitably impact upon the vitality of industrial Canada as a whole.

The Weakest Link examines in depth the impact of foreign investment. This fact alone should elicit vigorous discussion. Whatever the perspective of the reader, it is time to address this problem, which has reached an extent in Canada almost without parallel in the industrial world.

One might hope that, in our current economic uncertainty, we not only address this issue but develop a positive response to it, as a part of our endeavour to re-energize the technological, industrial and economic foundations of this country.

As with all background studies published by the Science Council, this study represents the views of the authors and not necessarily those of the Council.

J. J. Shepherd
Vice-Chairman
Science Council of Canada

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Throughout the preparation of the study two persons provided indispensable assistance. The first was Mark Murphy, Research Associate of the Science Council, without whose prodigious and competent labours in statistical and other analysis this study could not have been written. The second was Dr. Roger Voyer, Director of Research and Administration of the Science Council, who provided invaluable criticism, guidance and moral support.

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John N. H. Britton
Toronto
August 1978

James M. Gilmour
Ottawa

I. Introduction

Over the past four decades, Canada's standard of living has increased substantially. This has been achieved by economic expansion fuelled by a wealth of natural resources that has been exploited, by large numbers of immigrants who have stimulated demand, and by very favourable conditions for the expansion of production and trade in the world as a whole. In recent years, however, the confidence of Canadians in their economy has been jolted. The standard of living — the level of development of the economy — has slipped from its path of increase and the energy crisis has made matters worse. Stagnation and lack of direction in the pattern of economic change have set in. Nowhere is this more evident than in the manufacturing sector which bears high labour costs and lags behind the United States in its productivity by a considerable margin.

Reflecting the past strengths of resource exports and public borrowing of funds on the international money market, the Canadian dollar exchanged (until recently) at a level far too high to offset wage and productivity factors. *Canadian secondary manufacturing has proved ineffectual in selling abroad not only because its prices are uncompetitive but also because it relies on mature products that have had extensive exposure in international markets.* Canada is not holding its industrial ground against imports or maintaining its level of innovative activity. Although all industrial countries have problems maintaining employment and sales, it would be myopic to suggest that the short-run factors afflicting other industrial nations have a *dominant* role in explaining Canada's relatively worse performance and prospects in manufacturing production and trade.

This study is not concerned with the painful and obvious aspects of the levels of unemployment and inflation but focusses on deep-rooted problems in the structure and management of the economy that, though fundamental, may be obscured by immediate conditions. These problems have origins dating as far back as the late nineteenth century, but appraisal of their full significance in reducing Canada's capability in secondary manufacturing has never been as necessary as it is now, with continuity in the long-term growth in resource exploitation and population no longer prevalent.

This study is motivated by the need to assess the nature, magnitude, and causes of the long-term deficiencies of the Canadian economy. While broadly based in its perspective, it is focussed on two indicators of economic success. Evaluation of the *external* performance of the economy is accomplished by examining Canada's pattern of international trade of secondary manufactures. Economic performance is also considered from an *internal* standpoint. An evaluation of the changing job pattern in Canadian industries in terms of the type of work undertaken (occupations) is chosen because it provides a comprehensive basis for comparing structural changes in Canada with those in other economies.

The thesis of this study is that problems identified in the negative imbalance of Canada's trade in end-products, and in industrial and employment structure, derive directly from the *behaviour* of firms in Canada. Even more specifically, it is argued that the most important agent of the entrenched industrial malaise is the way firms of foreign origin have been permitted to operate in Canada. In other words, the overwhelming importance of foreign direct investment in the Canadian economy derives from the particular patterns of operation of the firms involved; Canadian manufacturing as a consequence

reflects a substantial measure of industrial underdevelopment. The argument is pursued in terms of the low level of technological sophistication and slow pace of change engendered by the choices made by these firms in Canada. The pattern of influence is *direct* – in terms of the types of activities undertaken or not undertaken by foreign firms especially in secondary manufacturing. There are *indirect* effects as well: repercussions are felt throughout the whole of Canadian manufacturing in terms of job-types, international competitiveness, and hence present levels of, and prospects for, economic development.

In pursuing this particular thesis, this work differs from the majority of studies addressed to the importance of foreign direct investment in Canada because in large measure the analysts involved in those studies have been far from convinced of the negative effects of foreign corporations in Canada. Although many working in this field *are* certain about the disbenefits of the high level of foreign direct investment, their ideas are not found to be the basis of industrial policy-making, with the exception of the connection between the Gray Report (*Foreign Direct Investment in Canada*) and the Foreign Investment Review Agency. Ultimately, this study suggests new directions for policy making in Canada: its purpose is in that sense constructive. The study is designed to form the initial stage of a major prescriptive program being assembled by the Science Council. Before that stage can be reached, however, it is necessary that everyone become aware of the structure, performance and inherent weaknesses in Canadian secondary manufacturing.

To a large degree previous writers on foreign direct investment have reflected the different strands of orthodox economic thought and some of the resulting work does not explore the full range of questions that can be based on existing data. The *Continentalist* view of the advantages in industrial efficiency that would be derived from North American rationalization of industries has been of great importance. Logically this idea can be viewed as standing in *opposition* to *national* aspirations, not only in political and social spheres, but also in the international economic position of Canada (and its standard of living). Another especially significant doctrine in Canadian writing suggests that firms seek *optimal* solutions and that this, in turn, leads to a beneficial distribution of resources (capital, labour skills, management, and enterprise) in Canada. This proposition continues by suggesting, directly or indirectly, that there are no differences in the ways foreign and domestic firms pursue economic goals when making industrial decisions. This position, however, clearly ignores the great differences existing between the real, corporate strategies of foreign subsidiaries in Canada, and the way in which the goals of usually smaller Canadian businesses are pursued.

Substantial forces affect the extent to which foreign subsidiaries in Canadian secondary manufacturing contribute to our economic development. The objectives of profits, or sales volume or growth, or return on invested capital on a *global* basis, consistent with the goal of maximizing exports from parent plants (often in the US), lie clearly within this category. These objectives are well documented in international business literature.

The operations of most Canadian manufacturing firms, by contrast, tend to be *domestic* in orientation. They are generally small and limited in their ability to seek and exploit foreign markets. However, many small, highly innovative firms in electronics, exemplify that small firms can export successfully. Nevertheless, the *aggregate* trade pattern for Canada is that of

a deficit in the trade of high-technology outputs, and in fact in all goods of secondary manufacturing. If foreign subsidiaries were export oriented, this situation would not exist.

Another orthodox Canadian view seems to be that it is not particularly significant whether replacement technology (embodied in products or in processing techniques) is *new*, in the sense of innovation, imitated, or licensed, etc., from another source. Either type of technology has been deemed “good enough” in much Canadian writing. Certainly most foreign subsidiaries producing finished consumer goods operate with mature product-technology and some writers argue Canadian industrial efficiency would be served best if existing technology were adopted faster by domestically-controlled firms. However, this position on efficiency has rather limited long-term significance as long as finished goods can be produced only for the Canadian market.

Market limitation is crucial and is determined by the wide variety of mature low-price products produced in low wage economies for international markets. Canada needs innovative industry in order to supply Canadian and foreign markets with new processes and products. In the past, foreign subsidiaries received most of the meagre support for innovation in Canada. A policy environment in which domestic firms of all sizes can utilize support specifically geared to innovative growth is essential.

Given the inconsistency between the economic orthodoxies and the realities of Canadian business, particularly the dominant presence of foreign manufacturing firms, it is understandable, perhaps, that the development of an industrial strategy in Canada has been a retarded aspect of the business environment. This study hopes to obliterate the stalemate in economic and business thinking, and to set the course for constructive policy making. *The Weakest Link* argues in favour of the following positions:

1. Canada and Canadians must accept that foreign direct investment in Canada is a powerful economic agent that modifies this country's present and future industrial and trade structure and performance. Furthermore, foreign direct investment, in general, has a negative effect on those aspects of the Canadian economy. Foreign direct investment is not a conspiracy. Simply (and obviously), the behaviour of multinational companies does not support the long-term aspirations of Canadians for their economy and society. The solution must, therefore, contain initial *support for Canadian firms* as compensation for their more limited resources and must modify the economic environment in such a way that policies are designed to be consistent with a developing Canadian industrial sector.

2. There is no inevitable outcome of the trend to Continentalism, but a good economic case can be made that Canadian economic sovereignty should be supported more effectively than at present. Much attention in recent years has been given to theoretical gains from free trade with the US. But this would be a counter-productive step from the standpoint of Canadian economic welfare, given the low level of Canadian competitiveness in secondary manufacturing and the dominance of US subsidiaries in these industries. Much more well-directed effort is required to develop *Canadian* manufacturing strengths *before* gains can be made from future or current tariff remissions.

3. The only way Canadian firms can establish international industrial positions as successful end-product exporters, is to foster innovative product

and process developments which can provide the basis of overseas marketing ventures. The products may have a low volume of output and their success may depend to some extent on components produced elsewhere in the industrial world; that, however, is not a problem provided enough Canadian businesses offset, sufficiently, Canada's imports of finished goods. This direction has been supported effectively by governments of other western countries: it is possible in Canada. The main problem is to convince government, business and labour, of the necessity for industrial change; the chief obstacles are lack of vision and leadership in government and labour, and the low level of entrepreneurial aggressiveness in the Canadian manufacturing sector.

Until now, Canada has never perceived the need for a policy of technological sovereignty. When Canada had a large competitive advantage as supplier of many industrial raw inputs, technological self-reliance was rarely seen as a major issue, and Canadian government support for innovation actually declined over the past decade. This was an extremely dangerous course of inaction as it transpired, because of Canada's emergent deficits in the trade of high-technology products (secondary manufactures) and because of the rise of highly competitive sources of industrial raw materials in the late 1960s and 1970s.* As a result of past inaction the future well-being of the country is at stake. The immediate task, however, is to prove the necessity for effective technological development.

*See Science Council of Canada, *Uncertain Prospects: Canadian Manufacturing Industry, 1971-1977*, Ottawa, October 1977.

II. Trade Imbalance and the Problems of a Semi-Industrial Economy

Canada's comparative advantage is still expressed in terms of exports of raw and partially processed materials – a pattern of commodity flow, often running north-south on the continent, that characterized the economy a century ago. Over the last quarter-century the volume of Canada's exports has grown enormously but despite substantial industrial growth *there has been no fundamental change in the types of goods in which Canada is internationally competitive*. It is surprising that in a country with as high a level of per capita income, and as substantial an industrial sector, there are *large and increasing trade deficits in manufactured goods*. While one hundred years ago Canada was an emerging nation with a developing economy, in the late 1970s Canada has not fulfilled its developmental potential.

Canada is not self-sufficient in industrial trade. South Africa, Australia, New Zealand, and some Latin American nations similarly depend on resource exports to offset large manufactured imports. But of this group only Canada has had the market size and the educated labour force to allow attainment of industrial status and only Canada has had substantial industrial development in the past. The Canadian economy could reasonably be expected to reflect transition toward truly industrial status, like the US or Germany, rather than regression toward economies like that of Chile or Brazil.

Canada's industrial problems, however, are long-standing and from the outset it should be noted that they are distinct from and essentially unrelated to the factors responsible for slow growth and high unemployment in most industrial countries over the past few years – world recession of the early 1970s, the oil crisis, high-wage settlements, stagflation, and the 1974 recession. These factors, however, have made the situation worse. In secondary manufacturing, particularly in the production of high-technology goods, Canadian trade failure has existed throughout the post-World War II period but the excess of high-technology imports has now reached such proportions that it has become a major reason for Canada's particularly poor general trading pattern.

Evidence on the causes of Canada's trade failure, and its miserable performance as an industrial nation, are uncovered below through examination of components of Canada's current account. Subsequently, too, it is found that the structure of Canadian manufacturing activity corroborates the trade evidence of industrial underdevelopment.

Disaggregating the Balance of Payments

Canada's balance of payments on the current account generally was in deficit over the period 1950–1970 but it fluctuated in accordance with long and short period cycles; there was, for example, a long upswing from the late 1950s to 1970 (Figure II.1). Generally, Canada's trade reveals the sensitivity of the economy to the fortunes of the US, its major market. Trade balance was positive only at the end of the Korean War and the Vietnam conflict though during the upswing of the late 1960s, Canada was receiving the benefits of greatly expanded world trade. There was, however, a major negative change after 1970, and much larger deficits ensued consistent with the experience of the previous 20 years.

Figure II.1 – Canada’s Current Account Balance of Payments

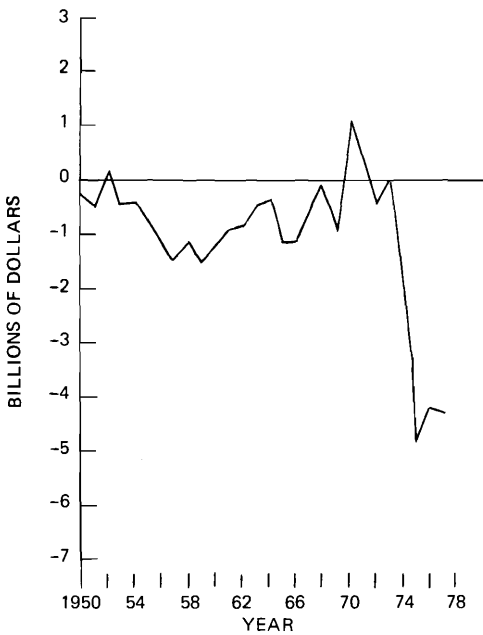
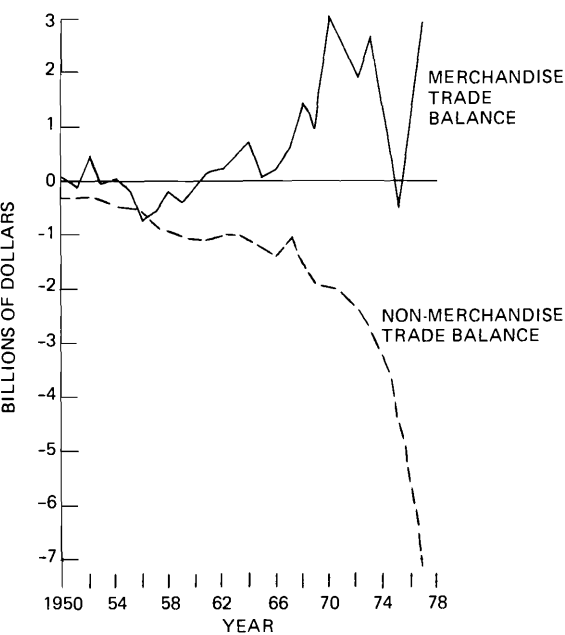


Figure II.2 – Canada’s Balance of Payments in Merchandise and Non-Merchandise Trade



Sources: Statistics Canada, *The Canadian Balance of International Payments*, Cat. No. 67-201, Supply and Services Canada, Ottawa, September 1977, p. 114; Statistics Canada, *Quarterly Estimates of the Canadian Balance of International Payments*, Fourth Quarter 1977, Cat. No. 67-001, Supply and Services Canada, Ottawa, April 1978, p. 32.

The size of the trade balance is measured in the merchandise and non-merchandise accounts which are combined in Figure II.1. Of these it is the deficit on the non-merchandise account that is the most persistent and has been a long-term increasing drain on the economy. There has been a recent increase in this deficit and a large fall in the surplus on the merchandise account (Figure II.2) after the early 1970s.

Non-merchandise account

The non-merchandise account covers *invisible trade* — transport, foreign travel, investment income and other services¹ — and *government financial flows and transfers* which are official and private donations (aid) and other government transactions. Although non-merchandise trade (Figure II.2) includes both components, the latter was less than \$300 million in 1971. A consistent focus is maintained, in this study, on business behaviour by considering only *invisible trade*.

During the 1960s, world invisible trade grew at a more rapid pace than visible trade, and its ratio to visible trade is now more than 25 per cent. Most of the 25 countries that lead the world in invisible trade have positive balances on this account. Canada, West Germany, Australia, Japan, South Africa and Argentina, however, do not. Within this group only West Germany, Japan and Canada had sufficiently large visible balances in 1971 to offset the negative position on invisibles (See Table II.1.) In Canada's case visible trade barely met the challenge though 1971 was a "good year" overall for Canadian merchandise trade (Figure II.2).

Table II.1 — Invisible and Visible Trade: Selected Countries, 1971 (\$ million US)

Country	Invisible Balance	Visible Balance	Total* Balance	Current** Balance
Canada	-2454	2592	138	393
West Germany	-4801	6369	1568	167
Japan	-2325	7787	5462	5797
Australia	-1277	597	- 680	- 884
South Africa	- 811	604	- 207	-1366
Argentina	- 292	- 129	- 421	- 390

*Invisible and visible balances.

**Invisible and visible balances and transfers and government spending.

Source: Brian Griffiths, *Invisible Barriers to Invisible Trade*, Trade Policy Research Centre, London, 1975, p. 10. Derived from International Monetary Fund data.

Table II.2 — Canadian Invisibles Trade Balance: Selected Years

	1961		1966		1971		1976	
	\$ m	%	\$ m	%	\$ m	%	\$ m	%
Transport	- 82	6.9	- 65	4.8	- 22	1.0	- 173	3.3
Travel	- 160	13.4	- 60	4.4	- 202	9.5	-1191	22.5
Interest and dividends	- 561	47.1	- 822	60.4	-1141	53.9	-2491	47.0
Other services	- 387	32.5	- 414	30.4	- 752	35.5	-1439	27.2
Total invisibles	-1190	100.0	-1361	100.0	-2117	100.0	- 5294	100.0

Figure II.3 – Canada's Trade Balance in Invisibles as a Percentage of GNP

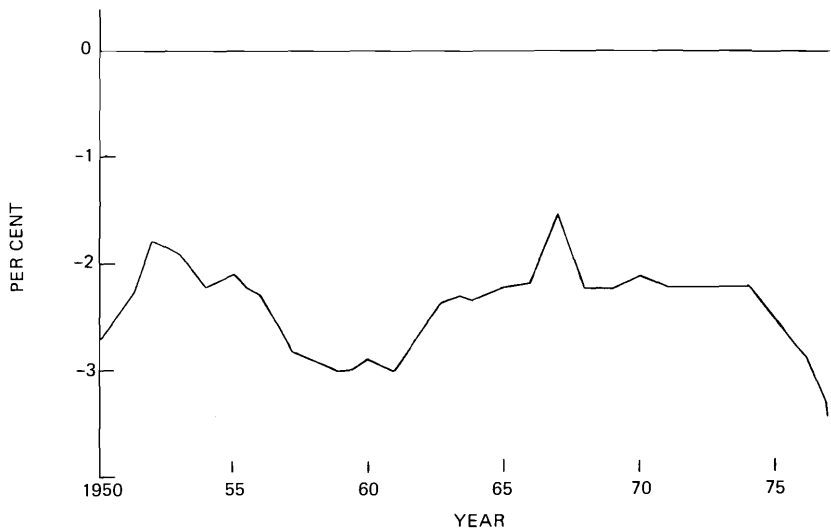
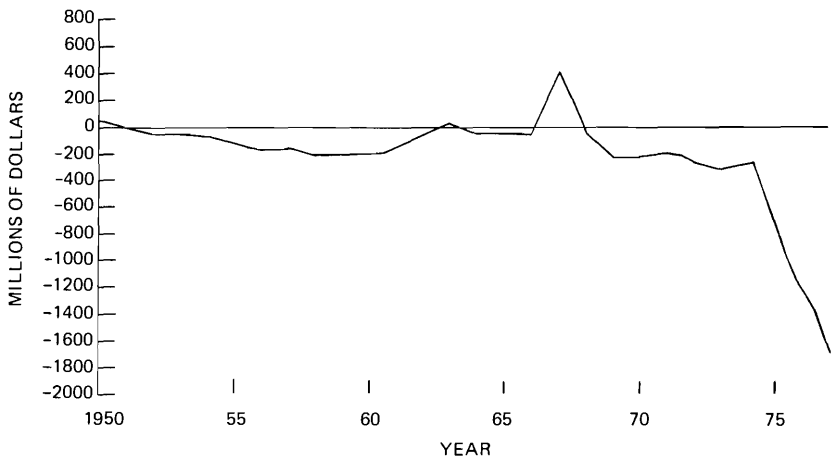


Figure II.4 – Canada's Balance of Payments: Travel



Sources: Statistics Canada, *The Canadian Balance of International Payments*, Cat. No. 67-201, Supply and Services Canada, Ottawa, Selected Years; Statistics Canada, *National Income and Expenditure Accounts*, Cat. No. 13-201, Supply and Services Canada, Ottawa, Selected Years.

When compared with other countries in terms of invisible receipts as a proportion of total *receipts* (1971), Canada placed last out of the 25 countries reviewed. Canada's ratio of 15 per cent (cf., US 34 per cent, UK 36 per cent) indicates a woefully small degree of success in selling those services included in the invisible account. Canada also has the fourth *smallest* invisible receipts/GNP ratio, indicating once again the stunted role invisibles play in Canada's development. Countries with lower ratios either have a very much larger and/or stronger economy (eg., US, West Germany and Japan) or are smaller and weaker in the specializations that generate invisibles (eg., Australia). Canada is weak in receipts but attains a more conspicuous position in payments (above the median of invisible payments/total payments and payments of GNP) in achieving a negative invisibles balance. The reason for this lies in Canada's peculiar economic structure.

In the world economy during 1971, transport accounted for about 30 per cent of invisible trade, foreign travel about 20 per cent, investment income just under 30 per cent, and other services just over 20 per cent. Canada's invisibles trade balance is very different (Table II.2) because the financing of the economy is foreign controlled. About *half* Canada's negative trade in invisibles is contributed by the outflow of dividends (stock dividends to foreign investors), profits (to foreign parent firms), and interest (to foreign bond subscribers).²

The trade imbalance in "other services", which measures the purchase of managerial and other professional inputs by Canadian governments, and corporations, is in relative terms as important a long-term characteristic of Canada's negative invisibles balance as are interest and dividend payments. The service flows of businesses are discussed in greater detail in Chapter V but it is noted here that they were as large as \$763 million on balance in 1970, and *dominantly reflect the imports of foreign-controlled corporations*.

The salient facts concerning Canada's trade balance in invisibles are:

1. Invisibles have been consistently a large *negative* contributor to Canadian balance of payments in contrast with the experience of most other economies with large trade in invisibles.

2. Relative to GNP the negative balance has increased over the last ten years (Figure II.3).

3. The invisibles GNP ratio is highly sensitive to the travel account. The period 1961-74 was marked by increased international travel expenditures in Canada because of EXPO 67. From 1974 Canadian incomes were inflating faster than abroad and Canadians were able to make international travel expenditures at a much higher rate than could be matched by travel receipts. (See Figure II.4.)

4. Deficits reflect the fundamental weakness of the economy in terms of foreign capital dependence and Canada's inability internationally to earn sufficiently in professional and other business services to offset the dividend flows. In Chapter V it will be shown that these two factors are intimately related.³

5. As surplus merchandise trade grew up to the early 1970s, so the deficit in invisibles expanded emerging as an offsetting burden on the economy. In this respect Canadian experience on the invisibles account has been at variance with that of the industrial powers.

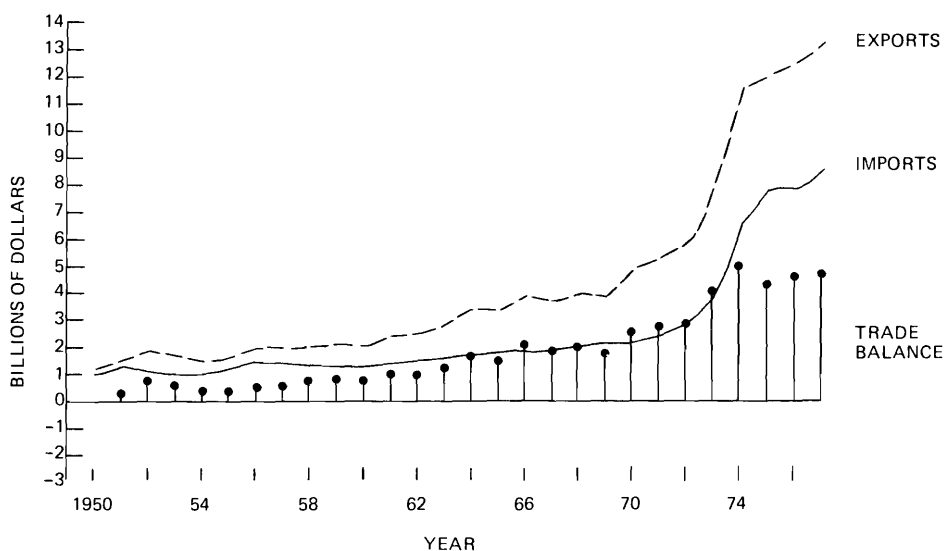
Merchandise Account

The merchandise account embraces the export and import of raw and partially processed materials, intermediate goods (parts and components), as well as finished end-products. Canada is accustomed to a surplus on the merchandise account and this throws the large recent, though temporary, deficit into sharp relief (Figure II.2).

Canada is a resource exporter – farm, fish and crude materials, as well as processed materials (Figure II.5 and II.6) – but positive balances in these commodities are insufficient to offset deficits in *fully manufactured goods* (Figure II.7) and in invisibles. During the past few years, however, this *deficit* has increased substantially as imports have grown more than exports. (To make a comparison of the graphs easier, consider Table II.3.)

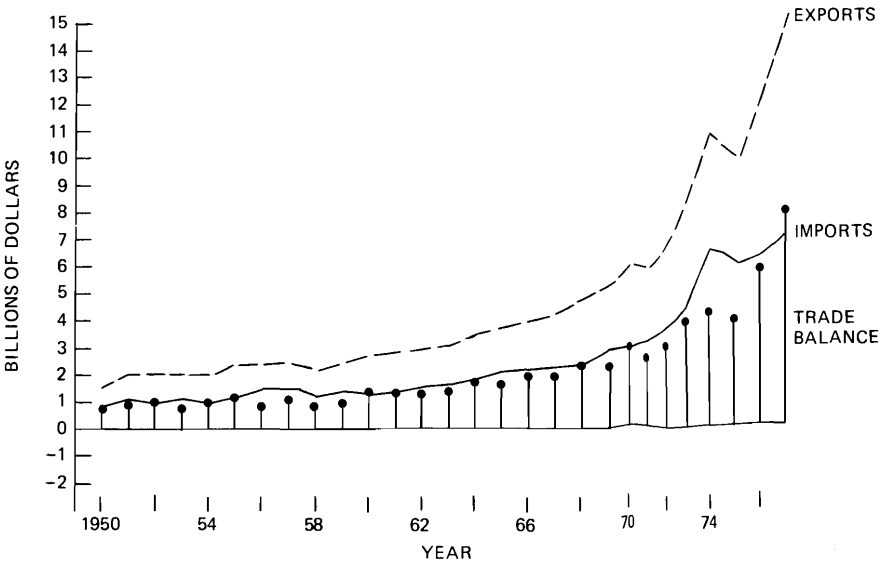
Canada's trading situation is bound to deteriorate without major changes in the economy. Prior to 1974 Canada's exports contained oil and gas sales subsequently found to be at levels the nation could not sustain. This item of export trade will probably become a sizeable deficit by the 1980s (Figure II.8). Unfortunately, this is not the only dismal note that must be struck concerning Canada's resource exports.

Figures II.5 – Canada's Trade Balance: Farm, Fish, and Crude Materials



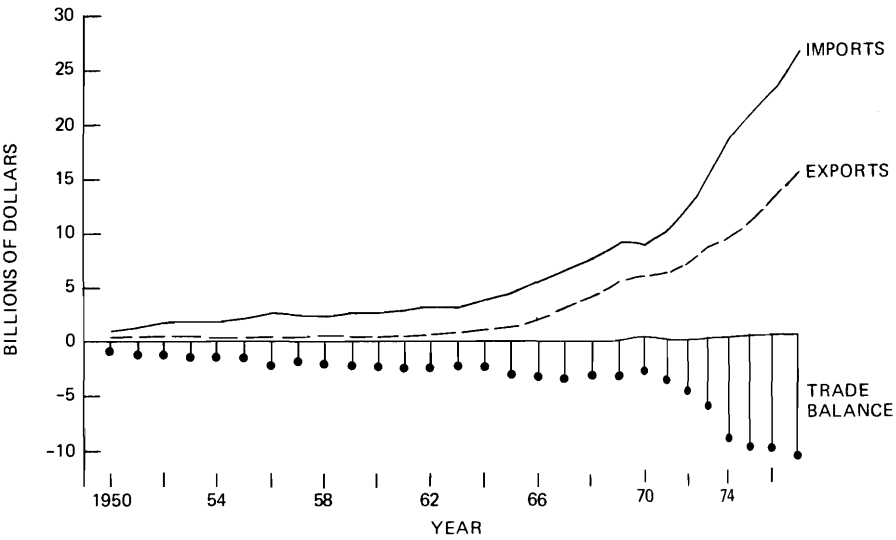
Source: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years.

Figure II.6 – Canada’s Trade Balance: Processed Materials



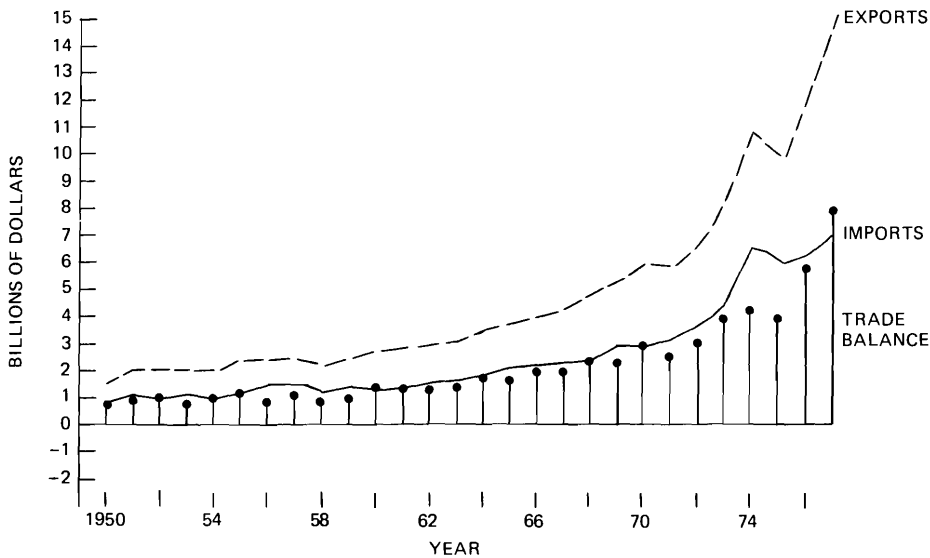
Source: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years.

Figure II.7 – Canada’s Trade Balance: Fully Manufactured End Products



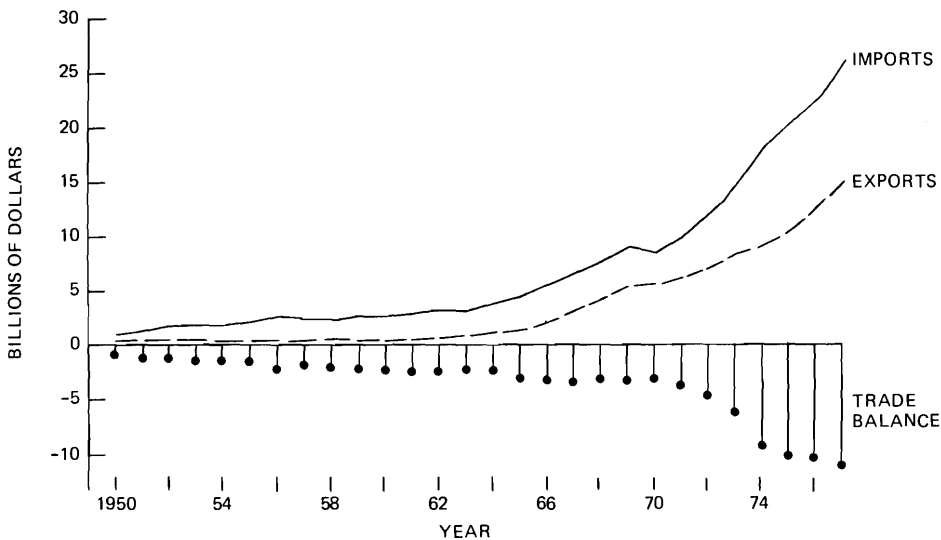
Source: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years.

Figure II.6 – Canada's Trade Balance: Processed Materials



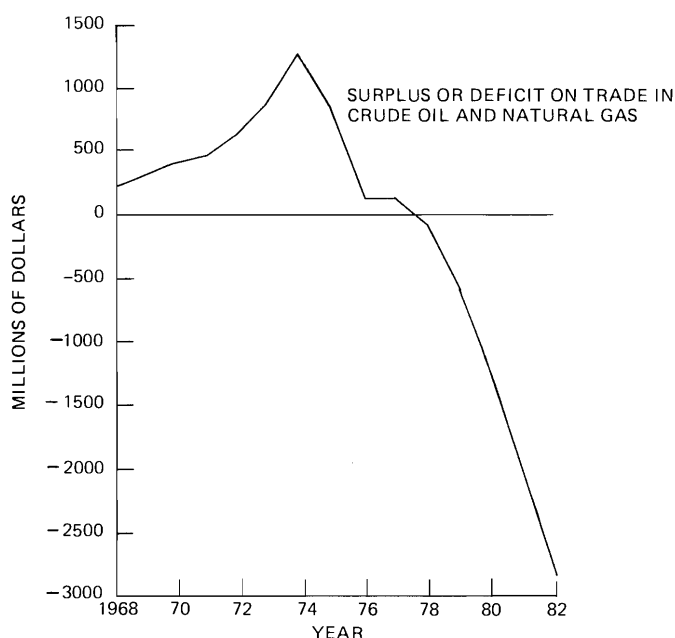
Source: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years.

Figure II.7 – Canada's Trade Balance: Fully Manufactured End Products



Source: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years.

Figure II.8 – Energy Account of Canadian Balance of International Payments, 1968–82 (\$ million)



Source: Judith Maxwell, *An Agenda for Change*, Policy Review and Outlook, C.D. Howe Research Institute, Montreal, 1977.

Table II.3 – Major Components of Canada's Trade Balance: Selected Years (\$ billion)

Trade Category	1950	1960	1965	1970	1975	1976	1977
Crude	+0.02	+0.74	+1.63	+2.61	+4.29	+4.53	+4.71
Processed	+0.77	+1.39	+1.61	+2.98	+3.90	+5.93	+7.89
Fully Manufactured End Products	-0.88	-2.31	-3.18	-2.97	-10.20	-10.25	-11.10
Invisibles	-0.50	-1.12	-1.25	-1.83	-4.17	-5.30	-6.98

Note: Summing the above columns will not yield the balance of payments as reported by Statistics Canada annually. The above commodity classifications do not include all goods traded. In addition, Statistics Canada reports merchandise trade balances on a balance of payments basis which entails considerable adjustment to the commodity trade data. Also as has been mentioned previously, invisibles include only major non-merchandise trade items.

Sources: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202; Supply and Services Canada, Ottawa; Statistics Canada, *The Canadian Balance of International Payments*, Cat. No. 67-201, Supply and Services Canada, Selected Years.

The Maturity of Canada's Resource Exports

Canada's economic identity has largely been based on a long tradition of growth in resource-based exports but the probability of this pattern continuing for much longer is very low. Unfortunately, this is not a contentious view but merely the consensus of much that has been written in recent years. While it is important to summarize the arguments for believing this dismal scenario, the implications of an inevitable and irreversible reduction in Canada's dependence on resource exports is of greater relevance for policy formulation.

While Canada is rich in the variety of resources which have been exploited, increasingly other countries are emerging as the growth locations cutting into Canada's traditional share of international sales and laying first claim to any market growth.⁴ In particular, Third World countries are attaining a more important share of the production of many commodities. The USSR is only now beginning significant entry into world markets despite its very large resource base. To a large degree Canada is vulnerable to these changes elsewhere in the world.

In mining, the productivity of labour and capital combined has been declining since 1960. The origins of the problem probably lie in labour shortages and turnover, in the low level of technical innovation (because of low returns on investment) and in the low yield of ores being extracted. The latter factor will become increasingly significant because of energy costs. In addition, the declining quality of ores is associated with high costs in the frontier regions now being exploited — many competitive locations overseas are more favourably endowed by nature though they may be less stable politically.

Low returns on investment while attributable to resource quality and labour factors also reflect the prevailing tax profile of Canada. In this respect resource industries have been burdened in recent years by high tax rates and government royalties although many "competing" governments are providing concessions. Few junior mining companies are now emerging because of the low profit factor induced by this aspect of the economic climate: probably legislation on protection of the physical environment, has been an additional retarding influence on the rate of investment.

Problems of physical resource quality and economic performance have emerged not only in the mining industry. In wood pulp production, for example, only one-third of Canadian mills are of minimal optimal scale. In large measure, the industry has been left behind in its modernization program at a time when capital costs have inflated rapidly. In newsprint production much equipment is outmoded and firms in Eastern Canada, in particular, are at a significant disadvantage compared with their competitors in the southern US. The cost of pulpwood delivered to an eastern Canadian paper mill is now the most expensive in North America. This is a critical factor given the importance of the US market. However, in wood density, growing rates, forest yields and other physical considerations, Eastern Canadian producers are at a further disadvantage vis-à-vis southern US plants. These factors are coupled with higher Canadian wages, lower productivity, poor labour-management relations (since the early 1970s) and higher transport costs to US markets. The industry is significantly less profitable than in the US.

All the evidence points to the maturity of many Canadian resource industries: the mineral and forest-product industries have experienced declining rates

of increase in output because the richest resource locations were exploited first. In mining the rate has been long-term decline dropping from 10 per cent per annum from 1950–55 to 3.2 per cent per annum from 1970–75 (1971 dollars). There is evidence that pulp and newsprint production was declining in its rate of increase even during the expansionary period of the 1960s.

The future for these resource industries given domestic and foreign *production* conditions is, at best, slow growth in output; certainly rapid export expansion, experienced in recent decades, can never recur given the newer, cheaper producers. The emerging trading arrangements, especially in minerals, aid the developing countries (e.g., bilateral policies of the European Economic Community (EEC) with former colonies) and reinforce this interpretation of Canada's prospects. On the *consumption* side, however, world markets have entered a new phase that breaks with recent historical trends: there is a major slowdown in the growth of consumption in industrial countries and Canadian resource sales will be adversely affected.⁵

On balance, Canada can no longer fall back on resource exports to offset increases in imports of manufactured goods. This places great pressure on the secondary manufacturing industry to attain an international position consistent with Canadian industrial development.

Manufacturing and the Trade Balance

Any hope of long-run improvement in Canada's merchandise trade hinges on the manufacturing sector. This position is suggested not only by the need to reduce the dependence of the economy on foreign sources of business but also by the limited prospects for resource exports. Manufacturing or related firms must begin to provide for themselves, or from domestic sources, many of those imported services thus improving the trade balance on invisibles. The same pressure applies for Canadian governments to contract with local service firms, especially those not dispatching profits to foreign parents. Similarly, Canadian manufacturing needs to produce goods for international markets and thus reduce the net economic dependence on foreign manufactures.

Are there alternatives to manufacturing re-development? Could the non-merchandise account be improved by reducing the outflow of investment income? This turns out not to be an alternative because this outflow and the deficiencies of Canadian manufacturing are related features of the same syndrome. New export sectors are required using Canadian capital: if manufacturing industry were developed in this way its exports would reduce both the relative importance of outflows of dividends as well as reducing inflows of manufacturing related services.

Could the export of secondary manufactures be increased based on traditional (low technology) capability? This is an improbable alternative given the cheapness of offshore sources and the uncompetitive performance of fabricating industries in Canada — produced by a combination of low productivity and high labour costs.

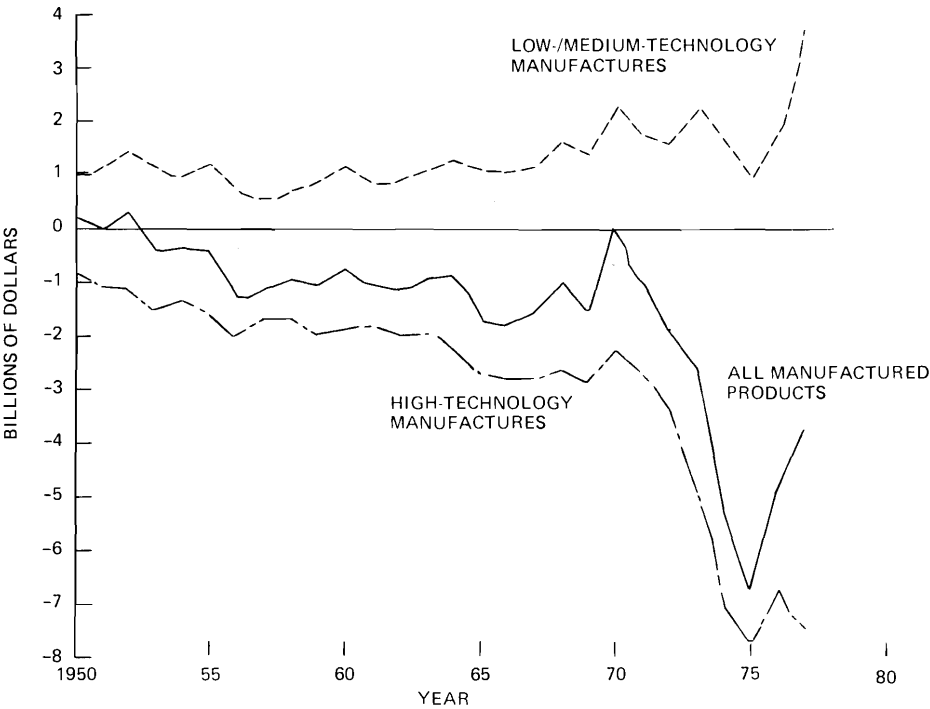
High-Technology Industry and its Trade Performance

Manufacturing development hinges on success in the high-technology industries⁶: included in this group are a wide variety of manufacturing activities that compete internationally on the basis of either a *low price* which is determined by the level of development of the technology used in production of

the particular goods (e.g., chemicals) or by the *efficiency, capacity or productivity* of the product being marketed (e.g., aircraft). There is, *in addition*, a plethora of industries that compete internationally on the basis of high technology components of equipment and which require substantial engineering or design inputs but produce less complex end-products (these often fall within the metal fabrication-domestic appliance industries). Many, though not all of these medium-technology activities have similar export potential as high-technology industries. High-technology industries achieve great importance in the world economic order particularly because no country can maintain its industrial condition unless it has sufficient strength in the block of industries producing high-technology goods to contain industrial spin-off and multiplier effects. An examination of this segment of Canada's *fully manufactured* trade account not only comes to the heart of the industrial factors that have caused the deficit in fully manufactured trade, but also provides the basis for a possible approach toward trade improvement.

High-technology trade has been experiencing a *long-term* increase in its deficit (Figure II.9). But the sector is notable also because of the severity of the deficit increase in the 1970s. Since resource-based trade is very unlikely to do better than hold its own in the foreseeable future, the *general decline in the trade balance in high-technology goods is the more significant especially because it caused the recent trough in the trade balance of all manufactured goods*. (See Figure II.9.)

Figure II.9 – Canada's Trade Balance: Manufactured Products

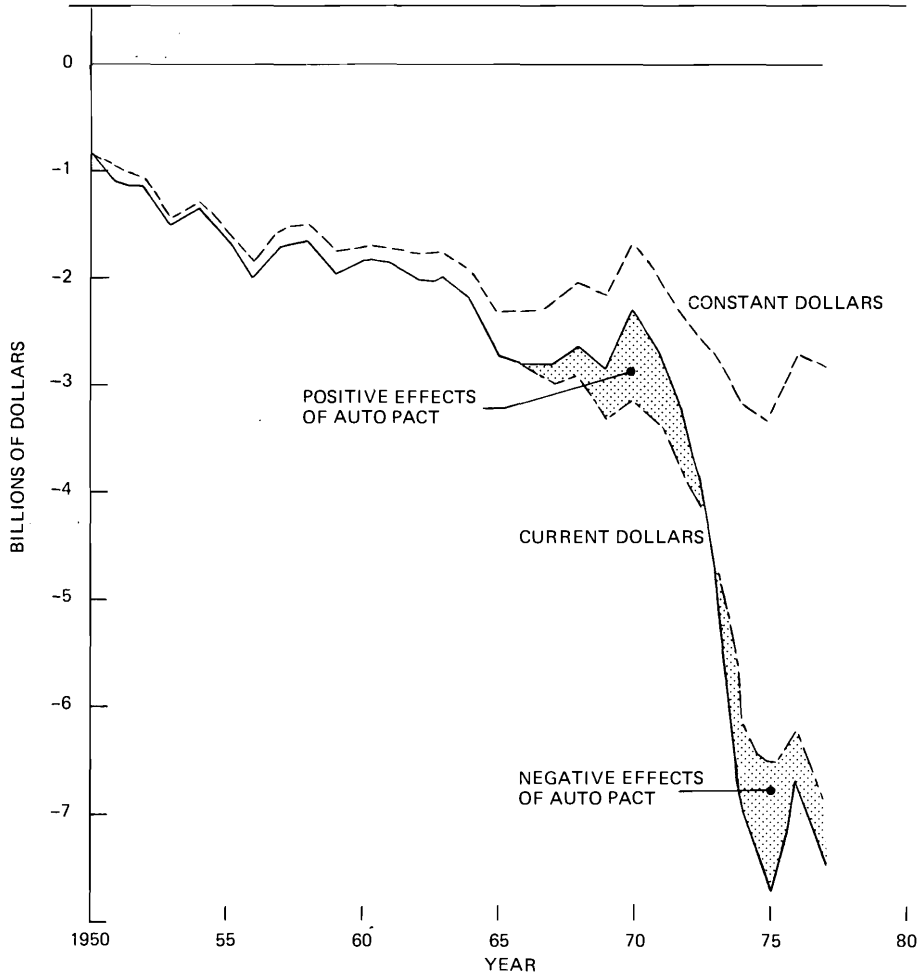


Source: Based on data available from Statistics Canada.

The Auto Pact

Among the problems of high-technology industry in Canada are the consequences of the Canada-US Automotive Trade Agreement (1965). The Auto Pact provided for the rationalization of the North American auto industry on a basis of free trade in autos and auto parts for new vehicles between Canada and the United States. Canada had an average deficit in *total automotive trade* of \$600 million annually from 1960–66.⁷ While the deficit in auto parts continued (1966-1970), Canada’s surplus in finished automobiles grew from \$70.8 million in 1966 to \$1164.7 million in 1970. This generated an overall positive balance in autos and auto parts for the first time which continued until the end of 1971. Without the Auto Pact, it is unlikely that the Canadian government would have allowed the deficit in automotive trade to rise above \$600 million. Since this sets a crude datum against which the actual pattern of the auto trade can be gauged, it is possible to re-evaluate the high-technology trade balance taking some account of effects of the Auto

Figure II.10 – Canada’s Trade Balance: High-Technology Manufactures, 1950–1977



Source: Based on data available from Statistics Canada.

Pact. When auto trade figures are evaluated it is necessary to subtract the \$600 million deficit — thus an auto trade deficit of \$438.2 million in 1967 represents a gain in high-technology trade of \$156.4 million. Proceeding in this fashion, Figure II.10 shows that the “improvement” in the high-technology deficit (1966-1972) can be explained by the Auto Pact alone. Similarly a substantial part of the post-1972 increased *deficit* in high-technology trade is attributable to the effects of the Auto Pact.

Despite the problems in the auto trade data related to statistical reliability, there is little doubt that by the end of 1972 the immediate trade benefits of the Auto Pact were exhausted. Deficits occurred owing to massive auto parts imports. Despite Canada’s surplus in assembled vehicles (1972–1976), the overall balance in automotive trade has grown more negative each year (until 1976) as parts imports have increased rapidly: between 1972 and 1974 Canada’s deficit in auto parts trade doubled and has remained over \$2 billion per annum.

Considerable debate has been generated recently by these deficits; the question of the equity of Canada’s production share of expanded markets has been posed by several government agencies and industry groups. Canadian performance falls short of a fair share, it is found, in overall production, parts production, investment, trade balance, employment and research, design and development. In the latter category, for example, Canadian foreign payments for R & D have averaged \$230 million over the past three years.⁸

While the experience of the Auto Pact is important in evaluating Canada’s chances under future parallel trade agreements when foreign transnational corporations are involved, it is the general issue of the health of Canada’s high-technology trade that is of immediate interest. The Auto Pact has obscured a continuing trend to increases in the trade deficits of other high-technology manufacturing in Canada during the late 1960s and 1970s. Figure II.10 provides strong support for a post-World War II trend of uncompetitiveness in the Canadian high-technology industry. The general deficits are attributable to the failure of a wide variety of manufacturing industries parallel to those of the auto trade.

Alternative Opinions on Canada’s Merchandise Trade Experience: Short-term vs. Long-term Interpretation

Given a period of trade improvement in the second half of the 1960s, it was understandable that the decline of Canada’s trading balance in the early 1970s should have been met with short-term explanations. Many optimists have advanced such arguments especially as there have been economic events since 1970 that are regarded as being of short-run duration and of a cyclical nature. Whether this view will prove to be correct is increasingly unlikely; nevertheless, two alternative propositions can be considered:

- 1) The pattern of change in Canada’s trade balance reflects short-term factors in the 1965–70 period just like post-1970: this implies that what have been popularly observed as *trends* (1965–70) were not long-term patterns and were not *temporarily* halted in the 1970s.

- 2) In addition to the *short-term* peculiarities of 1965–70 and post-1970, long-term trends were much more important because they reflect significant structural characteristics of the Canadian economy.

Particular attention will be given to the latter proposition. Though a long-term view is taken, consideration is first given to particular events in the pre- and post-1970 periods.

The Golden Years

Positive factors were dominant in Canadian trade during a five-year period beginning in 1965.

“Perhaps in no peacetime period in almost half a century did Canadian economic activity in broad and general terms appear to benefit as much as it did in the period 1965 to 1970 from certain favourable trends in relation to the United States.”⁹

Several factors made 1965–70 an exceptional period.

1. The Canada-US Auto Pact was signed in 1965. Although productivity advanced, Canada lost much of the managerial and technological capability the industry had maintained here. Greatly increased imports of auto parts have been partly offset by the positive trade balance in passenger vehicles. The vast increase in both import and export trade has had major effects on trade figures.¹⁰

2. Canada’s competitive position was improved by devaluation of the Canadian dollar in the early sixties.

3. During the late sixties Canada enjoyed the effects of the very large investment boom (1963–1966): labour productivity improved as Canada gained technologically (advanced and efficient plants and equipment).

4. During the Vietnam conflict, productivity improvements in the US slackened in a period of high-utilization levels whereas Canada achieved respectable productivity improvements. This positive effect on competitiveness made the American market easier to penetrate. Although Canada improved its competitive capabilities, gains were negated, even squandered, by subsequent cost increases.

The Post-1970 Decline

The trade deficit increased dramatically in the 1970s. The main reasons were the joint effects of the worldwide economic recession of 1974–75 and the relatively less depressed position of the Canadian economy. The volume of merchandise exports was reduced but no reciprocal check was imposed on the growth of imports, thus exacerbating the situation. The terms of trade swung against Canada. During 1973–74 there was an international commodity boom and the price of Canada’s exports rose much faster than the price of imports. Recession ended this situation but import prices rose by 18 per cent from the second quarter of 1974 to the first quarter of 1975, against an export price increase of only 9 per cent during the same period.

Compounding the problems arising from the operation of the trade cycle in the international economy, two other factors expressed themselves in decreased competitiveness of Canadian industry. The first factor was the abandonment of the attempt to hold the exchange rate of the Canadian dollar at the pegged level of 0.925 (US). In June 1970 the rate was set free to float. By the spring of 1974, the Canadian dollar had risen to about \$1.04 (US), representing a loss in competitiveness of about 12 per cent compared with the first half of 1970. Upward re-pricing of Canadian goods was a major contributor to Canada’s greatly increased trade deficit in manufactured goods. The second factor was the much more rapid increase in wages and salaries in

Canada as compared with the United States during the period 1974 to 1975. This served to reduce even further the selling ability of Canadian industry and made imported manufactured goods more attractive in Canadian markets.

The recent decline of the exchange value of the Canadian dollar, however, may go a long way to returning Canada's price competitiveness to late 1960s levels. But this will depend on the level of wage settlements yet to be made and on the inflationary effects of import costs embodied in Canadian production.

The Long-Term Counter View

Writing in 1976 and cognizant of the post-1970 events, Arthur Smith¹¹ concluded that underlying problems and distortions have made the Canadian economy increasingly vulnerable to cyclical instabilities, increasingly prone to a high basic rate of non-cyclical inflation, and less competitive in international terms. The appraisal of Canada's international economic position has to take account of longer term trends and should not be overly influenced by these factors. When placed in this perspective the basic facts seem to point inexorably to a long-term trend toward a *deterioration in the balance of trade on goods and services that is now a quarter of a century old*.¹²

In a high-wage economy it is not surprising that traditional industries should be hard-pressed in international markets. By contrast, however, high-technology sectors are expected to be a successful component of the trading balance. This has not been the case. High-technology industries have been a failure — a long-term failure. Nevertheless, the protagonists of the short-term view have been confused even by the behaviour of the high-technology sector of Canada's trade.

Relative Trade Performance

In evaluating the thesis of long-term manufacturing failure it is important that economic growth is taken into account. Although it is possible that relative to the size of the economy, merchandise trade, and particularly manufacturing trade, could have held its *relative* size, in fact this did *not* occur in the case of secondary manufacturing. The data show that Canada's manufacturing position has been getting both absolutely *and* relatively worse.

The long-term pattern of merchandise trade/GNP for Canada (Figure II.11) shows that though irregularities and cyclical influences are marked there was a general upswing from the mid-1950s to 1970; 1965 marked the end of a retarding recession and a second base from which growth occurred. Canada fared well when the US was at war — this was recognized earlier and is unshaken by the relative data. What now emerges however, is that the decline in merchandise trade/GNP after the Korean War was enormous in relative terms: the decline from 1970–75 is comparable in significance but not larger in these relative terms. The impression gained from Figure II.11, in spite of rapid declines, is that the total merchandise trade performance of Canada did trend upward.

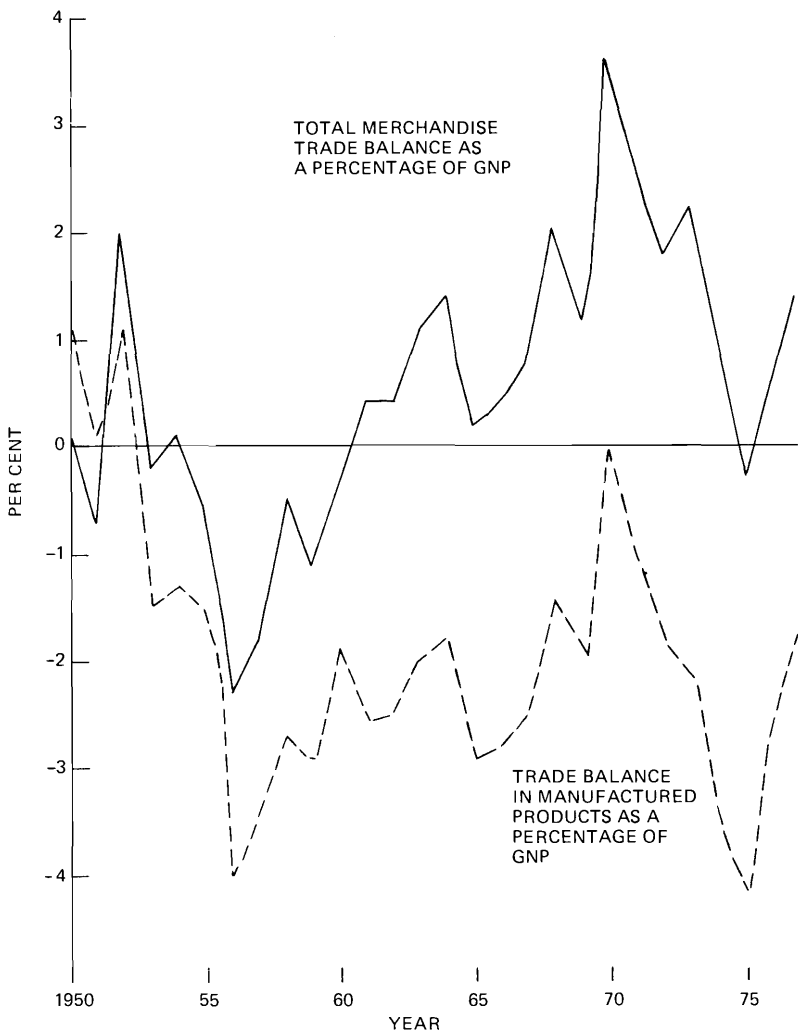
Recognition of this pattern, however, does not contradict the view that there are long-term trade problems. Rather, the earlier interpretation revolved specifically around high-technology manufacturing trade.

Relative Size of Manufacturing Trade

Tremendous growth and buoyancy occurred in the world economy from 1955 to 1970. The industrial countries could scarcely keep pace with the

world demand for goods and materials. World trade, including Canada's, increased enormously. In other words, Canada's trade in manufactured goods was to a very great extent propelled by forces beyond Canada's control. Compared with other countries Canada's improvement was a weak response to a world economic environment that was remarkably conducive to economic growth and expanded trade. In international terms and despite the course of the relative trade balance Canada experienced failure in its *manufacturing* trade. In 1964 Canada's export share of the imports of developed (market) economies climbed to nearly 6 per cent. However, by 1975 its share had fallen below 4 per cent, despite favourable conditions in the early 1970s for Canada to sell processed manufactured commodities.

Figure II.11 – Canada's Total Merchandise Trade Balance and Manufactures Trade Balance as a Percentage of GNP

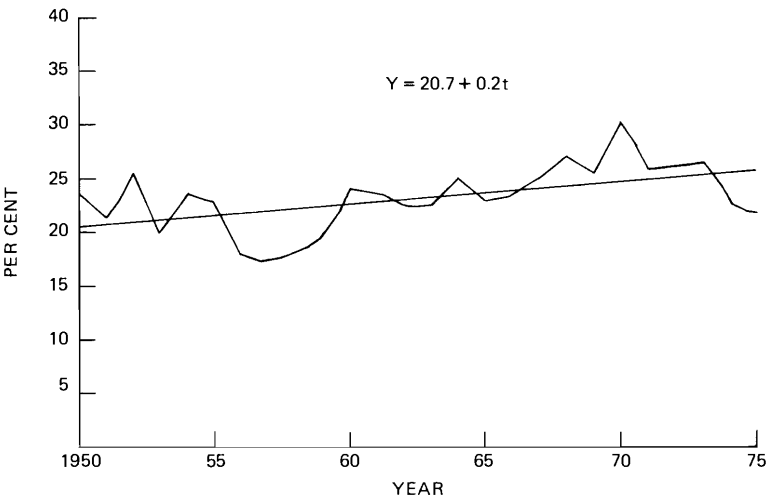


Source: Based on data available from Statistics Canada.

Under conditions of domestic and world market growth since World War II, opportunities for development should have been reflected in reduced dependence on natural resource exports and improvement in the deficits of manufacturing trade. In fact there could have been appreciable substitution of high-technology goods produced at home in place of imports. Canada's relative position, however, has worsened in secondary manufacturing.¹³ Notwithstanding phases of short-term improvement (1965–70), compared with 1950 or 1952 the situation has not improved in lasting fashion.

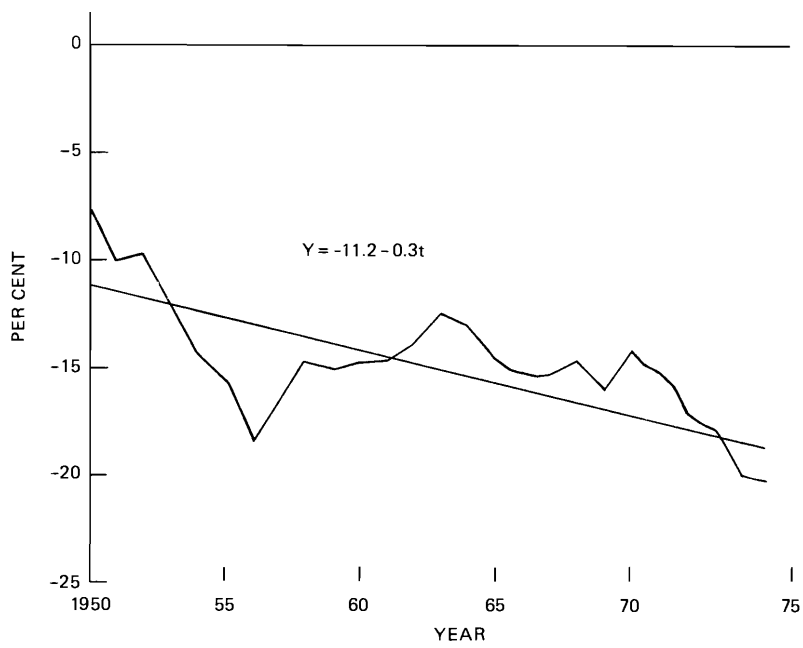
Given the general pattern of the manufacturing trade balance, expressed relative to value of shipments, it is necessary to identify which specific industrial sectors were responsible for successes and failures. The implication of the earlier discussion of absolute trade balance data provides the expectation of resource-based success but high-technology failure. The first part of this contention is verified by Figure II.12.¹⁴ There has been an upward trend in the trade surplus on resource-based manufactured trade. The dismal comparable performance of *secondary manufacturing* suggests the second part of this contention also has support. It should be noted that Figure II.13 has been drawn excluding data on the auto industry. *High-technology* trade (excluding auto-trade) has trended more strongly downward through ever-declining troughs and peaks over the period for which data are available.¹⁵ (See Figure II.14.)

Figure II.12 – Canada's Trade Balance: Resource-Based Manufactures as a Percentage of Value of Shipments



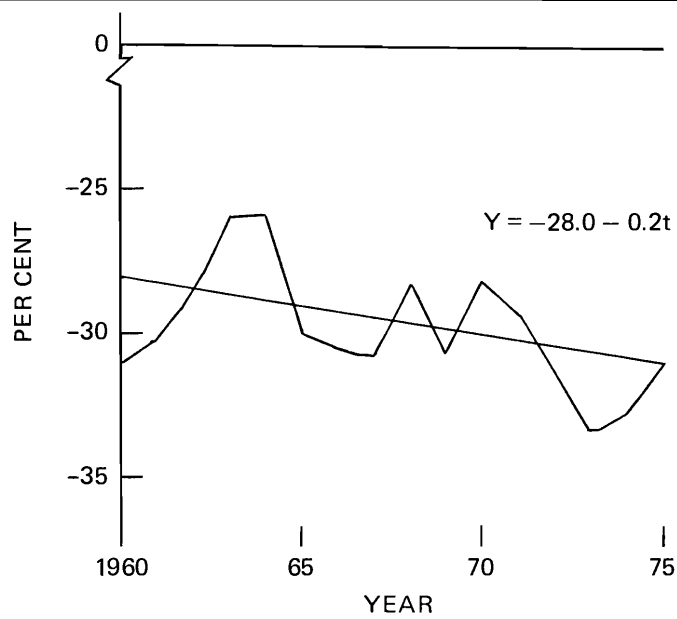
Source: Based on data available from Statistics Canada.

Figure II.13 – Canada’s Trade Balance: Secondary Manufactures (Excluding Autos and Auto Parts) as a Percentage of Value of Shipments



Source: Based on data available from Statistics Canada.

Figure II.14 – Canada’s Trade Balance: High-Technology Manufactures (Excluding Auto and Auto Parts) as a Percentage of Value of Shipments



Source: Based on data available from Statistics Canada.

Individual Manufacturing Industries

During the years 1950–1975, there was a wide range in the trade performance of individual manufacturing industry groups in Canada.¹⁶ This variation applies also to the period of economic buoyancy in the mid- to late-1960s. In Table II.4, industries are classified first, in terms of their deficit or surplus balances, and second in terms of the stability of their trading pattern. All four industries with *surpluses* are significantly based on Canadian natural resources. Of the four only primary metals improved its performance over the period, the others remained stable or deteriorated. The majority of the industrial groups with *deficits* are in secondary manufacturing. Although there has been no fundamental change in Canadian competitiveness, it is significant that generally the low-technology sectors have stable deficits whereas improving deficit performance is more *closely* associated with high-technology activities. Of particular interest are the industries that achieved a generally improving trade performance – rubber products (although most of the increased exports occurred from 1962–66), petroleum and coal (soon to change for the worse), primary metals, non-metallic minerals, transportation equipment (influenced by the Auto Pact), and machinery with the worst deficit of all industries by a wide margin.

These industrial data thus corroborate the finding reported above: secondary manufacturing has been in deficit for 25 years. There is little improvement in its performance to indicate substantial development and the economy has relied on primary and resource-based exports as partial compensation. This classification, however, depends on the relationship between *production* size and *net* imports/exports of each industry. While an industry may appear healthy on this basis, against the *consumption* level of the economy, the sector may be a bad performer. It is equally possible that stable trade situations measured on a production base, may in fact be areas of marked industrial failure when viewed from the consumption side.

**Table II.4 – Direction and Stability of Trade Performance:
Canadian Manufacturing Industries, 1950–1975**

Stability of Trading Pattern	Directions of Trade Balance	
	Surplus	Deficit
Stable	Food and beverage Wood products	Knitting mill products Clothing Metal Fabricating Chemicals Printing and publishing
Deteriorating	Paper products	Leather Furniture and fixtures
Improving	Primary metals	Rubber products Machinery Transportation equipment Petroleum and coal Non-metallic minerals
Variable		Textiles Electrical goods Miscellaneous

Source: Based on data available from Statistics Canada.

Export Weakness and Import Penetration

Between the mid-1950s and 1970, improvements in Canadian exports were, with the exception of transportation equipment, rooted in an upsurge of foreign sales by resource processors. Secondary manufacturing while showing improvement in certain areas (e.g., rubber goods) did not, in aggregate, make any significant headway *despite the existence of conditions exceptionally conducive to expansion in the international trade in manufactured goods*.

Some industries achieved massive relative gains but the most dramatic growth rates are associated with trifling quantities of goods. Furniture exports, for example, increased by 434 per cent (1964–70), but this was reflected in a rise in the current dollar value of exports of only from \$5.9 million to \$31.5 million. In 1970 the limited number of commodity groups collectively dominating Canada's export structure were, in the order of export importance; transportation equipment, paper products, primary metals, and then *a long way behind* wood products, machinery, food and beverages, chemicals, electrical goods, miscellaneous products and metal fabricated products. Together, all other groups were of little significance. In other words, despite impressive growth in exports in the majority of commodity groups, Canada's aggregate trade improvement was largely the product of export growth in certain key commodity groups.

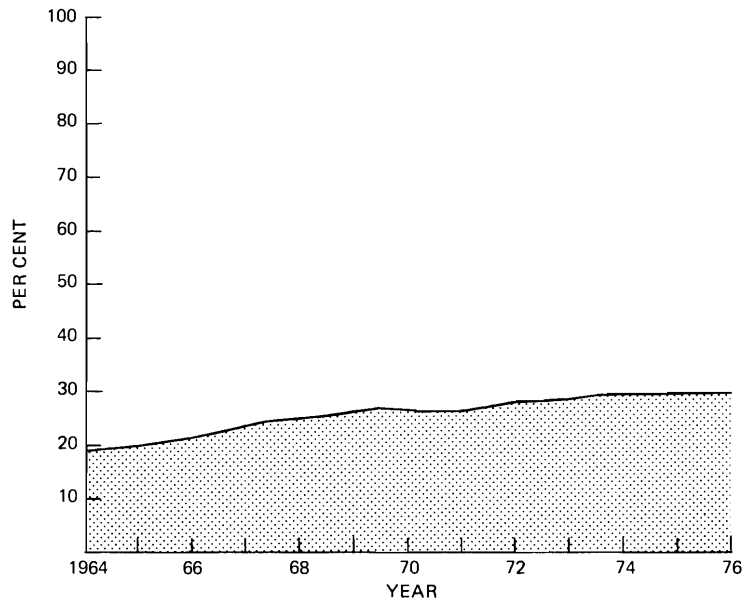
From the mid-1960s to mid-1970s, Canada's imports doubled while the domestic market increased by about one-third. Import penetration occurred: Canada has become generally more reliant on the manufactures of other countries. Canadian manufacturers effectively surrendered a larger part of the domestic market to foreign producers during the very period in which they were expanding export markets. Since 1970 unsustainable increases in production costs have ensured that the competitive position of manufacturing *at home* became worse: the overall evidence for this scenario is found in Figure II.15.¹⁷ The period most difficult to understand is 1964–70, when both Canadian exports and imports were booming. Only in rubber, paper products, machinery, non-metallic minerals and miscellaneous products did Canadian consumption expand more rapidly than imports. Thus, Canada's industrial problems are seen to be of a long-term and structural type.

While Figure II.15 shows a nation retreating from industrialism, when imports are disaggregated into fairly homogeneous categories, the situation turns out to be even more serious. Canada is on the brink of surrendering any claims it may have possessed to be a major producer of highly manufactured goods, especially those dependent on high-technology product development and design excellence.

An example of low-technology imports of manufactured goods is represented by Figure II.16. In primary metals, the percentage of the Canadian market served by imports has not changed significantly since 1964. More than two-thirds of Canada's primary metal needs are met domestically.

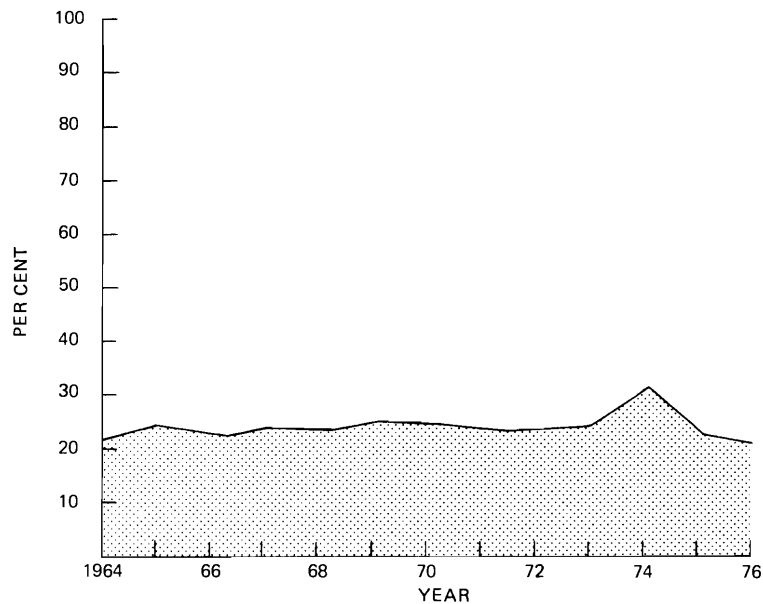
The medium- and high-technology industries, however, have much greater responsibility for Canada's increasing overall reliance on imports. In 1964 Canada imported approximately 14 per cent of its requirements in consumer electronics (Figure II.17).¹⁸ By 1976 imports met almost 63 per cent of Canadian requirements. In computer and office equipment (Figure II.18) imports moved from 56 per cent to about 90 per cent of domestic

Figure II.15 – Percentage of Canadian Market for Manufactured Products Served by Imports, 1964–1976



Source: Based on data available from Statistics Canada.

Figure II.16 – Percentage of Canadian Market for Primary Metals Served by Imports, 1964–1976



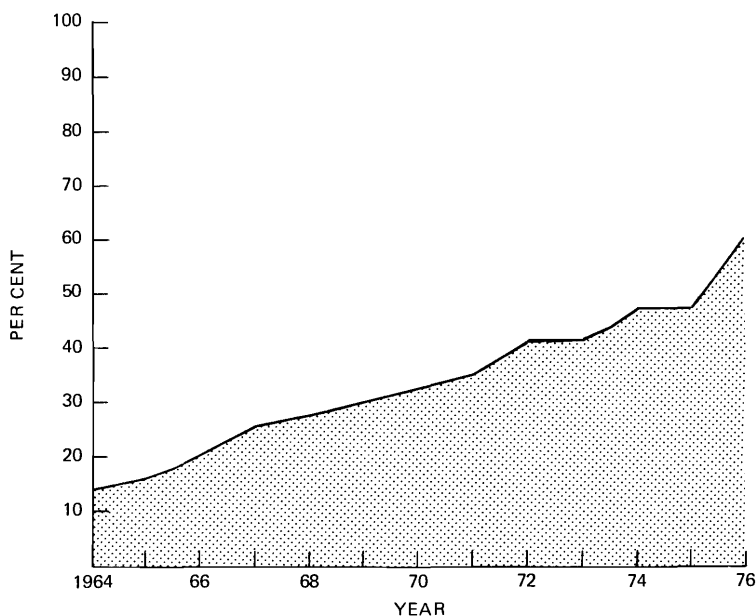
Sources: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years; Statistics Canada, *Manufacturing Industries of Canada: National and Provincial Areas*, Cat. No. 31-203, Supply and Services Canada, Ottawa, Various Years.

needs between 1964 and 1976. In the general machinery category (Figure II.19), the import ratio rose from 65 per cent to 74 per cent. Domestic producers of dominantly mature products were unable to stem the flow.

In a more specific machinery category, agricultural machinery, imports rose from 76 per cent to 81 per cent of the domestic market between 1964 and 1976. (See Figure II.20.) In a country with capital-intensive agriculture, as developed as in Canada, agricultural machinery imports of this magnitude are a disaster. Canada should be in a position to enjoy significant and self-sustaining multiplier effects from agriculture and related food processing industries. But Canada produces only 19 per cent of the agricultural machinery purchased in the country. In this case, Canada is surrendering the economic multiplier effects from an activity which is one of the basic components of the economy: one which promises to be of increasing world importance.

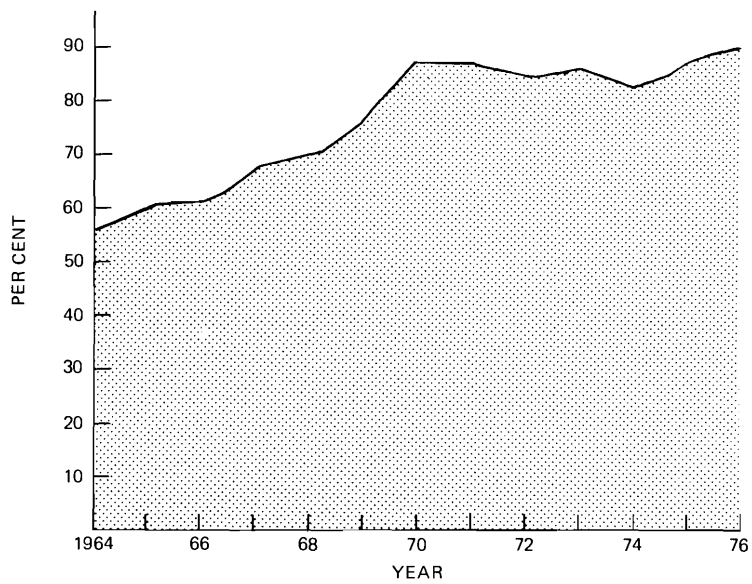
For the entire range of high-technology manufactures, it is no surprise that import penetration rose from 32 per cent in 1964 to 52 per cent in 1975 (Figure II.21.)

Figure II.17 – Percentage of Canadian Market for Consumer Electronics Served by Imports, 1964–1976



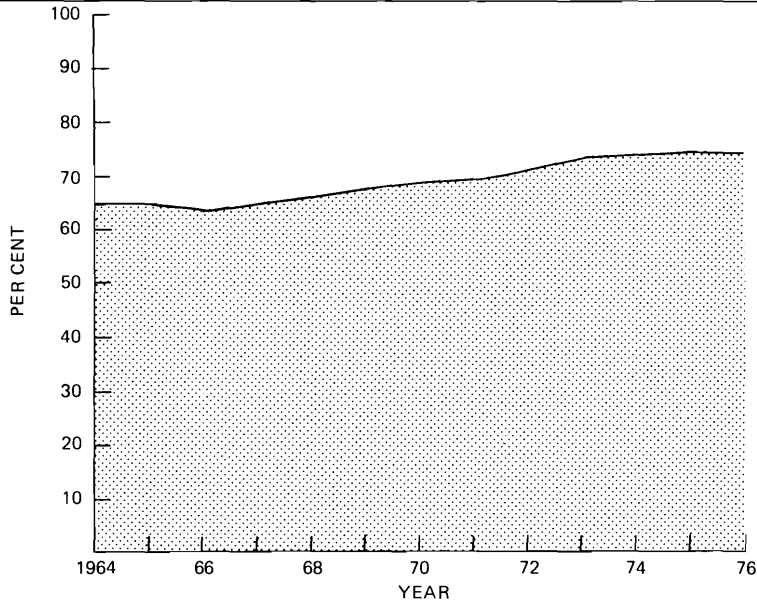
Sources: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years; Statistics Canada, *Manufacturing Industries of Canada: National and Provincial Areas*, Cat. No. 31-203, Supply and Services Canada, Ottawa, Various Years.

Figure II.18 – Percentage of Canadian Market for Computer and Office Equipment Served by Imports, 1964–1976



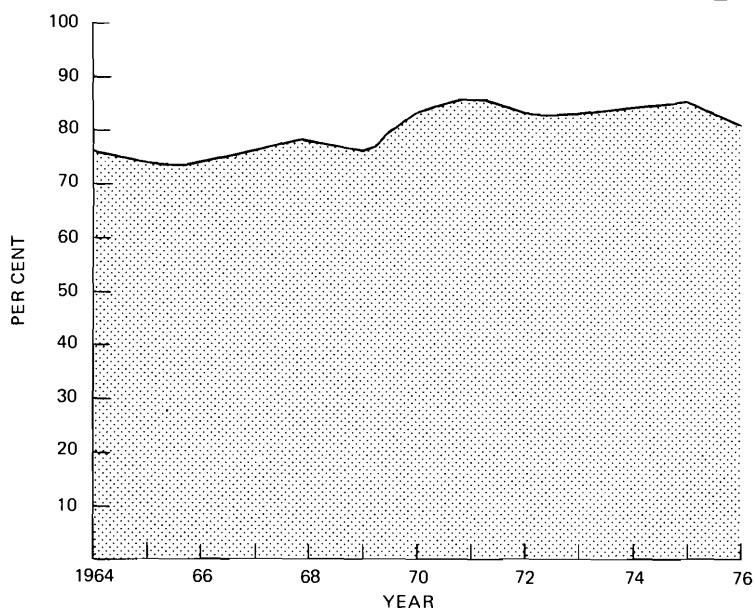
Sources: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years; Statistics Canada, *Manufacturing Industries of Canada: National and Provincial Areas*, Cat. No. 31-203, Supply and Services Canada, Ottawa, Various Years.

Figure II.19 – Percentage of Canadian Market for Machinery Served by Imports, 1964–1976



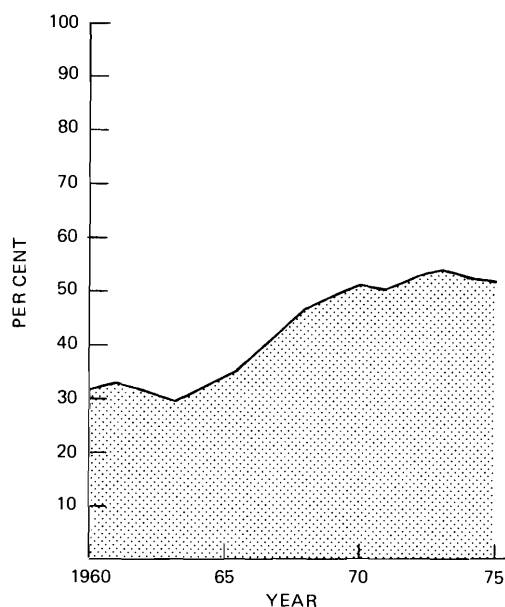
Sources: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years; Statistics Canada, *Manufacturing Industries of Canada: National and Provincial Areas*, Cat. No. 31-203, Supply and Services Canada, Ottawa, Various Years.

Figure II.20 – Percentage of Canadian Market for Agricultural Machinery Served by Imports, 1964–1976



Sources: Statistics Canada, *Canada Year Book*, Cat. No. CS11-202, Supply and Services Canada, Ottawa, Selected Years; Statistics Canada, *Manufacturing Industries of Canada: National and Provincial Areas*, Cat. No. 31-203, Supply and Services Canada, Ottawa, Various Years.

Figure II.21 – Percentage of Canadian Market for High-Technology Manufactures Served by Imports, 1960–1975



Source: Based on data available from Statistics Canada.

The Mirage of Tariff Protection

Explaining the degree of import penetration of the Canadian economy poses a major research problem, particularly because the conventional approach in Canadian economic writing is to view nominal tariffs as meaningful barriers to imports and to assume that the benefit of tariffs is obtained by producers (market protection) and by workers through the protection of jobs. Publications indicate the average levels of statutory "tariff protection" but not the *real* average tariff rates levied.¹⁹

Nominal tariffs may be of significant size, but their effect has been greatly reduced in high-technology trade by a multiplicity of duty exemptions. At present, over *63 per cent of Canada's merchandise imports of end products enter duty-free. This figure (1976) has increased from 53 per cent in 1970. Considering the official duty rate on manufactured goods is 16.25 per cent, the actual amount of duty paid in relation to total manufactured imports is a mere 5.9 per cent.* So much for protection!

The Auto Pact is, of course, a substantial influence on the level of tariff-free imports. But there are often other Tariff Remission items that explain the 44 per cent duty-free imports for the remainder of the end-product category of imported goods. The major commodity groups benefitting from duty-free imports are shown in Table II.5.

Table II.5 – Major Duty-Free Imports of End Products, 1976

Commodity Group	Duty-Free Imports (\$ millions)	Percentage of Imports Duty-Free
Industrial machinery	1631.4	51
Agricultural machinery and tractors	1295.9	98
Communications equipment	303.7	28
Office machinery	284.6	39
Scientific apparatus	333.6	64
Electrical equipment and appliances	229.4	29
Aircraft	402.5	99
Photographic equipment and supplies	196.5	50
Ships and boats	125.3	63
Printed matter	311.6	65
Medicinal and medical	153.2	48
Tools and other equipment	104.8	36

Source: Statistics Canada, *Imports-Merchandise Trade, 1974–1976*, Cat. No. 65-203, Supply and Services Canada, August 1977.

These duty-free imports explain in part the levels of import penetration of the Canadian market for high-technology products. Evidently, in a wide variety of high-technology activities Canada has been approximating a free-trade situation to a much greater degree than generally realized. While the duty-free arrangements created by the Auto Pact are well known, as are their strongly negative consequences for Canada, very much less has been documented on our openness to the foreign production of a wide range of

non-automotive goods. Canada has little or no protection on a wide assortment of machinery used by resource and resource-processing industries, e.g., agriculture, mining, oil and gas. In 1976, 67 per cent of all imports (by value) of drilling, excavating, mining, oil and gas machinery entered Canada duty free. Another part of the openness of the Canadian economy can be traced to the Canada-US Defence Production Sharing Agreement, which, though in balance in the past, will probably treble its 1977 deficit of \$450 million because of Canada's re-equipment plans and its technological under-development.

Canada's pattern of duty-free imports of high-technology commodities is distinctive among its major trading partners. Canada imported 53 per cent of its finished products free of duty in 1970. The UK, in comparison, had the closest duty-free level of 16 per cent (Table II.6). In semi-finished products, Canada compared favourably (30 per cent duty-free). However, the duty free proportion of raw material imports was almost as high as the proportion in UK (94 per cent). It is no surprise, then, that Canada's apparent trade improvement in the sixties was ephemeral.

In the first place, most of the trade improvement derived from the greatly increased export of crudely processed materials, and from the enormous upsurge in the export of automobiles – an improvement in Canada's trading position since succeeded by a large trade deficit which is likely to be enduring. In secondary manufacturing as a whole, the counterpart to temporary success in foreign markets was the steady displacement of Canadian manufacturers in their own domestic market. Ironically, the relative decline of Canadian goods in the domestic market has not proven to be equally temporary. Duty-free import schemes must take a substantial share of the responsibility.

In the 1970s Canada's relative productivity improvements were eroded by rapid wage gains. American involvement in Vietnam finally was ended, the world economy entered recession, and Canadian producers found entry to the US market much more difficult as growth in demand slackened and competition intensified. Between 1970 and 1974, the growth rates reversed their positions. Imports grew by 115 per cent while exports grew by only 73 per cent. Thus, the import penetration, strongly evident in the sixties, continued, but was no longer adequately matched by exports.

Table II.6 – Duty-Free Imports of Industrial Commodities, 1970

Country	Percentage Duty Free			
	Raw Materials	Semi-Finished Products	Finished Products	Total Trade
Canada	93.5	30.0	53.4	53.4
United States	51.7	36.6	6.3	23.0
United Kingdom	95.9	32.7	16.2	39.6
EEC	89.3	41.9	3.2	44.2
Japan	71.8	21.9	3.6	46.1

Source: United States Tariff Commission, *Trade Barriers: An Overview*, TC Publication 665, Vol. II, Washington, DC, April 1974, p. 34.

Trade Failure and the Structure of Manufacturing Industry

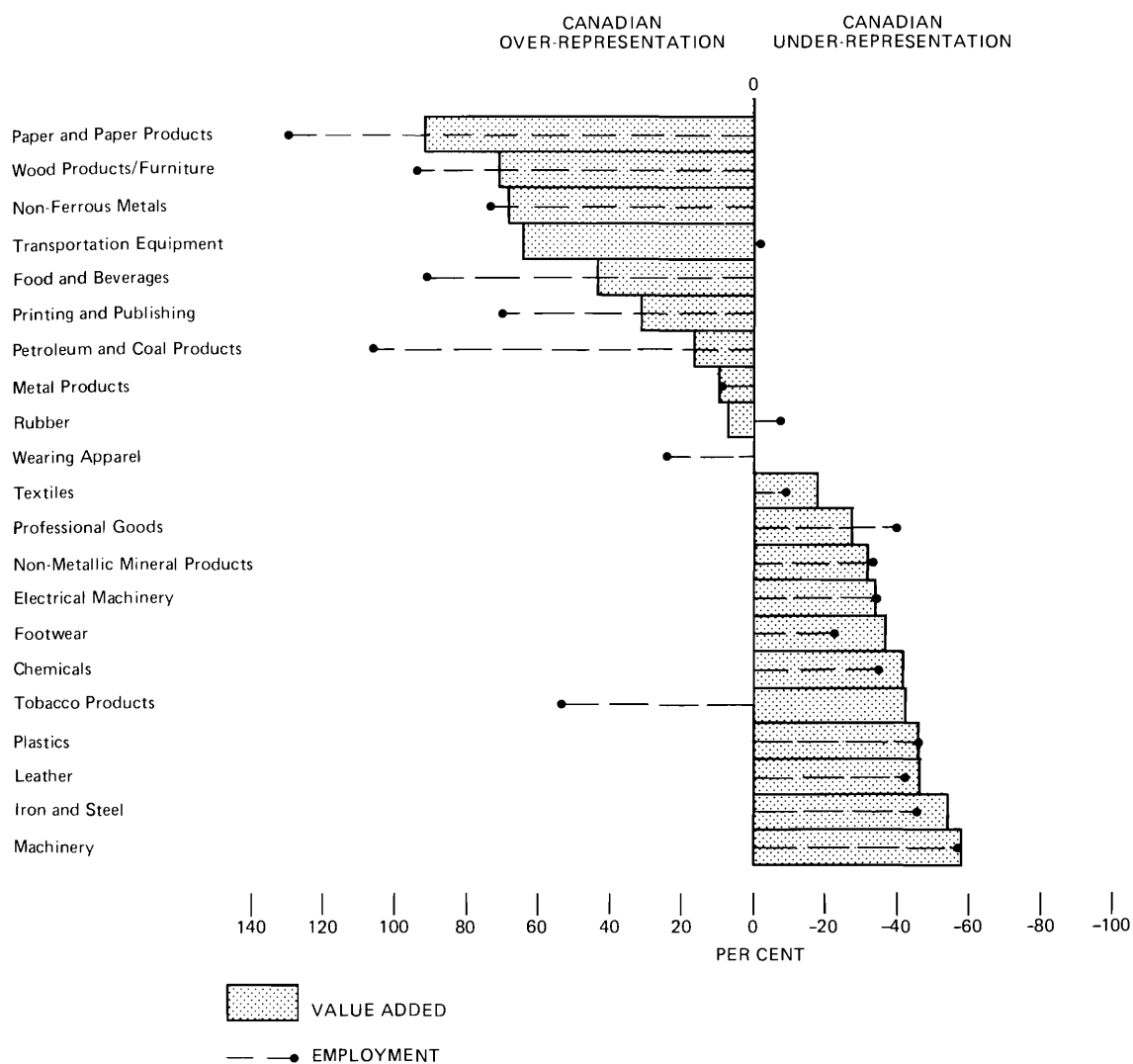
Canada's trading pattern reflects semi-industrial status and a high degree of economic dependence on economies whose comparative advantage is expressed in terms of highly-developed human resources – intellectual capital in terms of advancing industrial skills and new technology. Furthermore, the evidence indicates that Canadian manufacturing has been unable to respond positively to either bilateral or unilateral reduction in Canadian tariffs. In searching for explanations of Canada's poor industrial performance, the obvious first question is whether Canadian manufacturing is structurally adapted to selling in world markets. A simple comparison has been made relating the structure of Canadian manufacturing activity to that of the United States and Western Europe. This allows judgement of whether an industrial group in Canada is of greater or lesser importance relative to its importance in the manufacturing pattern of either the United States or Europe. Greater-or-lesser importance is expressed in terms of percentage production above or below the levels found for the same group in the US or Europe. This transformation of the data holds in abeyance the difference in industrial scale between Canada and the US, and Western Europe and allows the relative composition of Canada's industrial output to be observed. (See Figures II.22 and II.23.)

Over the decades an underdeveloped industrial structure typical of satellite or hinterland economies has been generated. Strong *specialization* is achieved only in primary manufacturing industries geared to processing natural resources – wood products/furniture, pulp and paper products and non-ferrous metals, and transport equipment: the food and beverage industry are lesser specializations. All these industries provide an important share of Canada's exports and with the exception of the transport equipment industry group, are capital-intensive activities characterized by fairly mature process-technology and a high energy consumption per unit of output.

As can be seen in the central portions of Figures II.22 and II.23, there are several industries (eg., metal products, rubber, and wearing apparel) of approximately similar relative strength in Canada, Western Europe, and the US. With the exception of petroleum and coal products and to a lesser extent rubber products, they contain industries using large amounts of labour relative to capital. Some of them, such as ladies' wearing apparel, are very labour intensive. Technologically, they are not dynamic and have a very low innovative potential. Their growth has been largely dependent upon market expansion rather than upon technological advances. Many industries, such as textiles, shoes, clothing and simple metal products, have grown strongly in Third World countries that combine widely known technology with low wages and have been successful in penetrating the Canadian and other western markets. These "normally" represented industries are, therefore, among Canada's weakest and their products, generally, are of declining export importance. In Canada, their difficulties have been reflected by shrinking size. Further reductions can be expected in the future.

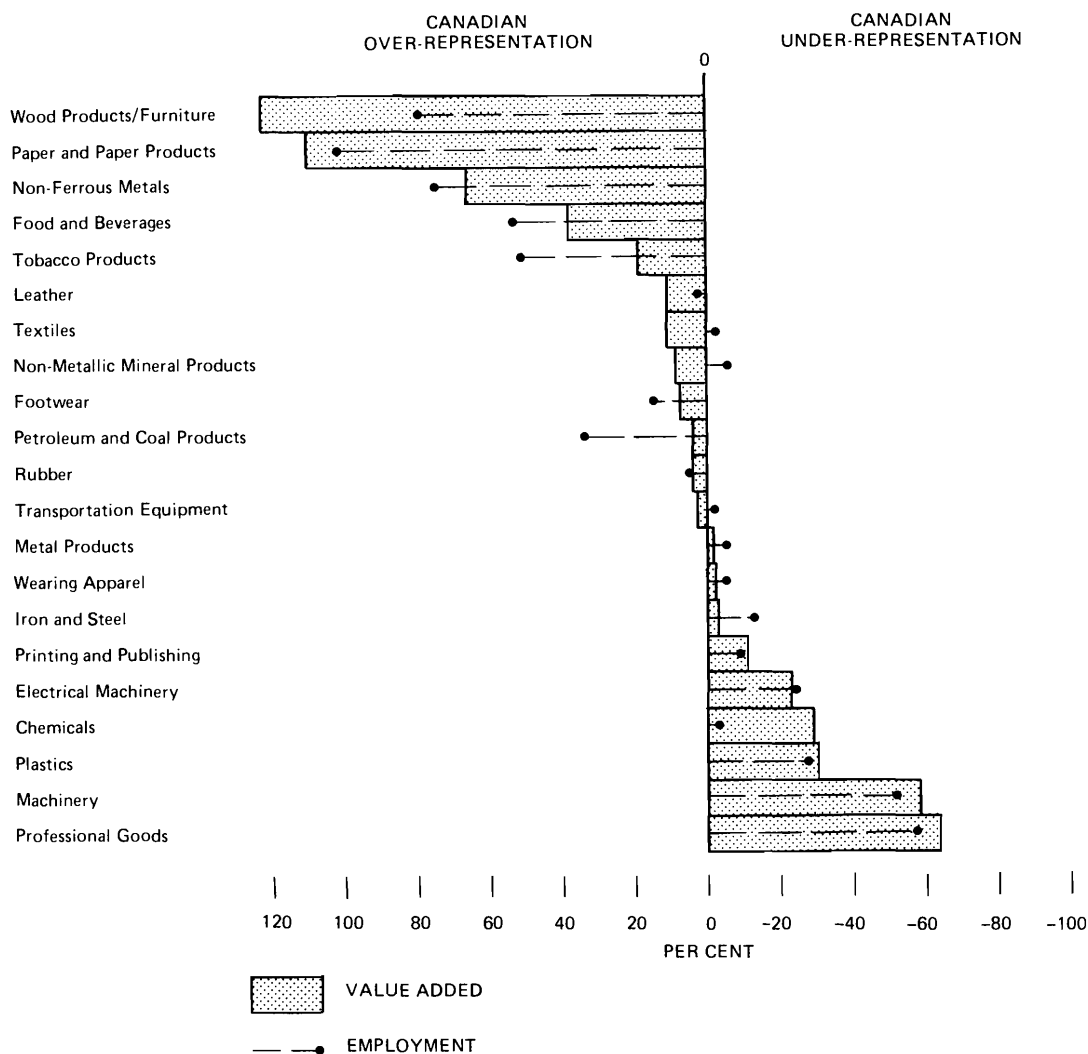
Finally, there are the industries in which Canada has a smaller share. Canada is a major importer of their products and "*under-representation*" is attributable to this and a range of other factors. The industries involved are professional goods, electrical machinery, chemicals, plastics, and machinery.

Figure II.22 – Comparison of Canadian and Western European Industrial Structures Based on Value Added and Employment, 1973



Source: United Nations, *Yearbook of Industrial Statistics*, Vol. I, 1974 Edition, UN, New York, 1976.

Figure II.23 – Comparison of Canadian and US Industrial Structures Based on Value Added and Employment, 1973



Source: United Nations, *Yearbook of Industrial Statistics*, Vol. 1, 1974 Edition, UN, New York, 1976.

These groups have led industrialization in advanced economies over the last twenty years. They have grown on the basis of new and evolving technologies and have had powerful, prolonged spread effects in other parts of the economy. Their comparatively small production share indexes Canada's industrial underdevelopment.

Of more serious concern is the fact that this underdevelopment has been intensifying. Comparing Canada with the US in 1969 and 1973, the "deficit" of the machinery group in Canada increased. A similar pattern of change occurred in professional goods (scientific instruments, measuring devices, etc.) and in electrical machinery. In chemicals, Canada appeared to make a significant relative improvement. In this case, however, the industry in the US faltered and the implied competitiveness of the Canadian chemical industry is illusory when a European base is used for comparison.

In general, Canada's industrial specialization is revealed by the trade patterns. Manufacturing is underdeveloped except in primary resources processing. Low comparative levels of activity in the growth industries of the late 1950s, 60s and 70s have been entrenched in the industrial specializations of Western Europe and the US by virtue of technical excellence, massive investments in R & D, and innovations in product and production processes. Of course within the broad industry groups discussed, there are some narrowly defined areas of Canadian development and to a large degree, the nation's main claim to industrial status is based on these.²⁰ Despite these exceptions *the overall lack of high-technology specializations is a distinct and general pattern.* The problem Canada faces is understanding why such an underdeveloped industrial structure has occurred.

Figures II.22 and II.23 also measure "over-" and "under-" representation based on employment data. The results are comparable with those based on output data. The discrepancies in each case can be attributed to Canada's productivity performance, which is uniformly inferior regardless of Canada's specializations.²¹

Inefficiency in the Canadian Manufacturing Industry

How large is the productivity gap? Using data on manufacturing value added per production worker for the US and Canada, Canada trailed by almost 18 per cent. In only two of twenty major industrial groups did Canada's labour productivity exceed the US level (1972).²² In only 21 of 138 individual industries was Canadian productivity greater than that of the US. (See related examples in Table II.7.) This is an indication of why few industries can compete in the US or in other export markets.

There are substantial differences in the combinations of capital and labour between various industries. In order to gauge the Canadian level of productivity, it is important that value added in manufacturing activities be related to the combined inputs of these two primary factors of production. In all industry groups, primary factor productivity in 1972 fell below that of the US – in aggregate, Canadian manufacturing lagged by a crushing 38 per cent. The labour productivity figures thus reflect poorly the true level of inefficiency with which capital and labour are combined by industry in Canada. These comparisons are drawn from an IT&C study based on a methodology developed by Fowler.²³ A more complicated methodology, developed by Frank, incorporates an adjustment for differences in US and Canadian price levels as

Table II.7 – Comparative Canadian Performance in Relation to US, 1972: Selected Industries

Canadian Industries Where Value Added Per Worker Was Above US		Canadian Industries Where Value Added Per Worker Was Less Than 10 Per Cent Below That of US		Canadian Industries Where Value Added Per Worker Was Greater Than 10 Per Cent Below That of US	
Industry	%	Industry	%	Industry	%
Distilleries	41.60	Wool Yarn & Cloth Mills	–7.02	Tobacco Products Mfgs.	–19.71
Breweries	10.51	Hosiery Mills	–7.27	Sawmills, Planing and Shingle Mills	–13.34
Cotton Yarn & Cloth Mills	16.53	Wooden Kitchen Cabinets	–9.93	Paper & Plastic Bag Mfgs.	–12.97
Thread Mills	32.88	Iron & Steel Mills	–8.90	Steel Pipe & Tube Mills	–17.62
Hardware Flouring Plants	4.99	Fabricated Structural Metal	–1.98	Truck Body & Trailer	–12.46
Wooden Box Factories	0.60	Metal Stamping & Processing	–5.73	Motor Vehicle Parts & Access.	–13.65
Aluminum, Rolling, Casting & Extruding	0.74	Wine & Wine Products	–8.40	Instruments & Related Products	–19.74
Motor Vehicle Mfgs.	7.81	Mfgs. of Small Electrical Appliances	–6.98	Knitting Mills	–29.30
Manufacturers of Household Radio & TV*	16.12	Communication Equipment	–9.51	Veneer & Plywood	–25.60
Cement Manufacturers	19.49	Electrical Industrial Equipment	–3.33	Smelting and Refining	–25.01
Glass Product Mfgs.	3.01	Electrical Wire & Cable	–8.93	Agricult. Mach. & Implements	–33.47
Petroleum Refining	14.13	Concrete Product Mfgs.	–8.49	Office & Store Mach.	–23.61
Manufacturers of Lubricating Oils	12.46	Mixed Fertilizers	–7.52	Major Appliances	–30.80
Clock & Watch Mfgs.	9.29	Paint & Varnish Mfgs.	–5.90	Pharmaceuticals & Medicines	–36.07
Pen & Pencil Mfgs.	3.30	Embroidery, Pleating, etc.	–6.67	Orthopaedic & Surgical Appliances	–41.52

*The effects of industrial aggregation in the statistics is reflected here.

Source: *Productivity and Competitiveness in the Canadian Economy*, Unpublished Report, ITC, October 1976.

well as the exchange rate, and gives substantially similar results for manufacturing in the aggregate.²⁴ For individual industries, comparisons are made more difficult because of differences in the degree of aggregation, but the results do not appear to be significantly different.

Although the Canadian economy operates as an open system and despite the duty-free schemes, many industries receive substantial protection from tariffs. The Economic Council of Canada has examined the industrial incidence of this protection. The Council notes that since World War II, through rounds of tariff negotiations under the General Agreement on Tariffs and Trade (GATT), there has been a gradual general reduction in the degree of protection enjoyed by Canadian industry. Nevertheless, these downward revisions have not been associated with an improvement in Canada's productivity. Furthermore, the tariffs create the opportunity for manufacturers in Canada to set prices relative to the US price plus tariff. This means not only Canadian consumers, but also Canadian industries may bear higher prices than their counterparts in the US. This limits competitive export potential for industry.

Generally, industries with the poorest productivity record are protected the most by Canadian tariffs: a good indication of how efficiency and commercial policy are inextricably interwoven. These low productivity industries would likely suffer heavy reduction in the event of an unprepared entry into freer trade. On the other hand, as Industry, Trade, and Commerce (IT&C) has shown, there are a number of industries mainly within primary manufacturing where Canadian productivity gives some reasonable expectation of continuing strength in the event of tariff reductions.²⁵ Taking advantage of such a situation is likely to be the pattern of negotiation by Canada at current GATT talks.

Factors other than tariffs, however, affect the Canadian structure of prices and productivity (number of firms in each industry, degree of competition, size and geographic spread of Canadian markets) and reflect economic sources of variation in efficiency (and hence productivity) and price. These factors and others are probably important in accounting for the existence of some plants of less than optimal size and hence higher prices for manufactured goods. Some industries are less efficient in Canada because of market-related location patterns. Trade-offs between plant-size and transport costs, in this general context, may weigh in favour of less transportation and more plants whether there are tariffs or not. More applied research is needed in this area. The relevant industries are protected by geography – spatial monopoly power – rather than tariffs.

Research by Scherer, however, indicates that variation in plant size can explain only a small part of the United States-Canada difference in average costs.²⁶ He has indicated that *production-run length* is more important than plant size in determining costs or productivity. Closely related to this is the larger range of items produced in plants in Canada. To the extent that the geographic dispersion of the Canadian market is important for some industries, it is difficult to see how production-run length can be increased in their case. So far, no test of the variation in length-of-run and country-of-control has been made although foreign plants can be the "miniature replicas" of their parents and hence, incur greater costs because of more product lines. It may even be that many Canadian-controlled producers are relatively

efficient. But as they cannot climb the United States tariff wall they are limited in size by the Canadian market and their specialization.

Tariffs affect efficiency and prices in a wide range of industries but the evidence of where inefficiency through tariffs ends and where other factors take over has not been determined. Only now is work being undertaken that provides a clearer picture of how productivity compares for industries in various Canadian regions. Appraisal of the activity, number, and location of relatively efficient firms/plants is still needed. Furthermore, little information has been collected about the types of firms contributing to Canada's gross exports of secondary manufactures. Yet commercial success depends on these very firms. It is important that Canada finds out how inefficient Canadian-owned firms are, for example, and in which activities they are most competitive.

In assessing the basic causes of low productivity the following points appear to be important:

1. In some industries, there are too many producers. In others, producers are responsible for excessive product diversification. Although the Canadian market is large enough to support efficiently sized enterprises, in many industries low production-run length causes major problems.

2. Pricing is modified by Canadian tariffs (where they are imposed) that provide a sheltered existence for producers in Canada; foreign tariffs have the effect of reducing output.

3. Canadian tariffs have encouraged the location of subsidiaries of large foreign corporations who are willing to coexist with each others' inefficient operations in the Canadian market.

4. Foreign ownership provides the advantage of access to foreign technology and world distribution systems. However, costs derive from the proliferation of plants. In many industries, little competitive rationalization has occurred because of the strength of parent companies in supporting their subsidiaries.

5. An important factor in the process of market fragmentation is the level of resale activity undertaken by foreign subsidiaries. This activity subsidizes suboptimal (inefficient) manufacturing to the detriment of the Canadian economy.²⁷

6. To a large degree, conclusions about Canadian industrial performance are drawn from comparisons with United States industry. Recently, however, Fowler has argued that there is a substantial measure of non-comparability of industries in the two countries. In practice the productivity differences that can be calculated have a distinct technological origin.²⁸ Canada's low industrial productivity can in some measure be attributed to foreign plants that are supplied only with relatively mature technology from within the corporation. Ironically when foreign and domestic plants are compared — industry by industry — US-controlled plants have a better productivity performance! The explanation may lie in the larger average size of foreign-controlled plants. In a number of cases, as Fowler demonstrates, Canadian industries do suffer from small plant size and minimally efficient scale is not achieved.

Textiles, knitting mills, apparel, furniture, and printing industries, which have low levels of foreign ownership, use standard technology, and have establishment sizes one-third to two-thirds the US level, illustrate the impor-

tance of being unable to attain scale economies in non-production activity due to inadequate rationalization. Machinery industries with a higher level of foreign ownership reflect a highly fragmented market structure and thus suffer considerable duplication of managerial functions.

In all other secondary manufacturing industries (generally high-technology activities) foreign ownership is relatively high and Canadian performance lower – suboptimal establishment sizes, replacement of engineers and scientists by supervisory staff. Excessive market fragmentation and managerial duplication underlie productivity differences. By contrast with Canada, plants in the US engage in the production of new products using new equipment and processes, and thus attain higher returns to capital in a market that can generate scale economies. Even if investment is made in Canada by one firm and others do not follow in oligopolistic fashion and fragment the market, the US plants will be ahead in costs because of an earlier start.

Evidently the search for the origin of Canada's productivity deficiencies runs the gamut from tariffs, through technology transfer mechanisms of multinational corporations, scale, length of production run and product diversification to the activity structure of Canadian industry. One cannot but wonder how capital and labour can be so poorly combined if managers are of international quality. Unfortunately, research on this subject has not caught up with the need to explain poor industrial performance. The most reasonable scenario is that the poor economic environment of Canada (policies, tariffs, capital availability, entrepreneurial development) has led to managerial poverty reinforcing the character of the business environment.

Canada's long-term productivity gap with the US did improve during the 1960s when markets expanded, but output grew throughout most of the world during the 1950s and 1960s. Canada's rise in output over that period ranked well among OECD countries (especially because of high performance in mining), but only in Canada's case did growth in employment account for more than half the increase in output. Productivity gains in industry were among the lowest, although the US, already far ahead, did falter. Canada was distinguished also by having the only negative contribution of service industry productivity to economic growth. (Table II.8).

Conclusion

From the trade patterns identified in this study and from the nature of Canada's present industrial structure, it is concluded that the Canadian economy is only semi-industrial. (On balance, the Canadian economy depends on resource products rather than specializations of secondary manufacturing in its merchandise trade.) While some individual high-technology industries do export, Canada generally is industrially backward. This position seems associated with technological underdevelopment. During the late 1950s and 1960s, Canada lost ground economically to European economies in spite of expanding domestic and international markets. Expanding markets provided a superb opportunity for new investment, new processes, and products, and should have influenced both productivity and profits. Canada appears to have squandered the opportunities of the past twenty years and has been left with inefficient, unprogressive secondary manufacturing firms.

Table II.8 – Factors Affecting the Growth of Output, by Percentage, 1955–1968

Country	Sector Shift	Source of Growth				Total Percentage Increase over the Period
		Growth in Employment	Growth in Industrial Productivity	Growth in Productivity Of Services	Growth in Agricultural Output	
Canada	11.9	43.9	21.4	– 1.2	1.8	77.7
United States	7.1	27.1	14.7	13.7	0.5	63.1
France	16.8	8.0	40.4	22.4	4.1	91.7
Germany	12.5	10.1	44.0	15.8	2.3	84.8
Italy	36.2	– 7.0	34.8	27.4	6.8	98.3
United Kingdom	2.0	5.0	20.1	10.0	1.4	38.4
Austria	19.4	2.3	39.2	16.6	3.6	81.2
Belgium	7.5	5.7	27.7	15.9	1.5	58.2
Denmark	17.9	21.1	15.4	16.0	4.6	74.9
Finland	26.8	5.0	26.2	8.0	4.9	70.0
Ireland	20.5	– 0.4	20.2	18.1	7.5	65.9
Netherlands	9.2	16.1	35.6	23.4	4.5	88.9
Norway	16.5	6.7	23.7	25.2	– 0.4	71.7

Source: OECD, *The Growth of Output*, OECD, Paris, December 1970, p. 39.

Many facets of Canada's trade failure have been considered orthodox Canadian economists. The basic cause, they point out, is poor productivity. They jump to the conclusion that the origins of Canada's productivity problems lie in the tariff protection of Canadian industry. Without question, the productivity of Canadian industry is crucially important to understanding Canada's competitive problems but this publication does not support implementation of the free trade position advocated for Canada by the Economic Council and other authorities. The belief of Canadian economists in the free trade doctrine is a theoretical position not a practical proposition, because it does not depend on the pragmatic appraisal of Canada's present industrial system.

Counter arguments to the free trade position, given Canada's industrial weakness, have been developed at length elsewhere.²⁹ Support for our view is also provided in later chapters; the factors explaining some of Canada's trade and industry problems, advanced in this chapter, justify the view that *Canada is not in a position to entertain the risks of significantly altering its commercial stance as it applies to secondary manufacturing without prior refurbishing of its industrial capability*. Low-technology industries, with the highest levels of protection, are resisting import penetration at a time when Canada has minimal domestic control over medium- and high-technology industries, themselves weak international competitors.

Free trade, at this time, would seem to suggest the prospect of an acceleration of present import penetration trends. No doubt some industries would expand, however, more would survive in a diminished form. The lower prices of their products — a postulated result of free trade — will be consolation only to those Canadians with jobs.

Can the fundamental and persistent deterioration of Canadian manufacturing be halted and reversed? There is no ready answer, but it is certain that unilateral tariff remission schemes have been of no benefit to high-technology industry. In addition, bilateral schemes have proved vulnerable to imbalanced trade. This would suggest that changes in commercial policy should come *after* there is better understanding of and general agreement on the causes of Canada's problems and on policies for reconstruction.

Certainly it would be more practical to develop policies that could restore firms to such a degree of competitiveness that they could benefit from bilateral or multilateral free trade, if introduced at a later date. Although the reciprocal duty-free schemes would have been preferable to the unilateral approach, the cause of the trade and productivity problems Canada faces are complex and not solely related to tariffs.

The need to develop a full explanation of Canada's economic performance still remains. How does Canada's employment and activity structure, and pattern of change, compare with the US and other nations? Is Canada peculiar in these respects? Does an explanation lie in the types of economic activities or jobs that form the foundation of Canada's industrial productivity and trade performance?

III. Jobs in Science, Technology, and Management

Industrialization in Canada is a partially realized process. While the area of greatest weakness is high-technology manufacturing, the problems of the Canadian economy are much larger than can be summarized by the data of this stunted industrial sector. A much broader perspective is required to understand how the failure of high-technology trade, for example, is merely a symbol of the structural underdevelopment pervading the goods-producing sectors.

The necessary breadth of view of Canada's economic situation is best provided by consideration of the evolving structure of jobs in Canada compared with other countries. This approach to Canada's economic problems is especially important because the nature of jobs in developed countries has been undergoing fundamental change over the past three decades as a consequence of the increased application of technology in the development of marketable new industrial processes and products. There are, for example, factories operating with very few production workers. Computers and related control systems have replaced human labour in production inventory, distribution and management systems.

Canada is failing in its rate of technological progress and lags in the application of knowledge, information, and organization in economic activity. This chapter shows that the pattern of jobs in Canada echoes the country's trade failure. It is argued that if unchanged the Canadian pattern of slow technological progress holds serious consequences for long-term economic growth.

Technological Change and its Economic Significance

The first two phases of the so-called industrial "revolution" have given way to the "third wave" of *scientific and technological change*. In the early stages of industrialization, production growth meant reduced labour in agriculture and rising employment in manufacturing, mining, and supporting activities. This first wave of industrialization occurred through the use of coal and steam. During the second wave, hydro-electricity, petroleum, the internal combustion engine, and communication and transport networks were the agents of change. In the "third wave", however, scientific and technological research, development, and implementation are of pre-eminent importance. As a consequence of increased applied scientific, technological, and managerial knowledge, output is rising without equivalent growth in industrial labour. Steadily, traditional work in production is falling off while jobs in *science* and its applied fields (technology, organization, etc.) are increasing.³⁰ Advanced economies have entered an era in which the *amount* of manpower (and other factors of production) is becoming less important than the increasing *quality* of labour (and other factors) and the *ability* of business to utilize this higher quality. The increases in quality are created by scientific and technological progress.

Changes in production are illustrated by the distinction between mechanization and automation. Mechanization was responsible for industrialization but under that system human activity was simple, often fragmented work of a relatively unskilled kind. Automation can eliminate these low-skill jobs, then reduce, perhaps abolish, machine operators and other comparable, menial industrial positions. The net effect is to increase the average skill level of work. Internationally, perhaps the chemical industry displays the best known reduc-

tion in the proportion of industrial *operatives*: supervisors, and maintenance and repair workers are more important in modern plants as production-flow systems have been adopted; laboratory workers, technicians, engineers, and managers are of increasing significance as a corollary of changes in production jobs.

Industrial technology progresses only in the presence of certain economic conditions related to:

1. The quantity and quality of the supply of personnel, available through education and training, to undertake scientific, engineering, design and management work.
2. Demand – increasingly international demand – for new products and new processes of production (influenced by marketing and income patterns at the consumer level; by profitability and aggressiveness in the case of corporate consumption).
3. The size and continuity of private and public investment in innovation – process and product development, which in the long run influences the possibility of continuing market advantage for the investing firm or country by influencing the rate at which replacement technology is available to retain or attain competitiveness.
4. The successful long-term planning for occupational and industrial change from the impact of technology.

The Myth of “Post-Industrial” Economy in the Contemporary World

Paradoxically, the present pattern of evolution of society, especially but not exclusively in the West has been labelled *post-industrial* and Daniel Bell is often cited as the source of this dubious term.

Bell suggests there are three dominant components to the archetype of a post-industrial society. “In the economic sector it is a shift from manufacturing to services, in technology, it is the centrality of the new science-based industries, in sociological terms, it is the rise of new technical elites. . . .” He goes on to suggest that more generally post-industrial society represents “a change over from a goods-producing society to an information or knowledge society”.³¹

It is very easy to misinterpret Bell’s view of the pattern of change. He may create confusion in many minds by oversimplifying the indicators of change. In particular, it is important to guard against the incorrect inference that goods production is now a less important activity. In fact, high productivity activities like manufacturing must be supported as never before. The reasons are:

1. The international failure of Canadian manufacturing, a reflection of the uncompetitiveness of producers, is a crushing burden on other trade sectors.
2. Personal services (e.g., health care) and government social programs are low productivity activities. They may even have a negative effect on economic growth (see Chapter II). Manufacturing is essential to average out the effect of low productivity sectors of the economy.
3. Each generation wishes to be involved in the most interesting and productive jobs that its intellect can command. Canada needs healthy manu-

facturing since it is an important source of jobs in management and in a wide variety of professional (especially technological) fields.

Economic Growth and Technological Change

The significance of this study, and this chapter in particular, hinges on the close tie existing between long-term economic development and the use of scientific and technical knowledge in the production systems of an economy. This relationship is already explained and supported by the Economic Council of Canada: “strong and sustained increases in productivity” are essential for increasing Canadian living standards – that is, there must be strong gains in the efficiency with which human and other resources are used.³²

The thesis that Canada is *technologically backward* is also supported by previously published work.³³ In *Canadian Growth Revisited, 1950–67*, Walters used Denison’s determinants of growth approach originally developed to compare Northwest Europe with the United States.³⁴ Two determinants of economic growth are identified: growth due to increases in the level of use of the factors of production (extensive factors), and growth attributable to increased productivity in the utilization of these factors (intensity factors). In the United States, increased quantities of the factors of production (inputs) and increased efficiency were found to be of nearly equal importance. In Canada the importance of increased inputs was dominant, especially from 1962 to 1967. Europe, with lower levels of productivity early in the period, experienced major gains through increased efficiency. (See Table III.1.)

Table III.1 – Growth of Real National Income, 1950-62 and 1962-67

		Canada		United States		Northwest Europe
		1950-62	1962-67	1950-62		1950-62
(1)	Average Annual % Change (1) = (2) + (3)	4.8	6.0	3.4		4.8
(2)	Average Annual % Change by Total Factor Inputs	2.7	3.8	1.8		1.7
(3)	Average Annual % Change by Productivity	2.1	2.2	1.6		3.1
(4)	Components of (3) Due to Advances in Knowledge and NEC	0.6	0.8	1.2		1.3

Source: Dorothy Walters, *Canadian Growth Revisited, 1950-67*, Economic Council of Canada, Staff Study No. 28, Queen’s Printer, Ottawa; Edward Denison, *Accounting for US Economic Growth, 1929-69*, 1974.

In the *three* areas the largest single contributor to output per unit of inputs was *advances in knowledge* (calculated as a residual factor). This factor includes considerations such as “the contribution of managerial education and skill to efficiency and to innovation, changes in the productivity of capital, and the adoption of best practice techniques in capital goods and production methods.”³⁵

Denison indicates the importance of the lag in the *application* of knowledge, especially management knowledge, in accounting for lower European residual productivity. In the Canadian case (Table III.1,) given the research results of Walters; Cordell; Bourgault and; Cordell and Gilmour, one can also emphasize the importance of lags in the innovation process related to production and product design.³⁶ These lags operate to Canada's trading disadvantage because they represent reductions in the level of Canadian human resources affecting Canada's comparative advantage just like natural resources. In fact, internationally, trade in highly research-dependent areas (chemicals, electronics, transportation equipment) has been increasing faster than trade as a whole. In explaining such trade growth "natural resource endowments and access to heavy transport and large supplies of unskilled or moderately skilled labour are in many cases unimportant. *Of much more significance are high-quality managerial, scientific, engineering and technical skills, and strong innovative capacities*".³⁷ A decade ago this view was clearly enunciated in Canada and ignored!

Employment Impact of Economic Change

Throughout the developed world, economic development has generated changes in the importance of various industrial activities, in terms of their demand for labour (employees). Increased mechanization in mining and manufacturing has led to extended production and productivity. Larger incomes have been effective in generating more demand for manufactured goods, particularly because of the higher income elasticity of demand for non-essential goods, most of which are manufactured. Agricultural output has generally increased while technical and organizational change has reduced its share of the labour force.

Until recently, manufacturing was responsible for a compensating increased share of the labour force (and a rapidly expanding output). But increased application of technology has allowed western countries to allocate a smaller proportion of workers to the manufacturing sector. Growth has occurred in the (non-production) tertiary service sectors.

Recently, Gershuny claimed that increasingly, goods consumption (especially durables) for home production of services was taking over from the direct purchase of services in the United Kingdom (UK).³⁸ Nevertheless, our analysis of very limited data does not support the tendency to decreased service expenditure by households. Although Bell argues his case for the expansion of the service sector on the assumption that the demand for services is highly income elastic, substantial research in the US and Canada disputes this contention. Of significance is the lower rate of increase in output per employee occurring for the service sector. The reasons advanced by Fuchs for this difference are: the faster rate of decrease in average hours worked in services (mainly the effects of the growth in part-time work); the negative influence of productivity changes in services vs. goods sector; slower improvement in the quality of labour; and a slower growth in the capital-labour ratio.³⁹ Worton has corroborated these interpretations for Canada.⁴⁰

Patterns of Change in Industrial Employment

Immediate Production vs. Non-production Employment

Immediate production activities declined in relative importance in Canada during the 1950s and 1960s while the non-production sector expanded (Figure III.1).⁴¹ This pattern of change, including the inversion in importance of the two sectors, followed the lead of the US (Figure III.2). Canada, like the US, now has more than half its workforce in non-production jobs. Although no other country had achieved inversion by the early 1970s, the trend was strongly in evidence with Australia next closest to parity: New Zealand, France, Sweden, Japan, Great Britain and Argentina all show this pattern though with a major lag.

Among western countries, Canada has real cause for worry. Not only is the *speed* of change notable, but also there is *greater reduction* in the importance of both primary and *secondary* industry employment compared with the United States. This latter decline is too large to be explained by increases in productivity. Although Canada has improved in its ratio to US productivity since World War II, there is still a gap of about 20 per cent. European productivity growth has been much more impressive. The share of the labour force held by manufacturing has not declined in the way it has in Canada. There is no escaping the conclusion that the jobs and trade status of Canadian manufacturing demonstrate the failure to progress technologically and at a rate commensurate with the growth of Canadian incomes, the achievements of other economies, and the continuity of comparative manufacturing advantage in the US.

The Growth of the Tertiary Sector

As primary and secondary industry decline in employment shares, the tertiary industry has expanded. Three components of this sector are:

1. the *traditional commercial* services of commerce and finance;
2. *social* services that include health and cultural activities;
3. *public administration* (government).

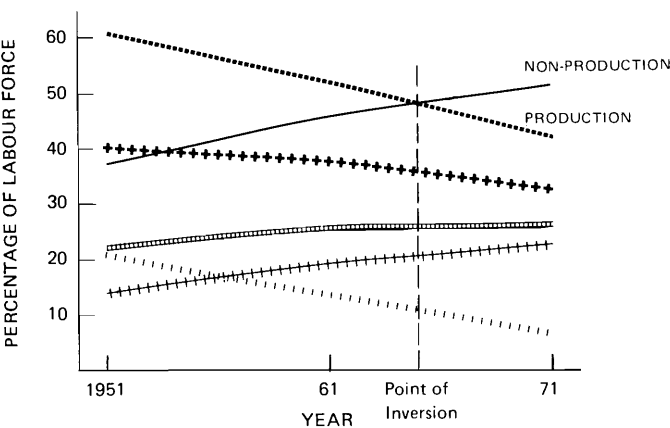
Traditional services are compared in size with a combination of the others in Figures III.3 and III.4. But a three-way distinction is also important. For example, the growth in bureaucracy (public administration) is often confused with social service provision which is another type of economic activity and may be responding to different forces of change. The growth in the employment *share* of *public administration* in Canada is quite limited as is the case in most other countries for which data were obtained with the exception of France. Although less expansion in tertiary employment is devoted to this activity, Canada still has a slightly larger public administrative sector, proportionally, than the United States.

Commercial services, while increasing their share of Canadian employment, are providing a smaller proportion of the tertiary jobs. As in most countries, semi-automated systems based on computer utilization reduce the labour input required to produce more output. *Social services*, however, have been responsible for an increased share of jobs in the tertiary sector.

A Goods Economy vs. A Service Economy

One can understand why Bell suggests that a "post-industrial" economy is emerging in the United States, but what is the nature of activities included in

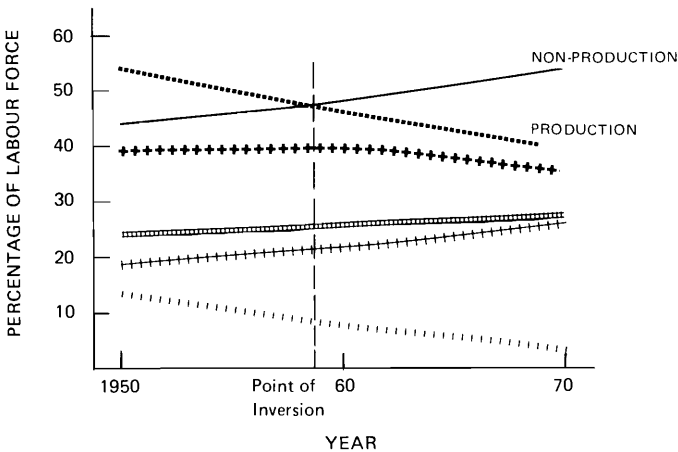
Figure III.1 – Industrial Employment: Canada



LEGEND

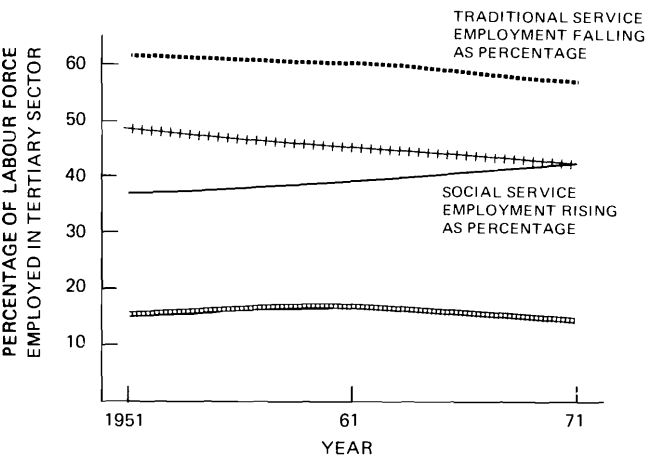
- (1) Total of (3) and (6) = Immediate Production Sector.
- (2) ——— Total of (4) and (5) = Non-Production Sector.
- (3) +++++ Secondary Industry (Manufacturing, Electricity, Gas and Water, Construction, and Transportation).
- (4) Trade, Finance, Public Administration, and Defence.
- (5) +++ Services (Includes Community, Recreation, Business, and Personal Services).
- (6) Primary Industry (Includes Agriculture, Fishing, Forestry, and Mining).

Figure III.2 – Industrial Employment: United States



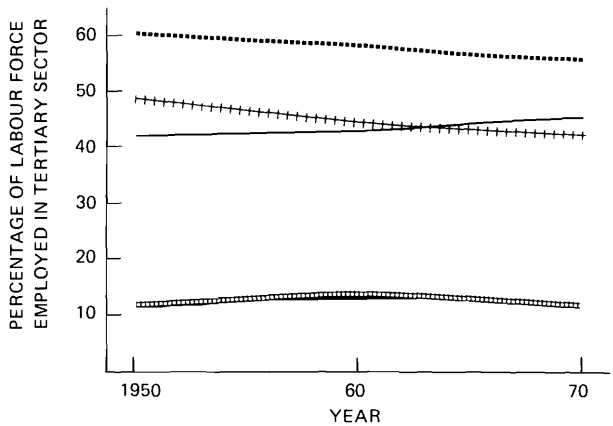
Sources: Statistics Canada, 1971 Census of Canada, Vol. III, Part 5, Cat. No. 94-758, Supply and Services Canada, Ottawa, Table 7; United States, Bureau of the Census, *Census of Population: 1970 Detailed Characteristics*, Final Report, United States Summary, US Government Printing Office, Washington, DC, 1973, Tables 77 and 235; Worton, David S., "The Service Industries in Canada", *Production and Productivity in the Service Industries*, in V. R. Fuchs (ed.), National Bureau of Economic Research and Columbia University Press, 1969, pp. 237-ff.

Figure III.3 – Components of Tertiary Sector Growth: Canada



- LEGEND
- (1) Total of (2) and (4) = Traditional Services.
 - (2) +++++ Trade, Finance, and Business Services.
 - (3) ——— Social Services.
 - (4) - - - - - Public Administration, and Defence.

Figure III.4 – Components of Tertiary Sector Growth: United States



the traditional service industries? Some of these industries are concerned with executing *goods* transfers, with the design of products, with goods handling and production systems, with developing and marketing data-processing machines. As specialized professional and technical tasks have emerged and been developed, separate firms have been established in the commercial and business service industries to serve those manufacturing firms without specialist units. These trends have strengthened the extent to which manufacturing provides a market for services. In 1961, 15 per cent of all service employment was dependent upon manufacturing for a livelihood and by 1971 the figure was 17 per cent. Thus gains or losses of manufacturing jobs have an effect on employment opportunities in service activities due to services purchased by the manufacturing sector and to the spread effects within the service sector. Twenty-six jobs in the service sector were linked to each 100 jobs in manufacturing in 1961. By 1971 there were 33 dependent service jobs.

How can the “goods” economy be defined? *Immediate production* is too limited a concept, because the design, engineering, and marketing aspects of the goods economy (found partially in the tertiary sector) are excluded from consideration. The concept of *goods economy* is represented here by primary and secondary industry (including manufacturing, electricity, gas and water utilities, construction and transportation), trade, finance, insurance, and half of public administration (in accordance with Gershuny’s solution to the problem of definition). The picture which emerges from the sample countries is as follows:

- The goods economy is dominant.
- Goods-related employment has declined in Canada, from about 80 per cent in 1951 to about 64 per cent in 1971 (Figure III.5). This is larger than a comparable change in the United States of 76 to 64 per cent (Figure III.6).
- The level of goods-related employment in Canada and the US is distinctly lower than the proportions maintained in Australia, France, Great Britain, and Japan. In each of these cases, except Great Britain, goods-related services *increased* proportionally more than social services. In North America, social service proportions increased more.
- The relative increase in employment proportions of goods-related *service* industries in Canada has been tapering off.

Sectoral Employment Changes in Review

1. Canada experienced *declines* in the relative importance of employment in primary industry and secondary industry while tertiary industry expanded.
2. The Canadian pattern of change was most like that of the US.
3. Within tertiary industry, *social* services expanded the most. Business-related service and public administration expanded at a lower rate.
4. In spite of change, employment is still dominated by activities concerned ultimately with goods production to such a degree that “post-industrial” is not applicable to the present Canadian situation. (The term is not particularly meaningful when applied to the United States’ pattern of employment.)
5. The faster decline in the proportion of the Canadian workforce employed in manufacturing can be explained by the low and falling level of export activity. Loss of domestic markets denies the labour force jobs associated with net trade balance (or export surplus) in manufacturing.

Figure III.5 – Goods Economy vs. Service Economy: Employment, Canada

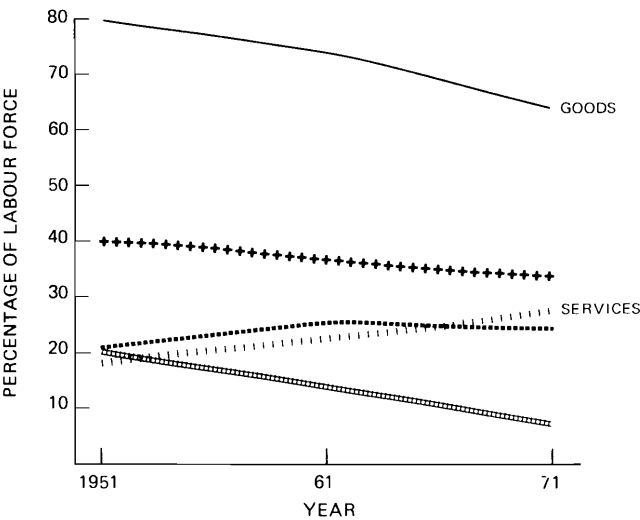
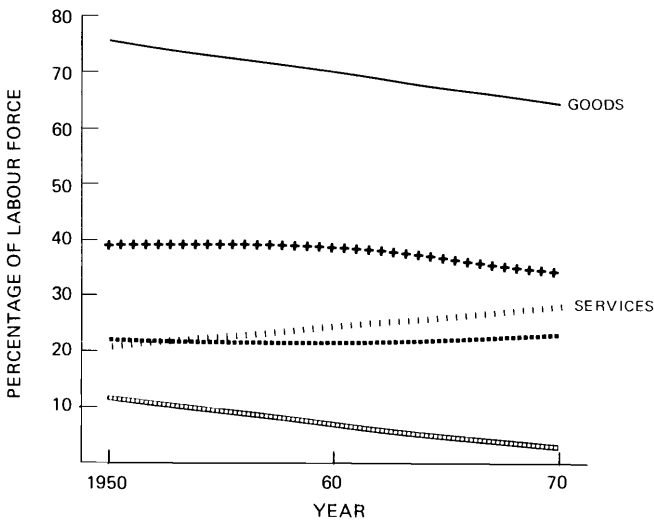


Figure III.6 – Goods Economy vs. Service Economy: Employment, United States



- LEGEND
- (1) — Total of (2), (3) and (5).
 - (2) + + + + + Secondary Industry (Includes Manufacturing, Electricity, Gas and Water, Construction, and Transportation).
 - (3) x x x x x Goods Related Industry (Trade, Finance, Insurance, and 1/2 of Public Administration).
 - (4) o o o o o Service Industry (Includes Personal, Entertainment and Recreational, Professional and Related Services, and 1/2 of Public Administration).
 - (5) x x x x x Primary Industry (Includes Agriculture, Fishing, Forestry, and Mining).

Source: See Figures III.1 and III.2.

The Pattern of Occupational Change

Canada's pattern of change in industrial employment is distinctive in several ways from that of many economies but once again, shows substantial similarities to the US. Nevertheless, this apparent comparability of trends masks basic differences between Canada and the US in the changing job patterns and, therefore, economic activities. Occupational data provide a useful guide to real changes in the type of work undertaken by Canadians.⁴²

Broad structural changes in employment by occupation in Canada parallel those of the United States: the expansion of white-collar occupations (managerial and administrative, professional and technical, and clerical and sales) exceeded blue-collar jobs during the late 1950s. Canada, however, has smaller proportions of both white- and blue-collar workers (Figures III.7 and III.8). The drop in the share of the latter group has been much faster than in the United States. In the other countries surveyed (except Mexico and Japan), the growth and level of white-collar jobs are comparable with that in Canada but these *other countries have all maintained their blue-collar labour forces at much higher levels than Canada.*

White-Collar Employment

White-collar jobs include: sales and clerical; professional and technical; managerial and administrative occupations. The latter two categories comprise *quaternary* employment.

There is wide variation between the sample countries (definitional differences are probably important); in most instances, however, quaternary employment *increased* while in Canada it *declined*.⁴³

To define differences in occupational importance with confidence (avoiding definitional change), it has been necessary to examine occupational data for industrial sectors. Analysis is focussed on managerial, professional and technical employment as an indicator of basic deficiencies in the Canadian mix of economic activities.

Professional, Technical and Managerial Occupations by Industry, 1961-71

In the non-goods sectors, Canadian patterns of quaternary employment are similar to those in the United States. Goods-related sectors lag, however, in the creation of professional, technical and managerial jobs. (See Table III.2.) In every sector, Canada's proportionally smaller managerial workforce is associated with poor productivity, uncompetitiveness and, hence, deficiency in manufactured exports and large imports of managerial and professional services.

Between 1960 and 1971, substantial occupational change occurred: there was marked relative *contraction* in quaternary jobs in manufacturing — probably in the whole economy. The decline in the managerial share of manufacturing jobs is extremely worrying because this sector is the core of the “goods economy”. (See Table III.3.)

In the economy at large, Canada trailed in the employment of *professional and technical workers* but improved its position from 1961 to 1971 (0.88 to 0.91 per cent of US level). Considering these jobs by sector, three major changes are found.

- 1) Manufacturing provided jobs for only six per cent more workers compared with a 32 per cent increase in the US. Manufacturing sustains these jobs at about half the comparable US level.

Figure III.7 – Long-Term Trends in Economically Active Population Classified by Occupation: Canada

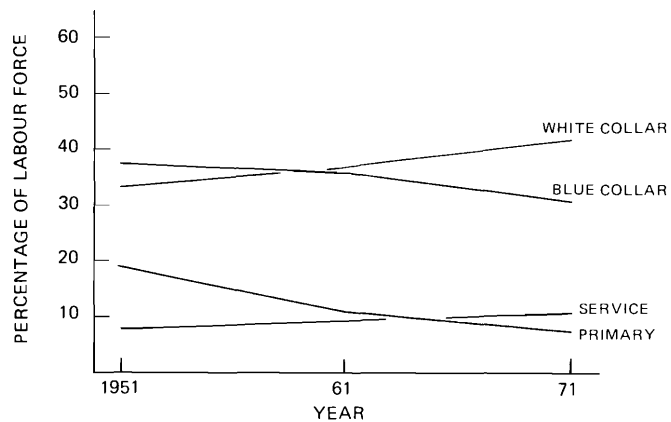
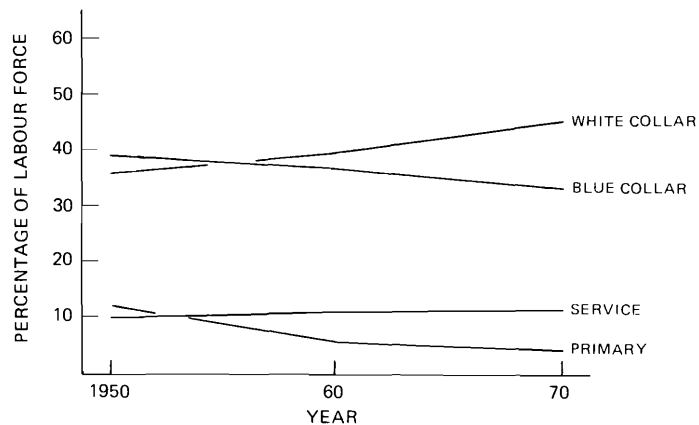


Figure III.8 – Long-Term Trends in Economically Active Population Classified by Occupation: United States



Sources: United Nations, *Demographic Yearbook*, UN Department of Economic and Social Affairs, New York, selected years; International Labour Office, *Year Book of Labour Statistics*, ILO, Geneva, selected years.

2) Service industries made major gains in their share of technical and professional jobs (in contrast to the United States). This increase advanced the service industry's share of these jobs (already large in 1961) further in comparison to the US pattern.

3) Other sector changes in Canada seemed to follow the US pattern quite closely. For example, a public administration gain in professionals approached the level of the US sector.

Table III.2 – Employment, Industry and Occupation: Canada and the United States

Sector	Canada, 1971		US, 1970	
	Managerial	Professional and Technical	Managerial	Professional and Technical
	%	%	%	%
AFFM	1.0	2.9	2.2	4.0
Manufacturing	4.0	5.3	6.0	9.1
Construction	3.1	2.4	9.8	4.1
TC & U	3.9	5.9	8.1	6.8
Trade	3.0*	1.9	15.3	1.3
FIRE	13.1	2.2	17.7	3.2
Services	4.7	39.6	5.5	35.5
PAD	10.6	13.5	13.1	14.0
Total	4.3*	12.7	9.2	13.9

*Definitional differences for managers in trade.

Note: TC & U Transport Communications and Utilities

FIRE Finance Insurance and Real Estate

PAD Public Administration and Defence

AFFM Agriculture, Forestry, Fishing, Mining

Sources: Statistics Canada, *1971 Census of Canada*, Vol. III, Part 5, Cat. No. 94-758, Supply and Services Canada, Ottawa, Table 7; United States, Bureau of Census, *Census of Population: 1970 Detailed Characteristics*, Final Report, United States Summary, US Government Printing Office, Washington, DC, 1973, Table 232.

Table III.3 – Manufacturing Workforce: Canada and the United States

Year	Canada		United States		Canada/US	
	Professional and Technical	Managerial	Professional and Technical	Managerial	Professional and Technical	Managerial
	%	%	%	%	%	%
1960			6.9	5.8		
1961	5.0	6.8			72	117
1970			9.1	6.0		
1971	5.3	4.0			58	67
% Δ in share	6.0	-41.0	32.0	3.0		

Sources: Statistics Canada, *1971 Census of Canada*, Vol. III, Part 5, Cat. No. 94-758 Supply and Services Canada, Ottawa, Table 7; United States, Bureau of Census, *Census of Population: 1970 Detailed Characteristics*, Final Report, United States Summary, US Government Printing Office, Washington, DC, 1973, Table 232; David S. Worton, "The Service Industries in Canada", *Production and Productivity in the Service Industries*, National Bureau of Economic Research and Columbia University Press, 1969, pp. 237-ff.

Components of Technical and Professional Employment in Manufacturing, Services, and Public Administration

By comparing changes in sub-classes of employment within the Canadian labour force with those in the US for the years 1961–1971, a better understanding of the Canadian situation is gained (Table III.4). Professional and technical (P & T) jobs generally improved their status but employment in scientific, engineering and mathematical occupations (SE & M) suffered, because it was the expansion of *non-scientific workers in public administration and the service industries* that made the gain on the United States pattern. In manufacturing, however, Canada lost ground heavily in the proportion of scientific workers in the workforce.

Details of the occupational change pattern for individual industrial sectors is summarized as follows:

1) There was a disastrously small growth in SE & M employment in Canadian *manufacturing*: it barely exceeded one-third the United States expansion rate. Ironically, the United States has been worried about its low rate of technological growth compared with Western Europe and Japan. Where does that place Canada's performance?

2) SE & M fared no better in the *public administration* sector but fast growth of *non-scientific* professionals in public administration occurred.

3) In the *service sector* (and despite suggestions made earlier), SE & M achieved a relative gain. In fact most of the growth in P & T employment in *service* industries was generated by non-scientific jobs (72 of the 79 per cent). Roughly equal shares were contributed by teachers (education) and by social workers and social scientists in health, welfare and religion. Compared with the United States where social service employment was also favoured, Canada generated only two-thirds of the comparative job growth in education but three times the comparative job growth in health and welfare. *Seemingly, Canada has traded-off long-term gains in education jobs for more immediate social service functions.*⁴⁴

4) In Canada, less than four per cent of the growth in P & T jobs is attributable to the growth of SE & M positions in manufacturing, compared with nearly 15 per cent in the United States. In fact, over the decade more SE & M jobs were added in service industries — mainly in *services to business management* — than in the whole of manufacturing. Although this growth does not offset the manufacturing sector's deficit, it is also related to construction, mining, and other activities.

Processes of Technological Change: "Engineers" vs. Scientists (and Mathematicians)

The process of technological upgrading depends on a broad spectrum of scientific and technological activities. In addition to the need for scientists in industrial research, (within government, corporate, and institutional laboratories), there is also the need for the services of engineers and industrial designers in the innovation process to translate scientific work into industrial products or processes, or to adapt existing technologies to suit the needs of particular firms. In pursuing the second component, so vital to manufacturing success, the employment of engineers is of particular interest because it provides an accessible employment index of the level of innovative activity in the Canadian economy.

**Table III.4 – Distribution of Employment Increases in Professional Jobs:
Canada and the United States**

		Percentage Change	
		SE & M	Non-scientific
Canada 1961-71			
	1 = 2 + 3	2	3
Services	79.4	7.3	72.1
Education	(33.2)	(2.3)	(30.9)
Health, Welfare and Religious	(34.6)	(0.4)	(34.2)
Services to Business			
Management	(6.0)	(4.3)	(1.7)
Manufacturing	4.0	3.6	0.4
Public Administration and Defence	8.9	3.8	5.1
Total	100.0	19.9	80.1
United States 1960-70			
Services	67.6	6.5	61.1
Education	(48.8)	(1.6)	(47.2)
Health, Welfare and Religious	(14.6)	(0.7)	(13.8)
Services to Business			
Management	(3.4)	(1.5)	(1.9)
Manufacturing	15.5	14.9	0.5
Public Administration and Defence	5.4	3.9	1.5
Total	100.0	26.2	73.8
<i>Source:</i> See Table III.3.			

Engineers and scientists both grew poorly in Canada (1961–71). There were sectoral differences, however, engineers and scientists increased fastest in services and lagged most in manufacturing. (See Table III.5.) Engineers, however, increased at twice the rate of scientists in manufacturing and this probably implies more activity concerned with implementation and adaptation of existing technology, rather than basic research work. Generally, the shift in favour of engineering jobs in Canada was of the same relative magnitude as change in the United States.

Canada barely achieved half the rate at which the United States shifted its human resources into scientific work and the Canadian sector in which the failure occurred was manufacturing. It can only be inferred that the development of technological expertise received scant support in Canada.

The Technology Gap with the United States

When comparing the status of engineers and scientists in Canada and the US (1960–61 and 1970–71), it is no surprise that the Canadian manufacturing sector has the greatest distance to make up. The concentration of foreign-owned manufacturing firms has a direct bearing on the situation. Foreign direct investment brings in the pattern of technical work being done in central labs outside the country and substantial imports of technological services.⁴⁵

**Table III.5 – Employment Change Engineers and Scientists (and Mathematicians):
Canada and the United States**

A	Canada, 1961-71		United States, 1960-70	
	Percentage Change		Percentage Change	
	Scientists	Engineers	Scientists	Engineers
All Industries	74.2	70.7	79.2	41.4
Manufacturing	25.8	56.6	80.0	37.6
Services	186.2	123.8	95.8	73.8
Public Administration and Defence	76.9	81.3	153.8	53.2
All Industries, All Employees	33.3		18.4	
B	Change Quotients*			
	Canada, 1961-71		United States, 1960-70	
	Scientists	Engineers	Scientists	Engineers
All Industries	2.23	2.12	4.30	2.25
Manufacturing	0.77	1.70	4.35	2.04
Services	5.59	3.72	5.21	4.01
Public Administration and Defence	2.31	2.44	8.36	2.89
*Percentage change in specific sector/Percentage change in all industry. Source: See Table III.3.				

In addition, the failure of Canadian domestically-owned industry to achieve adequate scale – a feature reflecting to no small degree constriction of the domestic market due to the import behaviour of foreign subsidiaries – similarly retards the development of scientific and technical jobs in Canada.

Some manufacturing industries use a standardized technology and their products vary only stylistically over time. Textiles and apparel are good examples of such *lower technology* activities. The performance of these industries from 1961 to 1971, in addition to six *high-technology industries*, is shown in Table III.6. The latter are distinguished by dependence on product and process innovation and by attention to automatic control systems especially in chemicals and petroleum products industries. In these activities by contrast to low-technology industries, the managerial and professional workforce is expected to increase as non-production jobs assume greater importance and as production jobs become susceptible to replacement by new production systems.

Canadian performance in the *low-technology industries* seems to have been acceptable – given that these activities were highly underscaled. A drop in managerial proportions, in fact, took the Canadian industries closer to the US pattern. But the low-technology industry in the US increased its proportion of *professional workers* while attaining or maintaining a more streamlined managerial structure. Canadian industry did not match the technological thrust of its US counterpart.

Table III.6 – Selected Industries: Occupational Composition

Industry	Canada				United States				United Kingdom			
	1961		1971		1960		1970		1961		1971	
	a	b	a	b	a	b	a	b	a	b	a	b
Textiles	5.2	3.3	3.3	3.1	2.8	1.8	2.9	3.3	3.7	2.2	5.2	3.1
Apparel	5.5	1.4	2.6	1.6	4.0	1.1	3.4	1.9	4.5	0.6	5.2	1.2
Petroleum and Coal Products	6.9	17.3	7.4	14.2	—	—	—	—	5.0	11.0	7.1	12.6
Chemicals	8.9	12.9	7.2	10.5	6.8	15.5	7.3	18.5	5.6	11.4	8.0	14.2
Basic Metals	3.1	6.3	2.8	6.4	2.8	5.6	3.1	6.7	2.9	4.9	4.2	6.0
Non-electrical Machinery	7.8	8.3	6.2	9.1	5.7	9.5	6.1	13.3	4.8	8.4	6.7	9.8
Electrical Products	5.9	13.2	5.1	11.4	4.3	15.3	5.2	18.1	3.5	10.3	5.5	12.6
Transport Equipment	3.6	6.6	3.1	5.3	2.8	12.2	3.6	14.1	2.2	8.1	3.5	9.0

Notes: a. Percentage of workforce in managerial positions.

b. Percentage of workforce in professional and technical positions.

Sources: See Table III.3; Great Britain, Office of Population Censuses and Surveys, *Census 1971 Great Britain*, Economic Activity, Part III, Her Majesty's Stationery Office, London, Table 19, p. 2.

In the *high-technology sectors*, the pattern in the United States, and even in the United Kingdom, was for managerial and professional employment *consistently* to take a more important share. In Canada, performance was inconsistent; only in one industry, petroleum and coal products, did managerial employment increase in proportion! In professional and technical jobs most industries experienced a fall in employment shares, but even in those where this proportion increased the rate was much less than in the United States.

Considering scientists and engineers separately, Canadian performance matches or exceeds that of its United States counterpart in only one industry — primary metals.⁴⁶ This industry is not usually considered a high-technology industry. It is the only one of the group studied with less than 60 per cent foreign ownership. The Canadian resource base is an initial advantage.

By way of comparison, transportation equipment should be singled out. North American rationalization of the auto sector allocates a comparable rate of change in engineers in both countries, but proportionally more engineers are employed in the United States. Basic research and development is done increasingly in the US. Canada's professional and technical status in the auto area is the *worst* of the high-technology industries.

There is no avoiding the implication that the indifferent performance of high-technology industry in Canada (in terms used) reflects the high degree of foreign ownership of these activities. Not only are managerial and professional services imported by foreign subsidiaries in place of skilled jobs in the Canadian economy, but other supporting factors are directly or indirectly related to the behaviour of foreign corporations (small size of Canadian firms, oligopolistic market structures, and poor quality of the managerial workforce). Canadian firms, unable to mount their own scientific, engineering and other technical departments, and managerial support may use specialist contractors. From the industrial point of view, services to business management are much less developed than in the US. In Canada 50 per cent of its engineers are civil engineers concerned primarily with construction projects. This group comprises only 3.6 per cent of engineers in services to business management in the US. In contrast with Canada, higher proportions of mechanical, aeronautical, and nuclear engineers among others make up the difference.

Perspective from the Supply Side

Canadian job patterns in recent decades are largely a product of the level of *demand* for professional and other specialist workers. The deficiency in demand lies in industry and is associated with the Canadian business environment. This assertion implies there have been no constraints on the supply of educated labour and it is relatively easy to establish that this has been the case.

The pattern of educational attainment of national populations varies considerably according to cultural, economic, and demographic situations. The United States is notable for the large proportion of its population with university or college education. Using level of education as a measure, early in the 1960s Canada had achieved about one-half the US level. Over the past two decades, however, the number of Canadian university graduates (per 100 000 population) has tripled. The gap has narrowed as a result of provincial and national expenditures, but other countries such as France, Sweden and Australia have done even better. Furthermore, the long-term effect of

cuts in educational budgets, if improperly managed, could damage the trend to a more qualified labour force. Already, Canada has employed a substantially smaller proportion of the growth in professional and technical workers (61-71) in the educational sector than is true in the US (49 per cent versus 33 per cent).

Tertiary education in Canada has been successful in general and would probably appear to have achieved even more if community college graduates were properly included in the statistics. The number of engineers and scientists graduating from university, however, is of concern because these occupations are important in generating new technology, in adapting existing technology for new products, and in maintaining and increasing productivity. By comparison with seven other developed countries, Canada has performed only moderately well — never better than fourth and nearly last in number of science and engineering graduates. Nevertheless, in scientific and technological areas the Canadian graduate training rate is gaining on the US. In comparison with the mid 1960s, the rate of engineering graduates in 1971, more than doubled, and the education system demonstrated responsiveness to demand.

Fortunately, in the period under review, the massive net immigration stream augmented the flow of graduate engineers from Canadian universities. Although in 1961 there was net emigration of engineers, by 1966 almost as many net immigrant engineers (2212) entered the labour force as were graduated (2241). This trend has continued. Nevertheless, the level of engineering jobs is much lower than needed in a technological world. Given the availability of European engineers and the large pool in the US, it can only be concluded that *demand* has been the limiting factor.

Research and Development and the Demand for Engineers and Scientists

In the technological thesis of economic development, industrial R & D occupies an important position, as the immediate origin of new processes, products or systems of production. Canada's weak technological position has been established using employment data for conventional classes of industrial activity; now it is important to consider R & D in a like manner.

Canada's R & D performance is about the worst of the western world! OECD data on R & D performance show Canada rises to mid-rank (of 10 countries) in educational variables conducive to innovation. As of the late 1960s Canada ranks near the bottom of the group surveyed in terms of R & D employment, expenditure (especially that financed by business) and scientific production. Looking at employment in R & D, Canada ranks second last in the survey group (R & D personnel/100 population) in 1967 and in 1971. While other countries were expanding at rates up to eight per cent per annum, Canada's R & D employment has *fallen*.

By any reasonable comparison, Canadian R & D is in a sorry state. There has been little recognition of the fact that the levels of scientific and technological activities are part of an industrial identity that Canada must strive to establish.

The long-term weakness of Canadian R & D employment is even more evident when the industrial distribution of R & D employment in the ownership status of the employing firms is considered.⁴⁷ A large proportion of the

firms undertaking intra-mural R & D are foreign (in 1973, 322 of a total of 834 firms). Foreign firms are responsible for larger R & D expenditures because there are proportionally more, large foreign than domestic firms in Canada: of total R & D expenditures 54 per cent is undertaken by foreign-controlled firms, but in manufacturing the proportion of foreign-controlled R & D expenditure is 57 per cent. Manufacturing, of course, accounts for the bulk (96 per cent) of R & D expenditures.

A large portion of R & D expenditure by Canadian firms must be used to modify existing ideas, methods and designs to suit the Canadian situation, as is the bulk of R & D in the foreign-controlled branches. This implies that the Canadian R & D effort directed toward maintaining an *active* presence in world competition through market-leading products is indeed much smaller than the aggregate figures might first suggest.

Summary and Conclusions

Only superficial impressions gained from highly aggregated employment data could indicate that the Canadian employment pattern is similar to advanced economies. A small amount of probing has shown just how much Canada lags behind other economies:

- Compared with the other western economies, Canada has experienced a larger relative decline in employment in immediate production activities.
- Although non-production activities have increased their employment share rapidly in Canada, public administration (often seen as the Canadian villain) is not an important area of expansion, and commercial services appear to show positive effects of technology in reduced employment shares. The social services have increased in proportional importance.
- The Canadian economy is still dominated by activities ultimately concerned with the production of goods: it is not, nor is the US, a post-industrial *economy*. But there is a faster decline in Canada's workforce proportion engaged in manufacturing. Canada's failure (compared with other western economies) to serve its domestic economy with secondary manufactures is reflected in the workforce data.
- White-collar occupations, in aggregate, have grown to a point where the number of employees exceeded blue-collar workers during the late 1950s (in line with the United States) while other advanced economies entered this phase only a few years ago.
- The importance of Canadian managerial and professional and technical jobs in goods-related sectors is well behind the United States, while the two countries are comparable in non-goods sectors. Managerial employment, is generally stunted and it declined in share of manufacturing jobs (1961–71). Professional and technical positions also failed to expand in relative fashion as in the United States.
- While scientific jobs in manufacturing failed to increase their share of employment, social service professional jobs expanded in the service industries.
- The employment of engineers and scientists is a direct guide to the importance of technological activity in Canada. In manufacturing, Canada lost ground in the share of jobs held by these occupational groups, compared with the United States — more in the case of scientific workers than engineers.

Individual high-technology industries repeat the patterns of relative decline in managerial, scientific and engineering jobs. The worst technological status position in those Canadian industries is found in transportation equipment, indicating the effects of foreign ownership and North American production and job rationalization in the auto industry. The best technological status occurs in the primary metals sector with the least foreign control and where natural resources have provided comparative trading advantages.

- Canada's educational policies in the professional area have been effective and have been augmented by the immigration of trained engineers and others. There is no obvious evidence that, given immigration, Canadian industry was starved of highly-trained personnel. Constrained demand by industry is responsible for the poor trends in employment change. The reduced level of immigration, however, may generate labour supply problems at the university-trained level and at the level of highly skilled production workers.

- R & D in Canada is underdeveloped compared with other advanced economies. Furthermore, over half of R & D expenditure is in the hands of foreign-controlled firms that generally are concerned with adapting existing product designs and production systems especially within corporations, to suit the Canadian market.

A knowledge-dependent society has emerged in the developed world over the past three decades and technological work undertaken within industry to solve product or production problems has grown enormously. Industrial success over the period, therefore, has tended to depend in part on the national effort put into this type of work. The "third wave of industrialization" is identified not only by an increase in the importance of scientists in industry but also by the development of management functions. There have been other changes also, especially in the expansion of the design professions (including engineering) that interconnect marketing functions with production and product technology. Design activity, however, is not necessarily dependent on in-house scientific work, because in many product areas "new" knowledge is widely available. An effective design and management workforce is required for industry to establish an *innovative capability*. Without this, Canada's market has been penetrated by imports, and exports of secondary manufactures have declined. Without successful management new market possibilities have not been perceived and as an indirect consequence, productivity lags behind economies with a wider range of products entering international markets.

In Canada managerial and other quaternary jobs failed to expand at rates sufficient to sustain technological development, and Canada experienced a weakening of future ability to compete in world markets. The increase in labour productivity in manufacturing during the sixties, was coupled with a decline in total factor productivity. With a retarded technological capability, the benefit of increased capital investments was largely labour replacing and not associated with product replacement which would have required improvement in inputs of human resources. Thus, failure of the secondary manufacturing sector, especially in high-technology trade, is consistent with the changing proportions of the labour force in blue-collar and quaternary manufacturing jobs.

The economy has suffered from large imports of service invisibles that also imply failure to develop a wide range of quaternary jobs in management and technical fields. Chapter IV searches for some of the causes of this de-

pressed economic situation. The industrial environment, generally, and high-technology industries, in particular, are dominated by foreign subsidiaries: in large part the origin of Canada's lack of technological competence lies in failure to recognize the full significance of dependence on foreign enterprises.

IV. The Dependency Syndrome: General Dimensions

The Canadian economy is exceptional in its reliance on resource exports of minimal manufacture, in its high percentage of employment in tertiary industry, in its failure to achieve trading balance in highly manufactured goods, in its low proportion of the workforce involved in R & D of any type, and in the poorer development of commercial services related to the demands of firms, compared with social services. There is a technological aspect to each of these features of the Canadian economy – a lack of technology supply to improve Canada's exports of highly manufactured goods, a lack of technology demand by import-reliant industries, and a lack of investment to advance technological capability in industry.

The pervasiveness of Canada's technico-economic problems has been observed in the past two chapters with no single explanation emerging. But the massive size of direct investment by foreign companies is a recurring factor in any explanation. This chapter gives an overview of foreign control as a root cause of Canada's economic structure and performance problems. It is not argued that the size of foreign ownership and control is the only factor contributing to Canada's peculiar industrial situation nor is the ultimate explanation that simple, but foreign control is so well developed, and its indirect effects on economic performance so strong that understanding its full ramifications is required before constructive suggestions can be made about what Europeans call "Canadianization" (i.e., the highest level in industrial dependency). Therefore, a general framework is developed to relate various facets of economic dependence while the following chapters examine imports, exports, and R & D.

Canadian and Foreign Perspectives on Foreign Ownership

It is tempting to assume that by establishing the Foreign Investment Review Agency (FIRA), Canada finally began an era when dependence on foreign firms and thus reliance on ideas, capital and components available from other countries, would be controlled and reduced. Recession and unemployment, among other reasons, may have reduced the stringency applied by FIRA in its examinations of foreign take-overs and new investments. But one suspects there are few take-overs of Canadian domestic companies these days, because acquisitions tend to focus on subsidiaries of foreign companies.

Nevertheless, analysis of the significance of foreign control in Canada has become more perceptive – the official reports are becoming more open; presenting more detailed evidence on business patterns harmful to employment in Canada and domestically-owned business. The recommendations of the Gray Report ("Foreign Direct Investment in Canada") however, were only partially met in FIRA. Similarly the Canadian Development Corporation (CDC) has not been as radical or polarizing an economic agent as the Watkins Report ("Foreign Ownership and the Structure of Canadian Industry") envisaged it would be. Most recently an Ontario Select Committee on Economic and Cultural Nationalism (1975) reported in very clear terms the direct and indirect effects of foreign control in a range of resource, manufacturing and service industries. But policies reflecting its very clear interpretations

have not been formulated. Private, as well as official, literary assaults on the perils of the strength of foreign dependence, political factions (NDP Waffle) and independentist groups (Committee for an Independent Canada) have all been unsuccessful in generating enthusiasm for a reduction in the level of cultural or economic dependence on the United States.

The Canadian government, however, is working with rather unresponsive material in terms of the attitudes of the Canadian public. This paradoxical situation surfaces in a recent paper in which Rotstein tries to explain the roots of Canada's colonial mentality. He observes, "It would be a mistake to evoke the image of Canada as a seething colony struggling to break loose. Canada bears rather the signs of a successful lobotomy to which it has voluntarily assented."⁴⁸

Unfortunately, the official and private attacks on foreign dependence in recent decades largely have been contrary to the positions taken by many orthodox economists in Canada. Their belief in free trade, for example, and apparent doctrinal blindness to the significance of foreign control of manufacturing, probably should carry a large part of the blame for the lack of a wide spectrum of governmental attempts to create a Canadian cultural and business environment conducive to the growth of domestically-owned firms. Canada is in a stalemate situation exemplified by inaction on the part of the government — it is clearly disposed to act in cultural-economic areas to protect national interests and to maintain a limit to the dependence-by-spillover that is to be tolerated. But in industrial-economic areas resolve weakens in the face of anti-nationalist economists and as a consequence only weak measures, like FIRA, have ever been taken against the effects of foreign economic dependence.

Essentially Canada harbours many economists in academic and bureaucratic positions who fail to perceive the conflict between attainment of Canadian economic objectives and the growth in influence of multinational companies operating in Canada.⁴⁹ In the same vein, many orthodox economists fail to appreciate how foreign ownership generates a significant negative side to proposals for a continentally integrated North American economy in which Canada is the junior partner.⁵⁰ It is unfortunate that establishment economists in Canada have been powerful enough to reduce the strength of opinion that recognizes economic problems derive from foreign control. However not all Canadian economists can be categorized in this way.

Elsewhere in the world abundant empirical proof has been assembled from many case studies by economic geographers and development economists, showing that foreign direct investment promotes *development* at the centre (i.e., controlling industrial nations) and generates at best only *growth* at the periphery (i.e., dependent nations). While this source of growth boosts the development of the industrial economies it is detrimental to self-sustainable development in peripheral economies.⁵¹ Empirical and theoretical literature on this theme now comprises an impressive body of "alternative" economics which has strong pragmatic roots.⁵² Much of it originated in underdeveloped economies and Canada may seem a poor example since incomes are high. Nevertheless, in Canada there has been growth with inadequate development accompanied by complacency in public attitudes and a high degree of foreign control over economic activities. It is recognized overseas that the dependency syndrome has occurred to its greatest extent in Canada.⁵³

Origins of Foreign Control

In orthodox Canadian economics many problems of the economy are laid at the door of the “protective” tariff policy followed, since 1879, by successive governments and the introduction of the “National Policy”. While there is a simple truth in this, it leaves too much unexplained. More important than tariffs, as tariffs, is the policy environment which has given tariffs their particular Canadian impact. A second concern, and a more important one now, is the behaviour of firms, especially foreign corporations, behind the tariff wall. Related to this question is the extent to which weak industrial power, now characteristic of domestic industry, is related to the level of foreign ownership. Ultimately, the most pressing question is what to do about the relative weakness of Canadian domestic industry. In tackling these questions, the origins of foreign control are reviewed and the basic hypotheses that itemize the effects of foreign control are examined.

It is sometimes suggested that a major reason for the high tariff protection afforded manufacturers in Canada was that such a policy was seen as an effective way to promote domestic industry and that its authors were well-intentioned and could not possibly anticipate the hazards for long-term development. While this view is naive and misleading, probably Naylor’s opinion that the National Policy should be viewed as a deliberate and considered abandonment of most of Canadian manufacturing entrepreneurship and domestic industrial enterprise to foreign capital, is too extreme⁵⁴. As could be expected Naylor’s interpretation has worried many Canadian economic historians who dispute that hard evidence bears out this theory⁵⁵.

Toward the end of the 19th century, Canada had a minuscule population in relation to land area and resources. A large outflow of staple exports (resource-based) drove the economy. A very large proportion of Canadian and borrowed capital was required simply to build and sustain the basic infrastructure necessary for these primary export activities. Exports were organized to supply demands of, mainly British, industrial and consumer markets. To the south the large and ebullient United States was experiencing rapid growth in manufacturing. Though manufactures were readily available from foreign sources, Canadian firms were also struggling to grow. Therefore, both manufacturing and staple development were in competition for capital!

Late in the 19th century, real economic (and political) power in Canada lay not with industrialists but with merchants, bankers and financiers. Their interests and decisions were paramount in determining the nature and direction of economic development. Their overlapping interests lay in trade, certain related industries like sugar refining, banking, and in the type of government and policies best suited to protect and promote their commercial (and related industrial) activities. Essentially they were merchant capitalists, and the National Policy represented their interests – merchant capitalism. This policy was ill-suited to the needs of industrial capitalism and the many entrepreneurs attempting to launch and build manufacturing businesses.⁵⁶

The end of the 19th century was “an era in Canadian history when it could correctly be said that an economic class ruled politically”⁵⁷ and that class has dominated by financial interest. “The National Policy was more of the commercial imperialism of the St. Lawrence merchants”⁵⁸ and hence the necessity to develop east-west railway connections to allow the export of

Canadian staples. "Railways . . . it was argued would "spin off" a series of financial and industrial benefits which would project Canada into a leading industrial nation by the twentieth century."⁵⁹ Tariffs were intended to create revenue and to "protect".

The slowly growing and evolving group of industrial entrepreneurs and capitalists (many of whom were Americans) were within the financial control of the entrenched merchant capitalists.⁶⁰ The power of the latter, especially their control of the banking system, meant restricted capital for manufacturers, as the capital market channelled funds into commercial and staple activities and away from manufacturing. The Canadian banking system at this time was interested only in short-term credit and this created a situation of "chronic deprivation of long-term finance to industry."⁶¹ But at the same time more manufacturing production in Canada was desirable: tariffs were essentially an open invitation to foreign industrialists to invest in Canadian manufacturing.

Tariffs promoted industrialization by invitation (or default). The policy protected products rather than indigenous firms, and Canadian enterprises would have required differential treatment during their formative years if the policy was to have had a protective effect. But apart from tariffs, no active help was applied to ensure the growth of infant industries. The banking system which in other countries (e.g., the US, Germany and Sweden) played a crucial role in fostering industrial growth showed little or no interest in providing capital to small struggling firms and industries, and through mergers, take-overs and centralization, eliminated or absorbed the few banks (especially in the Maritimes) which had actively interacted with manufacturers. As is well known, Canadian banks have continued this tradition and must shoulder a large part of the blame for the results of the tariff. Certainly a creative policy of infant industry protection would have shielded Canadian manufacturers from the enormous initial advantages possessed by the Americans. The National Policy certainly involved an import-substitution strategy but foreign industries were also substituted for Canadian entrepreneurship. The only national aspect of the policy Canada adopted was that east-west transportation links were sought, in order to foster the export of staple commodities controlled by merchant capitalists!

In view of the United States' strong industrial base, its large markets, and the skill and experience of its entrepreneurs, it was almost inevitable that nearby American industries would have little difficulty establishing themselves in Canada, and with advantages that most Canadian industries could not hope to match. Even before tariffs were introduced some American branch plants could be found in Canada. The new policy quickly raised their numbers. In 1879, thirteen plants were started, giving impetus to the branch plant movement. By 1900, there were at least 66 branch plants operating in Canada, by 1913, 450 foreign branches⁶² and by 1932, there were 1320 American branch firms.⁶³ This may seem a small number but the start-up size of these firms was large by Canadian standards. Foreign firms had an importance out of proportion to their number. By 1936, the situation according to Marshall *et al* was:

"In some industries only a scattered dozen or score or so of American plants are to be found. In others they loom so large that to describe their history and operations is to write the story of that section of Canadian industry."⁶⁴

The timing of the introduction of Canadian tariffs was not auspicious. At the turn of the century, industry in Canada followed the pattern of reorganization of much US manufacturing in the late 1890s. In the US, national markets had become available for many goods and services and merger activity leading to the establishment of national corporations was undertaken.⁶⁵ Domestic mergers occurred in Canadian industry but the spillover of US trends probably was an important factor contributing to the effects of the tariff. Corporate capitalism was also imported into Canada and the entrepreneurial base of Canadian manufacturing was subjected to substantial pressure from foreign business from this time on.

In the period after World War I and until the 1930s, the US economy underwent another wave of merger activity stimulated by the growth in the market from 1900–1920 of over 40 per cent. Access to this market, delivered by radio (advertising) and cheap transport (cars), resulted in a wave of financial consolidation. Canada imported consolidation (e.g., Canadian General Electric, Canadian Westinghouse and Imperial Oil). In banking, the number of banks decreased from 51 to 36 to 11 in 1874, 1900 and 1925 and the dominance of commercial interests again becomes clear.

By the beginning of the 1930s, British and US firms had taken over a wide variety of Canadian firms, had started others, and were well established. By the beginning of the depression, the “sell out” of Canadian industry was well advanced. British and American firms accounted for well over half the production in the electrical apparatus, chemicals, artificial abrasives, automobiles and other transportation equipment industries. Other sectors were influenced, but to a lesser extent.⁶⁶ United States portfolio investment grew substantially and exceeded all UK investment; even by 1921, 60 per cent of Canadian trade was with the US. Foreign firms continued to enter Canada throughout most of the thirties. Between 1930 and 1937, Britain added 51 and the US approximately 200 new branch plants.⁶⁷

From the mid-1940s, foreign acquisitions in Canada have followed a similar, though delayed, pattern in comparison with the US. After a long period of growth the peak in acquisition activity by foreign companies was reached in 1968–70.

In the post-World War II period, Canada received a substantial flow of US capital in the form of direct investment which has generated the pattern of control in force today. The overall strength of foreign control of industry in Canada is shown in Table IV.1 — a pattern with a direct lineage to the National Policy. Augmented by increased primary resource exploitation by US capital, the period is marked also by the emergence of the multinational enterprise in its modern form and power, and by technology-dependent growth derived from investment in R & D. Innovation in management and control has made the operation of subsidiaries in Canada easier for multinational corporations: easier for them to satisfy their corporate goals; easier for them to minimize the autonomy of the subsidiary. Foreign capital has brought foreign technology. Who is paying? For how long?

Hypotheses on Foreign Dependence

The contemporary pattern and depth of foreign control is most easily observed in Table IV.1: foreign capital is most concentrated in manufacturing

Table IV.1 – Foreign and Domestic Control: Major Non-Financial Industries, 1974

	Number Foreign- Controlled Corporations	Number Canadian- Controlled Corporations	% Foreign Controlled by Number	% Canadian Controlled by Number	Average Asset Size Foreign- Controlled Corporation	Average Asset Size Canadian- Controlled Corporation	% Foreign Control of Assets
Petroleum and coal products	26	14	65.0	35.0	398.1	3.1	99.6
Metal mining	55	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Communication	20	345	5.5	94.5	6.7	24.3	13.8
Tobacco products	17	3	85.0	15.0	52.8	n.a.	n.a.
Public utilities	39	363	9.7	90.3	16.3	71.0	2.4
Paper and allied industries	113	258	30.5	69.5	38.2	21.3	44.0
Transport equipment	158	382	29.3	70.7	30.3	n.a.	n.a.
Rubber products	34	43	44.2	65.8	30.0	1.5	94.1
Mineral fuels	235	238	49.7	50.3	28.8	9.3	75.4
Beverages	39	248	13.6	86.4	14.9	5.5	29.8
Primary metals	55	205	21.1	78.9	17.5	n.a.	n.a.
Non-metallic mineral products	113	497	18.5	81.5	16.2	n.a.	n.a.
Transportation	217	2190	9.0	91.0	13.9	7.8	15.1
Textile mills	97	307	24.0	76.0	13.4	n.a.	n.a.
Food	223	1344	14.2	85.8	13.1	2.2	49.4
Chemicals and chemical products	298	294	50.3	49.7	12.1	3.3	78.8
Electrical products	193	271	41.6	58.4	13.0	4.9	65.3
Wood industries	100	1038	8.8	91.2	8.4	2.1	28.4
Other mining	203	976	17.2	82.8	9.8	n.a.	n.a.
Construction	196	8101	2.4	97.6	8.8	1.1	15.1
Machinery	225	395	36.3	63.7	8.7	2.2	69.2
Retail trade	383	10995	3.4	96.6	6.7	0.9	21.1
Services	584	7754	7.0	93.0	5.6	1.0	30.0
Metal fabricating	321	1449	18.1	81.9	5.5	1.7	42.0
Wholesale trade	1598	11036	12.6	87.4	4.4	1.4	31.2
Knitting mills	17	200	7.8	92.2	5.1	n.a.	n.a.
Miscellaneous manufacturing	255	762	25.1	74.9	4.0	n.a.	n.a.
Furniture industries	40	492	7.5	92.5	3.7	1.2	19.7
Storage	16	158	9.2	90.8	3.3	8.3	3.9
Printing, publishing and allied industries	61	763	7.4	92.6	3.6	n.a.	n.a.
Clothing industries	42	939	4.3	95.7	3.8	0.9	16.5
Leather products	25	200	11.1	88.9	3.0	n.a.	n.a.
Agriculture, forestry and fishing	105	3077	3.3	96.7	2.5	0.6	12.5
Total non-financial industries	6103	55439	9.9	90.1	12.2	2.4	34.0

Note: In manufacturing, firms with assets of \$1 000 000 000 were unclassified as to ownership. There are good grounds for assuming the vast majority are Canadian controlled. Therefore, the figures in the Canadian-controlled column are in some cases over-inflated and in others, under-inflated.

Source: Statistics Canada, *Corporations and Labour Unions Returns Act*, Report for 1974, Part I – Corporations, Cat. No. 61-210, Supply and Services Canada, Ottawa, January 1977.

and mining and is a dominant factor behind the large exports of crudely-processed minerals. In addition, it is increasingly clear that Canadian resource exports are influenced in their degree of processing by the market power of the purchasing economies.

The high level of secondary manufacturing dependence on US capital is of even greater importance in accounting for Canada's underdevelopment. Characteristically, material inputs for secondary manufacturing in developed economies are derived from domestic sources.

Canadian subsidiaries, however, are very like US assembly plants and receive large flows of manufactured components from US suppliers. These flows inflate the imports of high-manufactured commodities and Canada's trade imbalance in highly manufactured products is worsened. Economic development is inhibited.

These observations introduce the basic thesis of this study used in unravelling the influence of foreign ownership on industrial underdevelopment. Generally, it is hypothesized, underdevelopment reflects the degree of dependence of the economy; that is, the greater the degree of dependence on foreign sources of materials, ideas, capital, etc. the greater the penalty for Canada until a point is reached when relative to population size the nation is economically underdeveloped. Evidence indicates this stage has been reached and the symptoms of dependence provide the substance for the connection of foreign control with underdevelopment.

The symptoms of dependence have a wide variety of expression but several basic hypotheses are outlined that have either been positively evaluated by other research workers or are investigated here. Only on overview (of the symptoms of dependence) does the full significance of foreign ownership in Canada emerge, and is the range and depth of Canada's economic problems really perceived.

1. Foreign investment has been a major cause of the dominance of Canada's merchandise trading by resource exports. The motivation for foreign investment has been to secure a reliable and inexpensive supply of raw or semi-processed material to permit US, European and Japanese manufacturers to realize downstream profits. As a result, foreign ownership and control are associated with the relative underdevelopment of the secondary manufacturing sector by comparison with the natural resource industries.

2. Foreign direct investment in Canadian secondary manufacturing is concerned primarily with establishing and protecting a position for *foreign technology, brand names, product concept and market power* in Canada.⁶⁸ Both the Gray Report and the Report of Ontario's Select Committee explain that foreign companies are interested in selling technology, marketing managerial and entrepreneurial skills to Canadians on an ownership (i.e., *perpetual return and control basis*) as well as providing markets for sub-assemblies and components.⁶⁹ Unfortunately, foreign firms in secondary manufacturing often are constrained from exporting by their parents. These attributes are revealed in industrial plants ("miniature replicas") and in the excess of imported components, sub-assemblies and finished goods compared with exports in Canada's highly manufactured trade category.

3. The *fragmentation* of the Canadian market for many goods – the excessive number of producers/sellers – occurs largely because of the large

number of foreign firms competing in the considerably smaller Canadian market. The result of the spillover of US oligopoly power into Canada is high-cost *low-productivity* industry that often has the capability to be responsive only to local or regional market competition as in the metal fabricating industries.

4. While Canadian manufacturing generally suffers from an insufficient development of large plants, probably because of its orientation to a domestic market of limited size, foreign ownership has made the situation worse. Domestically-owned plants have remained at the small-plant end of the distribution of plant sizes where low productivity generally is prevalent.⁷⁰ On average domestic plants attain only 82 per cent of the productivity level of US-controlled plants. Larger plants achieve economies of scale thus explaining the higher labour (and one suspects total factor) productivity that is achieved by the larger, foreign-controlled plants. It is, however, generally considered that the length of production run for each product establishes how well scale economies are realized. Foreign subsidiaries are highly diversified in their product structure, nevertheless, their size (and even production-run length) allows some scale economies to be obtained, thus placing their productivity performance above Canadian segments of each industry. This is only a relatively superior performance as Canadian industries (as discussed previously) are poor performers (in capital and labour utilization) when compared with US industry. Also, it is likely that many foreign firms suffer inefficiencies from attempting to penetrate many product sub-markets. Thus, Caves concludes that Canadian plants of any given size are more diversified than US plants, but the Canadian plants of multinational companies are more diversified than those belonging to domestically-owned companies — the mininature replica effect.⁷¹

Canadian firms are more often vertically diversified. Is this a device for self-protection — a response to the fragmented and widespread nature of the Canadian market for secondary manufactures? Foreign-controlled plants are concentrated in Southern Ontario and Quebec; Canadian plants are smaller, more widespread, and thus many operate in local industrial environments that lack developed industrial infrastructure (auxilliary firms, industrial wholesalers, etc.).

Probably the vertical diversification of Canadian firms reflects supply and even market uncertainty and derives in part from the spillover effects into Canada of foreign oligopoly power — the large domestic market shares obtained by large foreign firms reduce the residual market available for the smaller domestically-controlled firms and constrain their effectiveness. For very small firms the market probably appears more or less restricted to Canada because of their inefficiencies. Thus tariffs encouraging multinationals, together with domestic commercial behaviour which has long favoured larger foreign firms over smaller less secure domestic firms, indirectly have limited the development of the Canadian industrial environment. In effect, tariffs have inhibited Canadian firms from attaining greater size, specialization, long-production runs, and thus scale economies and export competitive production.

It is important to note, however, that while tariffs have had these long-run effects, *the isolated act of tariff removal* does not provide a satisfactory solution. The distress arising from the certain severe industrial dislocation

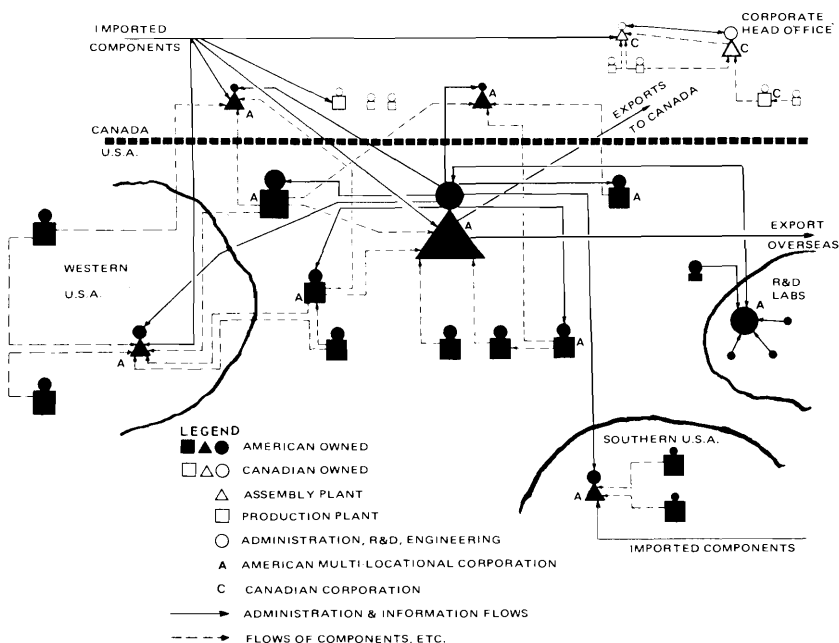
would more than outweigh the economic benefits deriving from the increased competitiveness of the firms to survive such crude surgery.

5. In many instances foreign ownership has contributed to the underdevelopment of Canadian industry, even where the Canadian market is large enough to support an internationally competitive industry.⁷² The forest and mining industries in Canada comprise a large market for engineering and machinery. In contrast to other industrial countries with similar activities, such as Sweden, Canada has incurred heavy net deficits in the engineering and machinery requirements of these industries. Explanation for the underdevelopment of these industries lies in the equipment purchasing patterns of foreign-owned forest and mining firms by-passing Canadian engineering, consulting, and machinery manufacturers. Foreign ownership "has frequently led to foreign sourcing of requirements for investment in Canada rather than development of strong indigenous industry."⁷³ This pattern has probably led to situations in which Canadian supply firms cannot attain the quality thresholds of foreign sources. Thus the sales potential of Canadian suppliers is further limited.

6. Foreign ownership has generated undesirable *spatial economic effects* that while recognized by a small group of economic geographers have received little public or government attention. At the *national* scale foreign firms have been instrumental in widening regional economic disparities in Canada, accentuating core-periphery contrasts through greater geographic concentration than domestic firms,⁷⁴ and thus reducing employment opportunities, income and development in all parts of Canada with the exception of Southern Ontario.⁷⁵ At the *regional* scale there is now strong evidence that foreign-owned firms tend to be only very loosely connected to the local urban economies in which they are located.⁷⁶ Substituting the multilocal resources of their corporations for local material and service inputs, foreign-owned firms make only minimal industrial and related demands on local economies. (See Chapter V.) The sources of these problems are illustrated in Figure IV.1 where the spatial organization of medium/high-technology industry in Canada is represented in stylized form. The major portion of many industries in Canada are collections of small domestic manufacturing units dominated by larger foreign assembly and marketing units which are bound to the large foreign organizations. By contrast with the foreign-controlled elements, the truly Canadian part of many industries contains only primitive forms of corporate organization – one-plant firms or another simple arrangement. One or two firms may have subsidiaries in the United States. Comparisons between Canadian-controlled and foreign-controlled firms must take account of these significant differences in organization and structure.

Even in Canada's most important industrial area – the Toronto and Lakeshore areas of Southern Ontario – many foreign firms are heavily dependent upon inputs from the US, especially materials and services from company sources. That is, they frequently by-pass Canada's largest industrial complex in obtaining inputs (at equivalent cost/quality) which are available, or which could be produced there. If this type of behaviour is found in Southern Ontario there is no doubt it is even more pronounced in other parts of Canada. It is a probable characteristic of branch plants.⁷⁷

Figure IV.1 – Selected Intra-Corporate Components of Organization of a High-Tech Industry in Canada



Note: Basic inputs, e.g., steel omitted; components included. In electronics 72 of the largest 100 Canadian plants (A&C) are foreign controlled and account for 55 per cent of sales. There are over 700 plants in the industry group, and most are small Canadian-controlled plants.

To the extent that foreign subsidiaries in secondary manufacturing undertake only assembly (and some production) or production, and domestic distribution, then there are demands for a range of specialized managerial, research, industrial and other services. Generally, they are supplied, like the large volumes of components and sub-assemblies, from US origins of the parent corporation. The effect is to reduce employment opportunities in Canada and to support production and non-production jobs directly and indirectly in US cities. The employment and income multiplier effects of these economic leakages have to be placed in the forefront of any consideration of the impacts of dependency. They are relevant, too, when Canadian domestic policies are considered. Given the impact of corporate behaviour on employment and income levels in Canada, many of the successes of the Department of Regional Economic Expansion (DREE) in attracting foreign firms to marginal locations have a counter-productive dimension.

7. *The low level of innovative capability in Canadian manufacturing* derives directly from the pervasive influence of foreign control of firms in Canada. Paradoxically, Canada is *industrial* in the sense that it produces goods but it is *semi-industrial* in the sense that frequently technological know-how, and even design inputs, are neither available nor demanded in Canada to produce the goods, in the first place, and to modify and improve the products and

processes that are used. Technology imports occur without any real Canadian choice once foreign ownership of plants is accepted, thus reducing job opportunities in Canada — especially jobs concerned with developing or using high levels of skills — and stunting the growth of innovation, the most important factor input to the modern developed (industrial) economy.

Canada's low level of technological achievement is one of many direct consequences of foreign ownership. By permitting foreign control over industries in which innovative capability is fundamental for international survival and growth, Canada suffers the consequence of foreign multinational firms attempting, and generally succeeding, in their aim of centralizing managerial, high-level technical, and scientific jobs in the country of corporate control.

Truncation: The Consequence of Dependence

In large measure the symptoms of dependency outlined have been captured in the concept of *truncation*, as developed in the Gray Report. By reviewing this idea, an integrated view is presented of the symptoms of industrial under-development generated by foreign-owned firms. The under-represented medium/high-technology industries in Canada are truncated and, in turn, are comprised of truncated firms. Such firms are found also in other industrial groups wherever foreign ownership is present but they are particularly prevalent in the medium- to high-technology industries.

“A truncated firm is one which does not carry out all the functions — from the original research required through to all the aspects of marketing — necessary for developing, producing and marketing its goods. One or more of these functions are carried out by the foreign parent of the Canadian firms.

“There are several reasons for a parent to truncate the operations of its foreign affiliates. Truncation may be necessary to enable the parent company to achieve the maximum economies of scale inherent in the centralized functions which it performs, thus constituting an efficient international distribution of corporate activity. It may be most efficient, for example, for the parent to undertake all the research and development of the international enterprise, rather than having part or all of it undertaken by subsidiaries. Truncation of the subsidiaries' operations in Canada may also come about because the foreign parent or some of its affiliates in other countries have an under-utilized capacity to supply inputs required by the Canadian firms such as components or services. Truncation of the Canadian subsidiary may seem advisable to the foreign parent to minimize the investment risk, to reduce the danger of making available training and know-how to Canadians who might subsequently employ it to become a competitor or to give the parent maximum flexibility to draw off profits from the subsidiary through royalties or management fees, or the prices charged for inputs supplied to the Canadian operations.

“Truncation normally maximizes the achievement of the global objectives of the parent firm and is, from its point of view, a rational business decision. It does not necessarily maximize the profits of the Canadian subsidiary or its contribution to the Canadian economy. *Depending on which activities are involved, truncation may mean less production for*

the Canadian market, less opportunity for innovation and entrepreneurship, fewer export sales, fewer supporting services, less training of Canadian personnel in various skills, less specialized product development at Canadian needs or tastes, and less spillover economic activity and so on. (Emphasis added.)

“Although it is desirable to minimize truncation it may be particularly difficult to do so in industries where there is a rapid product change. Short-run cost considerations are likely to induce the parent to supply the subsidiary’s needs for components for its new products because of the investment it has committed at home to the production of these components and other inputs. If and when the Canadian market becomes large enough economically to justify a component plant of its own, the product may be phased out to make way for a new technology coming on stream. *At best, component manufacture is likely to be shipped to Canada only for more mature products and only then if Canada is a more attractive location for production than other countries – including the “low wage countries”.*”⁷⁸ (Emphasis added.)

These perceptive observations from the Gray Report are central to understanding why Canadian secondary manufacturing is stunted and underdeveloped. Many of those who shrugged off the Report as another piece of nationalistic rhetoric, and others who believe that foreign ownership is not a problem to Canadian industry, have not stopped to consider, or have failed to grasp the essential structure of a truncated medium/high-technology industry in Canada. Once the implications of truncation are grasped, it is hard to believe that anyone would be so naive as to regard foreign-controlled and domestically-controlled firms as comparable industrial units.

Dependency and Underdevelopment: Describing an Industrial Archetype

Protectionist policies have assisted in the concentration of foreign firms in medium/high-technology industry seeking to increase corporate sales, to maintain a share of the Canadian market, and to constrain the sales of competitors. In the medium-term foreign direct investment is generally thought to produce a gain for the Canadian economy – net additions to capital stock, new jobs, and increases in the GNP are cited, thus prompting many Canadian institutions and individuals to call for even more foreign direct investment.

It is apparently very difficult to convince supporters of foreign direct investment of its long-term disbenefits; especially as the net losses to Canada attributable to foreign direct investment involve the difference between what now is in place and the Canadian economic growth that would have been created by greater domestic initiative. The argument could be developed by comparing the economic development of countries with much lower levels of foreign ownership. Sweden, for example, started its industrialization process at about the same time as Canada and permitted little direct foreign investment. But this study endeavors to interpret the long-term disbenefits from the scale of foreign control in Canada.

Foreign firms usually bring a *distinctive technology* with them. This factor (examined in detail later) leads the foreign firm to interact less with the host economy than is the case with domestic firms. Foreign-controlled

firms have a higher propensity to import capital equipment, material inputs, and services related to production. In many cases the high propensity to import from the parent organization maintains the foreign subsidiary as a warehouse/assembly type of facility. This in turn inhibits growth in the size of the industry, reduces the numbers of jobs it offers, restricts the range of skills required, increases imports, and increases Canada's need to export more raw materials. Exports of finished goods are unlikely as these are restricted to the parent, lower cost producing locations, or they are blocked by the establishment of subsidiaries in other economies.

As the proportion under foreign control rises, an industry becomes a shell. In terms of its products, the industry seems to be complete and comprehensive, but large elements of the production system are missing or deficient. Each increase in reliance on a differentiated technology, which comes with each increment in the proportion of foreign control, increases the industry's propensity to import capital equipment, parts, and components as well as managerial, technical, administrative, marketing, scientific and other skills. Ultimately, the growth potential of the foreign-dominated industrial groups is severely curtailed, and their size will be relatively small compared with the same groups in other countries. At this stage, industrial growth at best, merely reflects domestic demand.

Much foreign direct investment has occurred through the acquisition of domestic firms in order to gain greater market control. This is even less desirable than initial direct foreign investment for it represents merely a change in control without any additions to the national wealth. The transfer of control may bring new technology into Canada, but the technology itself creates the need for more imports and diminishes the benefits from the new investment.

Canada's rapid growth during the fifties and sixties masked structural deformities derived from foreign ownership allowing them to develop more or less unnoticed. Increased demand from a growing population promoted demand-led growth but the lost industrial multiplier effects and, therefore, the lost long-term development potential has aroused little concern. In the industrial groups that are totally dominated by foreign firms (theoretically and in practice the foreign domination of an industry can reach 100 per cent), growth is largely dependent upon expansion of the domestic market. The industry is no longer a development-inducing factor in the economy. In Canada such industries have become mainly passive although the same industries in another country may be dynamic, evoking responsive growth in other industries.

When an industry is dominated by foreign firms, its future is determined by *external* objectives. Had the industry remained under domestic control and had the domestic market been saturated, domestic producers would probably turn to export markets and export-led growth, or even to foreign direct investment as did US firms that came to Canada. But now these industries not only saturate the domestic market with their *end-products* but little new foreign capital investment enters the country. Expansion takes place through the use of Canadian retained earnings.

Under certain circumstances the foreign owners may start to reduce the size of the already stunted industry. For example, they will disinvest and thus, growth essential to Canada's future welfare takes place not in Canada but in other parts of the corporate empires of which Canadian branch plants

are quite small elements. With market saturation, foreign branch plants siphon earnings out of Canada through their intra-corporate connections by a variety of mechanisms, thereby drastically reducing the growth potential of the truncated industry under their control. Some evidence of the growth loss to Canada is found in the volume and directions of short-term and long-term capital flows across the US/Canada border. Rotstein recently noted:

“The short-term and long-term inflow of capital to Canada between 1950 and 1974 was around \$20 billion. This was matched by an outflow slightly over \$40 billion in the same period (\$7 billion in interest payments, \$17 billion in dividends and \$16 billion in “service charges” such as licence and management fees).”⁷⁹

The real losses to Canada (much greater than this) must take account of the lost jobs arising from the import and export behaviour of foreign firms, and the long-term effects on economic development from the failure to take full advantage of the multiplier effects from the resource industries. The value of the losses is astronomically high.

From the General to the Specific: The Canadian Electronics Industry

The Canadian electronics industry⁸⁰ is comprised of over 700 firms and its ownership pattern is uniquely Canadian: 80 per cent of the firms are domestically controlled but 72 of the 100 larger firms are foreign controlled, and foreign firms account for 55 per cent of the industry's sales. Most of Canada's firms in this industry are small by world standards: about 70 per cent have sales of less than one million dollars per annum; only 8 per cent have annual sales in excess of \$25 million. The largest company, Northern Telecom, which is domestically owned, is only medium sized by international standards. Internationally, over 30 electronics firms are larger and 15 of these have sales greater than the total domestic market for electronics products in Canada. The degree of foreign control is much higher in some segments of the industry than in the industry as a whole. In consumer electronics, for example, there is only one Canadian-controlled firm. In computers, foreign firms account for over 95 per cent of sales made in Canada.

During the past thirty years, at a world level the industry has enjoyed impressive growth: an average annual growth in production (in current dollars) of 12.7 per cent between 1965 and 1974. Over the last decade only the United States had a slower rate of growth than Canada (and it was growing from a relatively greater base). Canada was abnormal in its small size and its failure to increase the portion of national output contributed by the electronics industry (Table IV.2). Indeed Canada managed a decrease even though electronics is the most important industrial growth area.

The unsatisfactory performance of the industry is identified even more clearly when comparison is made with the American and European industry. (See Figures II.22 and II.23.) In 1969, employment in the Canadian electrical machinery group (including electronics and others) was short by 21.3 per cent of the level needed to maintain relative parity with the US (34 777 jobs). By 1974, the industrial development in this sector was 24 per cent worse off (40 183 jobs). Using value added, under-representations of goods of \$444.3 million (24.7 per cent) in 1969 and \$635 million (23 per cent) in 1974 are

found. Given slow growth in US electronics, it is no surprise when in comparison to Europe, the Canadian situation was found to be even weaker.

Table IV.2 – Average Annual Contributions to GNP by Electronics Industry

Country	Average		
	1965	1965-74	1974
Canada	1.7	1.7	1.6
France	1.6	1.8	2.2
Japan	3.0	4.4	4.2
UK	2.2	2.8	3.3
USA	2.4	3.0	3.3
West Germany	2.1	2.4	2.7

Source: Unpublished data from Industry, Trade and Commerce.

The Canadian relative deficit in the value of production is greater than the figures above indicate. A large portion of the Canadian industrial sales consists of *imported* end products.⁸¹ This means that the industry is not only stunted, but also, figures indicating the magnitude are “inflated” by above-average amounts of non-production activity.

The weakness of the electronics industry can be blamed neither on recession nor on the “poor business climate”, since this condition is of much longer duration. The failure of the Canadian industry was obvious even when the Canadian market for electronics products was booming. By international standards the Canadian market is small but it has been among the fastest growing in the world. Between 1970 and 1974, when the industry actually achieved relative decline, the domestic market was growing at an annual average of 17.8 per cent. In response to Canada’s inability to take advantage of a rapidly growing market and in spite of an average nominal tariff of 15 per cent,⁸² Canadian imports of electronics products (between 1970 and 1974) increased at an average annual rate of 21 per cent and in 1974 imports supplied some 53 per cent of the domestic market!

The Canadian trade balance in electronics products has always been negative, but there now seems to be an accelerating deterioration. In 1970, the negative balance was \$446 million. In 1974 it was \$1165 million. If the Canadian industry had even held its own, relative to the European industry, Canada would be enjoying a considerable positive balance in electronics production.

During the 1960s, technology-based industries were thriving. Electronics was expanding at the fastest rate and was the most dynamic of all in technological terms. In Canada, conditions could scarcely have been more propitious for growth. There was a very rapid growth in demand for consumer electronics, particularly colour television. The Canadian industry was benefiting from orders for military equipment destined for use in the American war effort in Vietnam. There was a moderately high level of tariff protection. In addition, throughout the sixties most electronics firms in Canada enjoyed a wage advantage compared to their American counterparts.

Despite all these advantages, the Canadian industry failed to keep pace with growth in the domestic market and relative decline occurred in most

types of production. This decline is symptomatic of deindustrialization. Dependency, through the institution of the foreign-owned enterprise, bears the central responsibility for the difficulties of this industry, though recession, a poor business climate, and low efficiency of Canadian industry stemming from tariff protection, intensified the problem. The electronics industry, like almost all Canada's medium- to high-technology industries, conforms to the general archetype described earlier.

This high-technology activity illustrates the retarding effect that foreign control can have on the innovative outputs of Canadian subsidiaries, and hence on the industry. The tendency for corporations to centralize R & D in the parent country is well represented in electronics subsidiaries in Canada.⁸³ Explanation for this includes costs of duplication of R & D facilities, improved communication when work is centralized, psychological benefits of a larger scale R & D unit, and organizational control over the degree of autonomy that subsidiaries may exercise.

Northern Electric (now Northern Telecom) illustrates the change in policy toward innovation that occurs when a firm is released from subsidiary status to that of a fully independent company. In 1956, Northern relied on a technological flow from Western Electric. Since the US anti-trust decree in 1956, Northern has had to develop more of its own designs and technology. Between 1960 and 1970, Northern's design capability changed in origin from 10 to 99 per cent Canadian. In-house design rose from 5 to 80 per cent. There has been a concomitant rise in Canadian employment, exports, and in the establishment of foreign subsidiaries to protect its markets. In 1958, 62 per cent of the sophisticated components used by Northern came from Canadian sources, but by 1968, this proportion stood at 85 per cent. These data establish quite clearly the general principle that foreign subsidiaries and foreign designs not only limit skilled R & D and related jobs in Canada but also inhibit Canadian high-technology exports and the emergence of highly manufactured products.

The Policy Context

It would be unreasonable to blame all failure of Canada's high-technology industries on the consequences of foreign ownership alone. In large measure the degree to which Canada suffers from the present situation is determined by the policy context in which Canadian industry operates. The protection of industries by tariffs is one policy aspect carried over from the National Policy of the late nineteenth century. While there have been times over, say, the past three decades when removal of Canada's tariffs (preferably under multi-lateral free trade) would, with hindsight, have been quite attractive, Canada is now heavily dependent on other policy measures to save domestic high-technology industry.

The federal "Make or Buy" program, for example, is designed to provide more jobs in Canada from government spending and might reduce the strain on the merchandise account. The argument, however, has been advanced, in the electronics industry, for example, that "Canadian content" is not the same as "buy Canadian". The former does not necessarily lead to research and innovation in Canada. If "the products required to meet Canadian needs were developed in Canada, the industry would enhance its innovation, pro-

duction, and marketing capabilities and build on this to develop new export markets”.⁸⁴ This recommendation, quoted by many in the industry, was developed after seeing many examples of Canadian governments and their agencies buying an advanced product from a foreign manufacturer because of the lower price and possible speed in delivery. What is forgotten is the wide range of long-term benefits from domestic procurement policies. Canadian industry is particularly rankled by being passed over completely when tendering is undertaken. “This is in marked contrast with certain foreign governments which hold briefing sessions with the industry to advise them of the nature of likely future needs long in advance of the actual tendering process”.⁸⁵

This industry view raises three clear issues which are examined at length in Chapter VII.

1. To what extent would careful management of *all* government purchasing (including Crown corporations and even public utilities) in Canada create the stimulus for *domestic* companies to overcome scale, production-run, and technology handicaps? That is, to what extent would Canada internalize recurrent and new material expenditures within Canadian industry and to what degree would restricting this “public sector” market to Canadian firms help to offset Canada’s long-term losses (such as small amount of R & D) from substantial foreign ownership of production capacity?

2. Electronics exemplifies the group of high-technology activities in which Canada generally has become weaker over the past two decades. Yet, the importance of this group is its potential to generate new technology which contributes to national wealth in the way no other activity can. Should not Canada adopt a *coordinated* set of policies and programs to maintain and develop high-technology manufacturing – particularly because Canadian industry is suffering from the effectiveness of such endeavours in other countries?

3. To what extent can these two policy areas be combined by Canada choosing particular areas of concentration; especially areas in which limitation of market size is of no consequence?⁸⁶ The electronics industry, for example, is most competitive in the area of technically complex systems for industry and government and “limited scale” products.⁸⁷ The CANDU reactor system is another though fairly lonely example of this principle. Clearly the tenor of these questions challenges the accepted position of the Canadian government that research and development on the part of subsidiary companies makes a net positive contribution to the host country. Some countries, notably France, take the position that the research and development activities of subsidiary companies can have a detrimental effect on the creation of a strong, domestically-owned research base.⁸⁸ This view identifies the fundamental issues Canada must face:

- Will it adopt policies to develop innovative capability in its industrial economy?
- Will it evaluate domestic control as a high priority?
- Will it accept that Canada’s economic progress is dependent on the generation of technological depth within Canadian industry?

V. Export Failure and Import Dependence: Origin and Impact in Canadian Manufacturing

Canada's weakest trade sector is in medium- and high-technology products of *secondary manufacturing* industries. These activities rely on the quality of Canadian *human* resources which, theoretically, can be expanded through the effects of successful economic policies. This area of industrial activity is now being called upon to develop significant trading advantages in replacement for Canada's traditional trading strengths. This will mean a reversal of economic form for Canada. A correction of the basic misallocation of industrial investment is required to remedy the underrepresentation of these industries. Within secondary manufacturing, mature-product high cost, low efficiency industries are overly prominent and it is this aspect of Canada's industrial structure that has generated the poor export situation. Canada has emerged as an innovative backwater.

Changing the industrial pattern, stimulating development, generating skilled jobs, and a balanced trade account for secondary manufactures require policies that must not fall prey to the factors that *caused* Canada's existing problem in innovation and secondary exports. Ironically, the existing policy environment has produced a situation in which the areas of trade deficit are the areas of strong US corporate control. Foreign (mainly US) control is a prime factor in the explanation of poor exports and large industrial imports. This chapter establishes the validity of Gilpin's view that most "countries and even all of Western Europe may worry about foreign domination, and particularly American domination, but Canada is the only country where one can say with a considerable degree of truth that American corporations have taken over the economy."⁸⁹

The position taken in this study is thus dramatically opposed to that of writers who have claimed that there are no significant differences between foreign- and domestically-controlled manufacturing.⁹⁰ Earlier it was acknowledged that some foreign subsidiaries in Canada are rationalized in terms of product specialization to serve continental or wider markets — the obvious example being auto assembly, though there are others that combine Canadian and international sales. But it was noted, also, that the majority of foreign firms are "miniature replicas" and do not even try to establish special positions in world-wide trade from their Canadian locations. The significance of this pattern is explored in this chapter. Even more attention is given to industrial dependence generated by imports of components and subassemblies that embody the technological strength of foreign parents. These flows, it is argued, obviate the need for innovation in Canadian plants and products. Efforts in this direction by most subsidiaries tend to be limited to changing products and the scale of technology (developed elsewhere, usually in the US) to suit the Canadian market.⁹¹

Corporate arrangements of this type have matured because of the effective policy vacuum with respect to foreign control. It is now evident that the importance of foreign ownership is so great that efforts to correct the economic situation must be addressed to the long-term policy environment.

Conventional Wisdom on Foreign Ownership and Exports

While there has been remarkably little discussion or investigation of the relationship between exports, foreign ownership and underdevelopment, a study by Safarian has had an influence in Canada that is not justified by the

quality of the data presented or by the types of questions asked.⁹² Repeated uncritical use of this work has delayed a general understanding of the real effect of foreign ownership.

On the basis of an analysis of primary material obtained from domestic and foreign firms, as well as secondary material, Safarian concluded that in aggregate, "... the American-owned sector of the industries involved is more oriented to exports than are the other sectors."⁹³ In fact, *American firms are not more active in exports, but tend to be more heavily represented in export-oriented industries.* In analyzing his sample of American and Canadian firms, Safarian found, "the only systematic difference between them ... is with respect to imports."⁹⁴ He dealt with 160 non-resident and 96 resident-owned firms with assets greater than \$1 million in industries where both types of firms exist. He acknowledged that resident-owned firms are more heavily representative of extractive industries⁹⁵ and this might influence the similar overall export performance of the two groups of firms. He did not point out, however, that firms in high-technology industries (e.g., metal fabricating, machinery, transportation, and electrical products) comprise only 20 per cent of resident-owned and nearly 60 per cent of foreign-owned firms in his sample. This imbalance should invalidate the performance comparison.

Safarian suggested that firms producing "fully processed or manufactured products" have insignificant differences in export performance, but failed to identify the mix of firms by export potential in the two groups. It is quite unlikely, too, that this comparison could be unbiased in terms of the activity of the firms willing to respond to his survey. The most important negative aspect of Safarian's analysis, however, was his failure to realize that within various industries foreign firms are not directed to utilize the export potential that derives from their size. On the contrary, Safarian stated:

"It is difficult to resist the conclusion that many of the potential gains from direct investment may not have accrued to Canada because the inefficient structure of her industry does not permit her to take advantage of them. Much of the poor performance which is ascribed to foreign-owned firms, and is shared in some respects by their resident-owned counterparts, turns out on closer examination to reflect the economic environment in which the firms operate."⁹⁶

Safarian, however, did not consider that foreign ownership itself is a prime cause of this unfavourable economic environment, rather he pointed to tariff protection as promoting inefficiency in Canadian industry, regardless of ownership. In spite of the fact that Safarian did not provide an acceptable test of his contention, many Canadian economists seemed to accept his work as the final word on the issue of foreign ownership. His interpretation has greatly influenced the supposed authority with which others have spoken and written in the debate on foreign ownership. The Economic Council of Canada, for example, reiterated that the problems were protection, tariffs, and inefficiency. In the culminating piece devoted to this triad, *Looking Outward, a New Trade Strategy for Canada*, the Economic Council advocated the ultimate elimination of Canadian tariffs on a multinational basis, or at the least, on a bi-lateral basis with the United States.⁹⁷ Implicitly or explicitly all the tariff-related arguments of the Economic Council rest on the view that foreign-owned and domestically-owned firms are not substantially different in performance or behaviour. Yet the study on which the Council's position ultimately

rests is now a decade old. The Economic Council has never investigated foreign ownership.

Even more puzzling than Safarian's finding on exports is his interpretation that foreign control does not have an unfavourable effect on Canadian manufacturing. With a knowledge of the structure of Canadian manufacturing — its size, productivity and product make-up — it should be obvious that foreign and domestic firms cannot be expected to have the same level of performance in exports. On the grounds of size, because of access to the technological and marketing resources of large organizations, foreign firms should outperform domestic firms by a very considerable margin.

Safarian's work was set in too narrow a framework. While it is useful to know whether or not foreign and domestic firms differ in export performance, this question is almost trivial compared with enquiry into the ways in which foreign control might affect the economic environment. By taking industrial structure as given and proceeding directly to an analysis of firms operating within the structure, Safarian was bound to miss many of the major detrimental effects of foreign control, outlined in Chapter IV. Evidence from around the world indicates that there *are* fundamental effects of foreign control on host economies. Given the level of foreign control in Canada, it would be impossible for far-reaching impacts on the structure of Canadian manufacturing not to have emerged. Effects on the export performance of secondary manufacturing are examined first.

Secondary Manufacturing Exports

Data collected by IT&C from 217 consenting larger foreign firms answer some questions on export performance, even though the records are incomplete.⁹⁸ The Reporting Foreign Corporations (RFCs) had total sales of just over \$16 billion in 1969 (average sales per firm of \$73.9 million) and exports of nearly \$5 billion (30 per cent of total sales). This latter figure is influenced by two major export trades: 1) sixty-five per cent of the exports of responding plants are attributable to the transportation equipment industry, and 2) nineteen per cent of exports are by the pulp and paper industries.⁹⁹ (See Table V.1.) The export pattern of these secondary manufacturing groups, however, is set apart from the performance of the remaining sectors by the reciprocal nature of the Auto Pact and because the paper and pulp industries are essentially primary manufacturing activities concerned with *resource* exports. Only \$778 million in exports are made by the secondary RFCs. More importantly, these exports represented only 9.5 per cent of their total sales, with *six per cent going to the United States and only another 3.5 per cent to the rest of the world*.¹⁰⁰ What first appears to be a high level of export performance can now be seen as a weak orientation to non-Canadian markets.

Similar information is not collected from domestic firms and only an indirect comparison can be made between the rate of exports found for the foreign secondary manufacturers and that attained by domestically-controlled firms. The RFCs in secondary manufacturing had a poorer export performance than Canadian secondary manufacturing as a whole. As shown in Table V.2 the exports for all Canadian secondary manufacturing contain the data for the secondary RFCs.

Table V.2 – Secondary Manufacturing Exports: Reporting Foreign Corporations and all Canadian Secondary Manufacturing, 1969

Category of Firms	Exports (in \$million)	Sales	$\frac{\text{Export}}{\text{Sales}} = \text{Per cent}$
Reporting Foreign Corporations	\$ 778	\$ 8196	9.50
All Canadian Secondary Manufacturing*	\$2718.2	\$26152	10.4
Residual Foreign		\$ 3590	10.8
Domestic	\$1940	\$14366	

*The industries in this group correspond to the industries covered by the reporting corporations, viz., all manufacturing industries, excluding wood, furniture and fixtures, paper and allied products, primary metals, non-metallic minerals, petroleum and coal products, and transportation equipment.

Sources: Industry, Trade, and Commerce, *Foreign-owned Subsidiaries in Canada, 1964-1971*, Information Canada, Ottawa, 1974; Statistics Canada, *Canada Year Book*, 1972, Cat. No. CS11-202 Queen's Printer, Ottawa, March 1972, pp. 1084-1087; Statistics Canada, *Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969 and 1970*, Cat. No. 31-401, Information Canada, Ottawa, March 1976.

The exports of residual foreign companies and domestic companies together have an export rate of 10.8 per cent (Table V.2). There are no grounds for expecting that residual foreign companies diverge greatly in their exports from the RFCS rate (9.5 per cent): on that basis the Canadian *domestic* export rate would be 11.3 per cent for secondary manufacturing. It can be inferred that in secondary manufacturing (as defined) the domestic rate of exports is over 11 per cent while foreign secondary manufacturers export only 9.5 per cent of their production. Thus foreign-controlled firms are contributors to Canadian balance of payment problems as well as to reduced job opportunities and income.

Corporate Size and Export Potential

In all industrial countries the average plant or firm is of small size. However, successful exporters grow and large firms must export to maintain their size; thus the larger firms and plants are responsible for the bulk of national exports.

The case against the foreign corporation, as an agent of underdevelopment in Canadian manufacturing, rests not only on the direct evidence on exports but also on the fact that the RFCS, being very large by Canadian standards, are underachievers in exports. This contention is based on foreign experience. Particularly because most large firms in Canada are American controlled, the behaviour of the *same firms* in the United States should establish whether size of firm is generally important in the level of export trade. Ultimately, however, the question to be answered is do large firms *in Canada* export according to international norms; and if not, why not?

Relative Size of Foreign Companies in Canada

In 1970 foreign concerns controlled only 12 per cent of all manufacturing establishments¹⁰¹ in Canada, but they were responsible for 52 per cent of the value of shipments.¹⁰² Foreign establishments are of much greater average

size compared with their domestic counterparts: the average number of production workers in foreign-controlled establishments in 1970 was 124 compared with 25 for domestic plants.¹⁰³ The situation varies somewhat between industries (Table V.3), but regardless of the degree of foreign control of a manufacturing group, the average size of foreign-controlled *plants* was always greater than the average size of domestic plants. In every case the difference was considerable. Foreign interests are dominant among the large plants. Canadian control dominates the small plants.

Foreign-controlled *firms* also are generally much larger than Canadian-controlled firms. The typical Canadian firm consists of one plant; while most foreign firms located in Canada consist of one or more plants in Canada and at least one plant in the country of origin. Since almost every medium to large American manufacturing corporation has a subsidiary in Canada, the foreign subsidiary firm is usually part of an organization the dimensions of which are rarely encountered in this country.

Table V.3 – Attributes of Canadian Manufacturing by Ownership, 1970

Group	Establishments: Foreign Controlled, by percentage	Average Size of Establishments (number of pro- duction workers) Foreign Domestic		Value of Shipments Foreign Controlled, by percentage	Average Size of Canadian Establishments as a Percentage of Average Size of Foreign Establishments
Food and Beverage	8.8	92	18	33.2	19.6
Tobacco	—	—	—	—	—
Rubber and Plastics	23.0	140	26	72.7	18.6
Leather	8.4	123	43	20.2	35.0
Textiles	12.6	179	42	46.8	23.5
Knitting Mills	9.4	120	59	18.4	49.2
Clothing Industry	2.8	131	37	9.8	28.2
Wood	5.0	98	19	25.1	19.4
Furniture and Fixtures	2.6	94	14	16.8	14.9
Paper & Allied Industries	32.3	211	110	49.3	52.1
Printing and Publishing	2.1	55	13	11.9	23.6
Primary Metals	27.5	339	173	45.9	51.0
Metal Fabrication	11.3	74	20	39.9	27.0
Machinery Industry	31.0	120	27	71.6	22.5
Transportation Equipment	21.4	398	40	86.8	10.1
Electrical Products	42.8	146	70	64.6	47.9
Non-metallic Minerals	15.9	72	20	51.6	27.8
Petroleum and Coal Products	67.0	100	11	97.9	11.0
Chemicals	46.7	55	18	81.3	32.7
Miscellaneous Manufacturing	—	—	—	—	—
TOTAL	11.9	124	25	52.0	20.2

Source: Statistics Canada, *Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969 and 1970*, Cat. No. 31-401, Information Canada, Ottawa, March 1976, pp. 42-45.

Domestic United States Performance of American Multinationals

The industries which account for the large share of American foreign direct investment (e.g., non-electrical machinery, chemicals and instruments and related products) also predominate in US merchandise exports in manufacturing products.¹⁰⁴ These same industries have been among the most rapidly growing manufacturing industries in the US. Firms involved in maintaining multinational operations from an American base have also exported a growing proportion of their domestic production — their ratio of exports to domestic production (10.8 per cent in 1970) being double that of the average US manufacturing firm. From 1960 to 1970, domestic employment increased at the rate of 3.3 per cent per annum in a sample of American multinational firms compared with the average for US manufacturing of 1.4 per cent per annum.

United States subsidiaries in Canada are large operations within their respective secondary manufacturing industries and are generally operated as closely tied extensions of their parent firms. Their target is the Canadian market. They are poor exporters.

Tied Exports

The majority of exports made by foreign-controlled firms in Canada are “tied”. That is, they consist of intracorporate transfers across international boundaries. As they are not “arm’s length” transactions, these sales do not represent a guide to the market competitiveness of subsidiaries in Canada. Of all the exports of the RFCs in 1969, 77 per cent, by value, consisted of tied exports. This proportion was as high as 84 per cent on exports to the US. Two industrial groups (machinery and metal, and transportation equipment) had an exceptionally high proportion of tied exports. In both cases, tied exports to the US were over 90 per cent of total exports, by value. With the existence of the Auto Pact such a high figure for transportation equipment is not surprising. When this industry and pulp and paper are removed, the proportion of tied exports falls but only to 58 per cent while 69 per cent of export sales to the United States were tied. *The total value of RFC sales was \$8 196 000 000 — \$778 million were exported (9.5 per cent), only \$451 million were intracorporate transactions, leaving “arm’s length” sales at only \$327 million. Exports made on the “free market” comprised only four per cent of sales!*

Clearly foreign-controlled subsidiaries do not direct themselves to making export sales, whereas Canadian-controlled secondary manufacturing firms are the main ones penetrating foreign markets.¹⁰⁵ Despite the clarity of this pattern some Canadian writers believe foreign firms to have been equal or superior performers: they must have ignored the reasons given by foreign companies for locating in Canada and other countries. Most foreign direct investment in secondary manufacturing exists to serve local markets, the main exceptions being instances of cheap labour, for example, electronics in East Asian countries. In the case of European firms in Canada, there should be no doubt about their motivation.¹⁰⁶

In the survey of US multinationals cited previously, 70 firms ranked determinants of their decision to invest in Canada. The first-ranked factor was

market demand (59 per cent) followed a distant second by trade restrictions (23 per cent). (See Table V.4.) The threat of local competition was usually considered a “market demand”. This confirms the position taken by Stobaugh in his investigation of foreign investment decisions by US companies.¹⁰⁷ The decision was usually based on the conviction that local production was an unavoidable alternative — either as a result of, or in anticipation of the investment initiative by competitors. The critical determinant becomes the perceived advantage to be gained through pre-emptive investment or, alternatively, the necessity of protecting market shares threatened by investments of others.

Table V.4 – Major Determinants of United States Investment Decisions in Canada

Number of Responses						
Ranking in order of importance	Market* demands	Trade** restrictions	Investment regulations (e.g., local content regulations)	Labour cost advantages	Other factors	Total
1 (Most)	41	16	4	3	6	70
2	7	25	19	7	7	65
3	7	12	13	14	3	49
4	4	2	8	16	1	31
5 (Least)	1	—	3	4	1	9
Negligible	7	12	20	23	3	65
Total Responses	67	67	67	67	21	289

*Includes major differences between US and Canadian product specifications, product perishability, and service and distribution requirements.

**Includes tariffs, quotas, and other non-tariff barriers to trade.

Source: United States, Emergency Committee for American Trade, *The Role of the Multinational Corporation in the United States and World Economies*, ECAT, Washington, DC, February 1972, Table 28.

Material Imports of Secondary Manufacturing

Ever since serious attention has been paid to the operations of foreign subsidiaries in Canada (and for that matter, elsewhere) evidence has been mounting to show that foreign subsidiaries, particularly those in high-technology industries, have a higher propensity to import than domestic firms. This is true for both goods and services. Several Canadian observers have noted the propensity of foreign firms to import. Safarian, for example, indicated:

“... the typical subsidiary in secondary manufacturing ... is likely to be a much greater importer than exporter since it is in part an extension of the parent’s sales and techniques into markets which cannot be served by exports from the parent because of transfer costs and the related economies of partial de-centralization of production.”¹⁰⁸

The Gray Report noted:

- “(i) Foreign-controlled companies are importing about one-third of their requirements and the proportion is increasing.
- (ii) Between 30 and 40 per cent of total Canadian imports are in the form of interaffiliate dealings. This proportion is increasing.

- (iii) Foreign-controlled companies tend to import from the country of the parent and indeed from parents and affiliated companies.
- (iv) Imports tend to be high in the sectors where foreign control is high¹⁰⁹ and where parent companies themselves export a high proportion of production.
- (v) Foreign-controlled companies appear to be more import oriented than Canadian-controlled companies.”¹¹⁰

“It is significant that all the industries in which imports represents a relatively high percentage of purchases have these common characteristics:

- (i) A high degree of United States ownership,
- (ii) United States parent companies that spend significant amounts on research and product innovation.
- (iii) United States parent companies that export a large proportion of sales, and
- (iv) Canadian exports that are low as a percentage of sales (except in those industries that are rationalized, for example, automobiles).”¹¹¹

Import Behaviour of Industrial Plants in the Canadian Heartland

To a large degree assessment of the significance of industrial impacts has to rest on aggregate data. There is, nevertheless, some research that evaluates the assembly of material input by *individual industrial plants* in Canada. The conclusions reached breathe some life into the aggregate statistical record. One of the few examples is the work of Britton concerned with the effect of corporate organization and control on the linkages of plants in the wire goods, auto parts, machinery and electrical products industries of southern Ontario.¹¹² US subsidiaries in a sample of 87 plants, were found to have a significant strength of connection with material suppliers in the US: only 8 of 41 American subsidiaries do *not* receive US imports. Half of the US plants import *at least* 50 per cent of their inputs, while a higher proportion of auto-parts plants obtain more than 50 per cent of their imports from the US. (See Table V.5.) Leakages from the Canadian economy in the case of foreign branches are considerable. Canadian firms, however, tend to be small “one-plant” operations, and thus totally reliant on “arms-length” transactions in obtaining inputs, whereas American-owned firms are larger “multi-plant” businesses and make frequent use of intra-company sources in procuring inputs. In fact, in the sample, more US subsidiaries than Canadian plants obtained intra-company inputs within Canada.

Britton’s analysis showed that *Canadian* plants, in contrast to US-controlled, are weakly linked with foreign suppliers, in addition to maintaining minimal in-company linkage (this conclusion is valid even if the number of Canadian one-plant firms is taken into account).¹¹³ Imports made by Canadian firms (generally less than 25 per cent) are more or less inevitable since they represent commodity supply deficiencies in Canada that derive from Canada’s inability to supply all highly fabricated components, special steels and similar commodities. The data collected for Canadian firms probably understate the degree to which domestic plants rely on imported materials that enter the industrial system of Southern Ontario through wholesalers. Nevertheless, the crude data for American branch plants also understate the significance (value) of imported materials. Basic commodities such as steel

sheet, bar, rod, wire, etc., are obtained from local sources. With import proportions of the size shown in Table V.6, very little call is made on Canadian capability to supply more technically advanced inputs. This in turn reduces, over time, the capacity of local auxiliary manufacturers of industrial components, suppliers of industrial services, and subcontractors to produce for Canadian-owned business.

Table V.5 – Input Sources for Sample Plants: Non-Exclusive Input Categories

Input Source	Canadian-Owned Plants	US Branches	Other Branches
Intra-Company: Canada	3	8	0
Intra-Company: US	0	24	0
Intra-Company: Overseas	2	1	2
Other firms: US (arms-length)	7	9	0
No imports: US	35	8	0
TOTAL (n = 87)	42	41	4

Source: John N. H. Britton, "The Influence of Corporate Organization and Ownership on the Linkages of Industrial Plants: A Canadian Enquiry", *Economic Geography*, Vol. 52, October 1976, p. 314.

Table V.6 – Imports From US Sources: Sample of Foreign and Canadian Plants

Foreign-Controlled Plants		Canadian-Controlled Plants	
Inputs from US by percentage	Number of Plants	Inputs from US by percentage	Number of Plants
Less than 10	9	2 – 25	6
10 – 20	5	26 – 50	1
20 – 40	1		
40 – 50	2		
50 – 60	2		
60 – 70	2		
70 – 80	3		
80 – 90	5		
90 – 100	1		
	3		
	33 of 41		7 of 42

Source: See Table V.5

The backward linkages to steel mills and some other industries, protected by geographic factors, the efficiency of basic Canadian industry and the impact of tariffs must not be allowed to mask the importance of higher valued inputs in the account that must be made of dependence. These highly-valued inputs – auto parts components, subassemblies, bearings, industrial hardware and electrical equipment and parts, carry high opportunity costs of Canadian development when imported: through these imports Canadian consumers pay returns to American, not Canadian, labour, capital and technology.

In accounting for the flows of material which link plants and firms (material linkages), Britton considered influences such as size of plant, nationality of ownership, import orientation and industry type.¹¹⁴ Company organization and management are of greatest importance in explaining the level of

local and regional linkages and the degree to which local subcontractors are by-passed in favour of imports.

On the basis of detailed analysis of input flows, Britton established several groups of plants. The *dependent* group, comprised only of US-controlled plants had strong input linkages with plants in the US. Identification of this group adds spatial detail to the definition of the truncated subsidiary, that is branches that “lack the capacity and opportunity over time to develop the full range of activities normally associated with a mature business enterprise and, it can be added, to enjoy the full measure of integration into the industrial fabric of their region.”¹¹⁵ Dependent, truncated firms occur in all locations in Southern Ontario. Britton examined the more general differences between Canadian and foreign plants when viewed in the locational context.

“Domestic plants in central locations, take advantage of access to a wide local range of suppliers and many foreign subsidiaries are similarly integrated into the regional industry system. But a substantial proportion of United States-owned branches located in the Toronto and Lakeshore areas are heavily dependent on long distance intra-company inputs. *This type of behaviour for such a location is not just lack of response to evident advantages of the region, it also provides an index of the importance of corporate scale and organizational economies required and obtained by international companies despite their location in Canada’s foremost industrial and metropolitan centre.*

“In the light of this situation it is more understandable that other industrial environments in Southern Ontario compare poorly with Toronto and the Lakeshore to the extent to which branches receive inputs independently of their corporations. Southwest Ontario represents a transition between central and peripheral regions, and it maintains this role by means of its relative industrial development and the attraction it exercises by virtue of its location for foreign and domestic companies. Peripheral towns, however, demonstrate the substitution of corporate for local flows to the greatest degree.”¹¹⁶ (Emphasis added.)

Foreign firms locate to facilitate contacts with their American suppliers and are distinct in their purchases of imported inputs. Thus, where *US imports are dominant* (50 per cent of total inputs) the plants, overwhelmingly under US control, are found at a level of greatest local importance in Southwestern Ontario. These plants also are concentrated in the assembly industries – auto parts and electrical goods – that can import highly fabricated components.

Some foreign plants, especially those in the wire products industry are quite “independent” in terms of material procurement. There is a discernible gradient “whereby plants in the machinery, electrical and auto-parts industries demonstrate increasingly dependent forms of organization.”¹¹⁷ The four industries illustrate:

- Smaller opportunities for imports in secondary manufacturing activities that use simpler processes and that rely heavily on basic, widely available inputs (steel wire and sheet, etc.).
- Smaller propensity to import materials in the machinery industry which responds more to custom, not mass markets and whose products in Canada tend to be at the relatively simple end of the product range. The input patterns for small- and medium-sized foreign-owned machinery plants in

Toronto and the Lakeshore area thus reflect the procurement of major inputs from wholesalers in these areas.

- The high propensity toward truncation (to import medium- and high-value components) by the assembly industries illustrates the way technology is imported in intermediate product form¹¹⁸ rather than in the form of a capability to manufacture the components in Canada.¹¹⁹

The regional and national effects of material imports inhibit development, for example, fewer or smaller businesses, fewer local economic opportunities, fewer jobs in manufacturing, and hence fewer jobs in related service activities, and loss of income. These effects might appear least pronounced in Canada's most important manufacturing areas (metropolitan Toronto and the adjoining industrial areas along the north shore of Lake Ontario) but even here they have an important influence on industrial depth and strength. They become more pronounced in Southwestern Ontario (along the two axes, Hamilton to Niagara Falls, and Hamilton to Windsor). They are a strong influence in the rest of Southern Ontario, in the scattered towns to the north and east of Toronto, even though the industrial resources of this region are regarded as Canada's industrial heartland.

Foreign-branch plants have perpetuated a high level of industrial underdevelopment in most non-metropolitan locations in southern Ontario by utilizing the multilocal resources of their parent corporations in substitution for local inputs. If this situation exists in Southern Ontario, there can be little doubt that even worse effects are experienced in all other areas of Canada where foreign subsidiaries have located.

Aggregate Imports of Components Materials and Production Equipment

Although the case is strong for believing that major leakages from the job and income creating processes in Canada can be attributed to the policies of foreign corporations, the evidence presented covers only the medium/high-technology segment of secondary manufacturing concerned with engineering-related products. What about the other manufacturing industries? Do they create trade patterns like, say, electronics? Some data are available to examine this question but they are in aggregate form and do not specify the activity of individual corporations.

The aggregate data on capital equipment, parts and materials and other imports leave a great deal to be desired: strangely enough more is known about the import activities of RFCs. While of limited value these data do provide further indications of the import levels that should be considered in conjunction with the survey evidence. They confirm the pattern of limited demands foreign firms place — through backward linkages — onto the Canadian industrial supply base. The clear employment implications in Canada and their significance for the technical competence of Canadian firms are examined.

In 1969, 217 foreign-controlled corporations imported goods valued at over \$4.5 billion (Table V.7). These RFCs imported nearly 50 per cent of their material requirements compared with exporting 30 per cent of their output, by value: it would appear, as Safarian acknowledged, that foreign-controlled firms are greater importers than exporters. Very dissimilar industries are aggregated: the automobile industry alone accounts for 69 per cent of all imports.

When the automobile and pulp and paper industries are excluded, the secondary RFCs are found to import 32 per cent of their purchases compared with exports of 9.5 per cent.

In the four technology-intensive groups (machinery and metal fabricating, transportation equipment, electrical products and chemical products) foreign firms have disturbingly high import rates that agree with the survey data. The bulk of these inputs (over 90 per cent) come from the US and most are "tied", that is intra-corporate sales are included rather than "arms length" sales. In 1969, almost 37 per cent of RFC'S total material purchases consisted of "tied" imports, 75 per cent of the total imports were tied.

Foreign subsidiaries substitute a substantial portion of inputs from US plants for those that could be supplied or produced in Canada because it is less expensive. Imports are the inevitable product of Canada's long-established habit of "buying" technology through branch plants that manufacture goods designed and first produced with parts and materials from a non-Canadian source. Large corporations, though geographically dispersed, are vertically integrated and sources of supply in Canada are shut out when intra-corporate sources are available. Similarly, local suppliers of parent companies become familiar with the needs of the leading manufacturers and advantages of industrial interdependence spill over into Canadian operations when production is transferred.

A change of supplier means inconvenience, added costs, and greater risks to the subsidiary. Nevertheless, the significance to Canada of foreign flows from within the corporation and from foreign associates is such that research development and engineering activity has virtually ceased in Canada, in industries in which the end-product companies obtain their technology from outside Canada. For example, "The automotive industry in Canada closely approximates the model of an industry where the end-product technology is entirely sourced outside of Canada."¹²⁰

Manufacturing and Resale

Although most of the goods sold by firms are manufactured in their own plants, many also sell finished goods produced elsewhere in the same firm. In this way multinationals make substantial sales in foreign markets. Foreign-controlled, particularly American, firms are more involved in buying goods for re-sale than Canadian-controlled firms. (See Tables V.8 and V.9.) No data are available on the origin of purchases but on the basis of other information, it can be assumed that a large proportion of the resale goods have US sources and that the majority of the purchases are intra-company transactions. Furthermore, American-controlled firms manufacture a smaller proportion (84 per cent) of the goods they sell than do Canadian manufacturers (91 per cent). In addition, they purchase and resell goods to a greater extent (Table V.8).

Resale imports indicate that American manufacturing plants have retained or gained wholesaling functions, thus reducing the scale of Canadian wholesaling.

Table V.7 – Relative Importance of Imports and “Tied” Imports: All Reporting Corporations by Industry, 1969

Industry	Imports as Proportion of Total Purchasing %	“Tied” Imports as Percentage of Total Purchases	“Tied” Imports as Percentage of Total Imports	“Tied” Imports from US as Percentage of Total Imports from US	“Tied” Imports from Other Countries as Percentage of Total Imports from all Other Countries
Machinery and Metal Fab.	47.9	38.3	79.8	80.1	76.9
Electrical Products	32.1	23.2	72.4	69.8	78.8
Chemical Products	31.3	19.0	60.7	62.4	50.0
Food and Beverages	19.5	8.9	45.7	47.5	43.2
Other Manufacturing	31.6	22.2	70.3	70.0	72.2
TOTAL					
Secondary Manufacturing	32.0	21.8	68.1	69.5	62.7
Transportation Equipment	72.9	57.4	78.8	78.6	87.7
Pulp and Paper	8.3	1.9	23.2	20.0	30.0
TOTAL	49.3	36.9	74.9	75.7	65.4

Source: Industry, Trade, and Commerce, *Foreign-Owned Subsidiaries in Canada, 1964–1971*, Information Canada, Ottawa, 1974.

Table V.8 – Shipments of Own Manufactures as Percentage of Total Value of Shipments and Other Revenue: Major Manufacturing Groups, 1970*

Industrial Group	Country of Control		
	US	Other Foreign	Canadian
Food and Beverage	89.5	84.7	88.7
Tobacco	—	—	—
Rubber and Plastic	87.9	87.3	94.2
Leather	81.4	98.4	95.1
Textiles	94.1	91.5	94.3
Knitting Mills	97.8	94.1	98.2
Clothing	—	—	97.4
Wood	96.8	98.3	95.1
Furniture and Fixtures	92.4	91.1	96.1
Paper and Allied	93.5	95.5	93.8
Printing and Publishing	87.7	89.3	97.2
Primary Metals	91.6	93.2	85.7
Metal Fabrication	89.8	87.7	92.2
Machinery	70.4	78.0	90.3
Transportation Equipment	76.0	98.6	95.4
Electrical	80.5	82.3	79.2
Non-metallic Minerals	88.5	93.5	90.1
Petroleum and Coal	95.8	94.1	91.3
Chemicals	80.9	80.7	86.5
Miscellaneous	—	—	—
TOTAL	83.8	89.5	91.0

* As of April 1977, only this report had been published: it is a unique set of data.

Source: Statistics Canada, *Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969 and 1970*, Cat. 31-401, Information Canada, Ottawa, March 1976.

More importantly the capability of large foreign firms to import commodities for resale has stifled some Canadian industries. Resale imports are relatively small and at about the same level for foreign and domestic manufacturers in industries in which foreign ownership is at a relatively modest level – less than 50 per cent of assets. There is a class of industries, however, where foreign ownership and resale imports are both high. These industries include electrical goods, chemicals, machinery and transportation equipment – the core of high-technology manufacturing. In the machinery group, for example, American firms imported 30 per cent of their market shipments whereas Canadian firms imported only 10 per cent.

At finer levels of industrial disaggregation, the difference between foreign and domestic producers is even more substantial (Table V.9). In many cases the foreign firms so dominate that their behaviour sets the pattern of imports for the whole industry. This situation reaches its extreme form in the office and store machinery industry: the foreign-controlled firms import 63 per cent of their shipments (20 per cent for Canadian firms) and the entire industry purchases approximately 62 per cent of its shipments.

Most importing for resale by high-technology industry is undertaken to maintain a full line of equipment, or to pre-empt Canadian production, and/or to maximize world sales of product innovations, often with a high-technological content which appeals to a market segment whose demand is income elastic.

Table V.9 – Shipment of Goods of Own Manufacture as a Percentage of Total Value of Shipments and Other Revenue: Selected Industries, 1970

Industry	Country of Control				
	US	Other Foreign	Total Foreign	Canadian	Total Foreign and Canadian
Commercial Refrigeration Office and Store	—	—	70.7	94.5	79.5
Machinery	—	—	36.7	80.3	37.9
Aircraft and Parts	92.3	97.7	93.7	96.8	94.0
Motor Vehicles	—	—	—	—	68.6
Household Radio and TV Communications	—	—	66.0	94.0	71.5
Equipment	—	—	75.7	63.7	69.3
Electrical-Industrial					
Equipment	76.5	93.8	77.7	91.3	79.3
Battery Manufacture	—	—	79.6	100.0	79.9
Clay Products	—	—	85.2	95.9	94.0
Plastics and Synthetic Resins	75.5	81.2	76.4	88.2	78.1
Pharmaceuticals and Medicines	88.2	72.1	85.6	92.0	86.5
Paint and Varnish	86.4	84.8	85.9	92.7	87.5
Inorganic Industrial					
Chemicals	77.6	82.7	80.2	90.9	81.4
Agricultural Implements	—	—	80.5	96.6	90.0
Machine Shops	—	—	85.1	94.5	94.2
Shoe Factories	77.3	99.9	80.1	98.5	93.0
Smelting and Refining	—	—	89.2	32.8	71.6
Hardware, Tool and Cutlery	84.2	59.0	82.4	96.8	89.6
Heating Equipment	—	—	72.0	90.6	81.4

Source: Statistics Canada, *Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969 and 1970*, Cat. No. 31-401, Information Canada, Ottawa, March 1976.

The effects of resale imports are:

1. To maintain a lead for US manufacturing in the sale of goods in the early phase of the product cycle: the innovative or technological capability, that is, skilled employment is not exported, only the goods.
2. To the extent that new products in the Canadian market are produced only in *parent* plants of subsidiaries, foreign firms are a major factor in the explanation of Canada's weak position in comparison with other industrial countries.
3. Technological opportunity costs are attached to the level of corporate imports of finished goods — costs that have accumulated over at least three decades of rapid technological change. Chances for Canada to have developed technological skills were forestalled by the policies and actions of multinational/American corporations. These actions took place, of course, in many other countries industrially even less developed than Canada. Nevertheless, Canada has demonstrated some technological capability and if Canadian policy had curtailed foreign control of high-technology manufacturing, the present degree of technological deprivation facing Canada would not have arisen.

Non-Material Linkages

When investigating the service (non-material) linkages of manufacturing plants, Britton verified the existence of sizeable imports of services obtained on a regular basis from the US.¹²¹ The more sophisticated services (technical and managerial) needed by foreign branch plants are frequently imported long distances under the control of a central company office. The extent to which industrial plants depend on these controlled linkages is related to the size of urban centres. Toronto is most affected and small peripheral towns have the highest proportions. Branch plants in small towns which might have been expected to obtain higher level services from Toronto obtain them from the United States because of ownership control. These imports like the flows of materials represent leakages from the Southern Ontario economy, especially from Toronto, to the United States. In many cases Toronto provides similar services to similar companies in Southern Ontario.

It is recognized that for most United States branches in Britton's sample, demand for more irregular "higher-order" services does not even exist because decision, policy-making and planning activities are vested only in the US head offices. This implies that,

"because of the importance of foreign-owned subsidiaries, Toronto firms supplying business services are operating under disadvantages of small scale and/or that given the number of operative jobs in Canadian manufacturing there are proportionally fewer managerial administrative, technical and research jobs in the manufacturing and tertiary industry sectors compared with United States cities (allowing for productivity differences in production activity). Furthermore, it may be inferred that because of the organizational diversion of some demands to the United States, the thresholds for some very specialized business functions are not met in Canada and thus further imports occur."¹²²

Imports of managerial and professional services (MPS) by manufacturing branches, Canadian head offices, sales offices, etc., occur in a variety of ways and forms.¹²³ For example, technology is created through the application of a range of highly skilled activities, so when the technology is licensed, the licensee is indirectly importing the skills invested in the technology, and of course providing just another manifestation of dependence. In a multinational corporation with a Canadian subsidiary, MPS are being imported insofar as the foreign staff serves the Canadian subsidiary. MPS are imported whenever the services are provided by non-residents of Canada.

Direct import occurs when a Canadian firm purchases MPS by means of an "arm's length" transaction or by way of a parent-subsidiary relationship. Indirect import, however, is another way of expressing the technological content of a country's trade. When Canada imports high-technology goods such as machine tools and jet aircraft, and exports such low-technology products as lumber and newsprint there is a net indirect import of MPS through the merchandise trade account.

Gordon estimated Canada's payments to non-residents for directly imported MPS to be \$1016 million. (See Table V.10.) As expected from the discussion of invisible trade, Canada's exports of MPS are small in relation to imports. Gordon puts the trade deficit in MPS at \$763 million in 1970 and consequently Canada's merchandise trade in manufactured products created

an import balance of \$417 million in MPS. Therefore, Canada's trade deficit in MPS on both direct and indirect account was about \$1180 million in 1970. Gordon estimated direct imports of MPS in 1970 represented 23 per cent of the compensation of all salaried personnel, managers, engineers, salesmen and clerks in manufacturing and mining, indicating the large volume of foreign MPS needed to run Canadian manufacturing and mining.

Very little of these MPS imports are purchased by domestically-controlled firms, suggesting that many of the functions may be obtained domestically. Although as argued previously, there must be a major impact on Canadian service businesses by the level of imports. Direct import takes place predominantly through foreign corporations (90 per cent of payments) and 75 per cent of their payments are intra-corporate. Insofar as these firms have very strong control over Canada's secondary industry, their decisions also contribute in a major way to Canada's *indirect* imports of MPS.

Table V.10 – Estimates of Direct Expenditure for Import of Management and Professional Services, 1970

Service	\$000 000
Royalties	163.8
Franchises	84.3
Advertising and Sales Promotion	33.1
Management and Administration Fees	139.3
Professional, Consulting and Other Services	202.3
Special automotive charges	137.9
Commissions	93.3
Miscellaneous	83.0
TOTAL, MPS	1016.5

Source: Unpublished material furnished by Professor Myron Gordon.

The Employment Consequences of Manufacturing Dependence

Truncated industry exercises truncated demands for manpower with implications throughout the economy. But the demand for scientific, technical and managerial skills is low especially in manufacturing, because, as is shown above, many businesses in Canada are not sufficiently independent of other parts of the foreign-controlled corporations to be able to exercise a full range of functions. It is no surprise then that the number of salaried employees (1970) per 100 production workers was 23 per cent higher in the United States than in Canada. More importantly, the salary/wage ratio was 43 per cent higher in the United States than Canada, indicating that even in the salaried group there was clear differentiation of job quality – responsibility and challenge – in favour of the average US salaried worker in manufacturing. This ratio is highly significant for the Canadian economy. Gordon has calculated that if the US salary/wage ratio had prevailed in Canada in 1970, the Canadian salary payroll in manufacturing would have been \$1674 million greater than it was!

More direct employment evidence on the cost to Canada of dependence on the US comes from the data produced in the debate over foreign invest-

ment between the American big-business lobby and the American trade union movement.¹²⁴ By the early 1970s labour was arguing that foreign investment was depriving Americans of jobs and contributing directly to a deteriorating employment situation at home. Business argued that their foreign operations created American jobs which otherwise would not have appeared.

The AFL-CIO calculated that US-based multinational corporations had caused a net loss of 500 000 jobs between 1966 and 1969.¹²⁵ While the Emergency Committee for American Trade calculated that American transnationals had made a positive contribution of 300 000 new jobs.¹²⁶ The Harvard Business School entered the debate on the side of the corporations, Stobaugh claiming that *foreign direct investment in manufacturing was responsible for saving or creating approximately 600 000 jobs in the United States!*¹²⁷

The labour movement assumed that any job created overseas was a job taken away from American workers, that investments made overseas could have been made in the US, and that exports could have been substituted for direct investment in foreign countries. No consideration was given to export-constraining factors such as American labour costs as compared with foreign labour costs and tariffs.

The business community argued that pre-emptive investment (say in Canada) is required to prevent a Canadian, Japanese or European firm from taking over that market, reducing American exports, and to forestall competitors established in Canada (or say Taiwan) from penetrating the American market, thus reducing American jobs.

The labour view suggests that foreign direct investment has very beneficial effects on employment in Canada. The big business view implies by contrast that foreign direct investment has fewer beneficial effects in host economies in terms of employment and development and that the impact is in fact detrimental.

Traditionally, the Canadian business community, influenced by their foreign colleagues, has argued in favour of foreign direct investment in Canada, thus supporting the position of the American labour movement. The experience of Canada, and other host economies, however, dovetails well with the self-supporting arguments made by American business.¹²⁸

Stobaugh's arguments supporting foreign direct investment read like a mirror image of the Gray Report's arguments about the truncation of Canadian manufacturing:

- "1. Direct foreign investment is an integral part of a manufacturer's worldwide strategy for growth. In many industries, to survive – let alone grow – a company is virtually forced into such investment at some point.
2. This investment has a favourable effect on the US economy, in expansion of exports and in job growth at home.
3. Direct foreign investment inevitably causes shifts within the domestic job market."¹²⁹

Direct foreign investment, he maintained, creates jobs for US production workers in three major ways:

- 1) direct blue-collar effects on employment derived from (a) the manufacture of capital equipment used in new plants overseas; (b) the production of components required in the foreign subsidiaries, and (c) the manufacture of US goods that would not be sold abroad unless the company is established overseas.

2) Foreign direct investment increases the need for white-collar labour (mainly in MPS) for the foreign subsidiaries.

3) Corporate research and development activities grow as the company expands overseas (Gordon's work on MPS imports indicates how this US gain is Canada's loss).

Stobaugh explained the benefits to the US in terms of the Industry Life Cycle model.¹³⁰ New products are developed in response to domestic US demand, and production is started in the US for reasons such as the need for interaction between firms and their customers during the product's introductory phase. Export occurs with the American firm (or firms) the sole source of world supply. As consumption increases in overseas markets, production begins in other industrial countries by non-US firms or by US firms fearful of losing overseas sales if they do not produce in these markets. As the cycle moves on from the growth to the mature phase, total sales increase and product quality becomes standardized. Cost considerations then attain vital importance and production begins in countries with low labour costs or cheap raw materials. If by this point American producers are not manufacturing abroad they can expect a progressive diminution in their share of the world market. Therefore, foreign investment is a defence against the rapid erosion of markets.

What has been the employment impact on Canada of foreign direct investment? As there is no evidence that this is not a gaining problem with a zero-sum, the net gains made by the US economy from foreign investment may be treated as net losses to host economies; that is, benefits to the US are detrimental to Canada. In measuring the net employment gain to the US, as a result of foreign investment, the US Senate Committee on Finance and its subcommittee on International Trade estimated that by 1970 the US had gained 140 200 jobs in headquarters employment (exclusively white-collar), 286 600 jobs from the effects of multinational exports to affiliates abroad (mainly blue-collar), and 34 400 jobs from the income effect of direct investment abroad.¹³¹ Between 1960 and 1970, 50 per cent of all US foreign investment in manufacturing was in Canada, so it can be taken that 50 per cent of the alleged employment gain in the US was due to investment in Canada.

Job Gains

The report to the Senate Committee observed that 551 000 Canadians were employed in Canadian subsidiaries of US corporations in 1970.¹³² The majority of these were blue-collar jobs. If a conservative export estimate of 20 per cent of the output of *American*-controlled firms in Canada is used, it would be expected that 20 per cent of the Canadian employment in these firms exists because of exports. The employment involved in production to sustain these shipments (blue-collar workers) is *a gain for Canada of 110 000 jobs* (i.e., $0.2 \times 551\,000 = 110\,200$) even though they are dominantly "tied" exports. The other 80 per cent of the 551 000 jobs in American subsidiaries (440 800) probably would have existed without any foreign direct investment in this country.

Job Losses

The United States has made net employment gains as a result of foreign direct investment in Canada, but it seems fair to assume alternatively that if Canada had used domestic or portfolio investment these net employment gains would

have accrued to Canada. Between 1960 and 1970, 50 per cent of all US foreign investment in manufacturing was in Canada. Therefore, 50 per cent of the alleged US employment gain is taken to be at the expense of Canada. As of 1970 this meant *Canada had lost 70 100 white-collar jobs* (50 per cent of 140 200; *143 300 blue-collar jobs* (50 per cent of 286 600)¹³³; and *17 200 other jobs* (50 per cent of the 34 400 jobs related to the income effect of foreign direct investment), *giving a gross Canadian job loss of 230 600 in 1970.*

Losses Minus Gains

When gains are subtracted from the losses (230 600 – 110 200) Canada is found to have lost 120 400 jobs because of foreign direct investment. Of these, 70 100 are white-collar jobs since the blue-collar gains and losses to Canada tend to cancel each other out. Because white-collar jobs on average are higher paying than blue-collar jobs, the resulting loss in income to Canadians is much greater than implied by a *net job loss of 120 400.*

This estimate is crude and limited by necessary assumptions but it is also a substantial underestimate of the employment losses to the Canadian economy. It deals only with the effects of US investment and takes no account of other foreign direct investment in Canada, and there is every reason to expect it has similar, though less severe effects on Canadian employment. Furthermore, the analysis could have been based on estimates of the Harvard Business School group that specified employment gain to the United States of 600 000 jobs. On the basis of this figure Canadian losses would be higher.

Excepting resource-related industries, the export orientation assumed for US subsidiaries is probably unrealistically high as is the associated employment gain. Furthermore, if Canadian industry had developed without foreign direct investment it would probably have generated exports of its own. These would have taken the place of the tied exports from US subsidiaries. It may therefore be unrealistic to regard employment related to the exports of subsidiaries as a gain stemming from foreign direct investment.

Finally, there is good reason to suspect that any inferred net gains in employment accruing to the United States are *less* than Canada's corresponding (assumed) losses.

It is probable that exports to Canada require little, if any, addition to the capacity of American firms and similarly, the inferred expansion in US labour force requirements is probably greatly overstated. If even a significant proportion of foreign-controlled jobs were in domestic firms one would anticipate considerably greater employment generation. To supply the same parts and equipment to Canadian manufactures (i.e., substitute for imports) would require new plants, even industries, and more than just marginal increments to the Canadian labour force. It would not merely be a question of small incremental increases in the capacity in existing plants, or using existing capacity more fully, or marginally increasing the labour force, but one of creating, where the size of market permits, the plants and jobs now missing from the Canadian economy. Exactly the same argument applies to white-collar work, especially managerial and professional jobs.

It seems fair to suggest that the estimate of jobs lost to Canada greatly understates the employment and development losses to Canada.

For those who are convinced that Canada would have remained an unindustrialized hinterland but for the influx of foreign capital and technology, this line of reasoning may seem particularly exasperating. But, in point of fact, the value of foreign technology and capital is not at issue here. The real question is, whether the importation capital in the form of foreign direct investment and technology via branch plants has disadvantages for the borrower as compared with alternative modes of importation. Certainly the history of industrial development of many other countries shows that technology importation via licensing arrangements and the use of foreign portfolio investment have been viable alternatives which pose fewer constraints on long-term industrial development. Some observers convey the impression that Canadians should be grateful for their good fortune in receiving foreign capital and technology in the way they did. This somehow implies Canadians were granted favours. In fact, this is not the case, for the *form* in which capital and technology were imported into Canada was a very inferior one from the point of view of developing an indigenous industrial and technological capability. Thus, the form of our importation of capital and technology significantly limited the benefits of these factors of production to the Canadian economy and hence to the Canadian people. Indeed, when one considers that the foreign producers of secondary goods located in Canada because a proven market was there, and profits could be made, it seems more realistic to believe Canada granted rather than received favours.

Industrial Trade and Innovation

Foreign direct investment has a “trailing edge”: there is a self-perpetuating interaction between the origin and host economies. In much of Canada’s medium- and high-technology industry, the parent firm controls the flow of innovation, materials and services “required” by the subsidiary. Technological and industrial development is thus suppressed by limited local purchases of inputs. Truncation also implies concentration on the end product stages of manufacturing (especially assembly). Among end products produced in Canada, foreign-controlled manufacturing concentrates on supplying *mature* products which possess a weak export potential. Domestic manufacturing is small scale and to a great extent is reliant on mature products. By producing mainly mature products to meet Canadian demand, export opportunities related to new products are largely lost to Canadian manufacturing. By the time new technology and products are transferred to Canada, the export rivalry between the major industrial blocks is already fierce and as noted, this competition or the threat of it leads to transferring assembly to Canada in the first place. The result is that few secondary manufactures are made in Canada which are not made elsewhere, although many goods made elsewhere are not made in Canada.

Given this background it is understandable that once foreign firms become *dominant*, their patterns of input (import) linkages also inhibit industrial innovation in the host economy.¹³⁴ Industrial innovation depends on investment to produce new processes, products, designs, etc., but in the Canadian case imported technology substitutes for domestic R & D. Hence foreign scientists and technologists do the jobs which *might have been performed in*

Canada had policies been pursued which would have encouraged the growth of large Canadian companies in the medium- and high-technology industries.

In most multinational corporations the major R & D effort takes place in the country where the head office is located. Only a few perform some R & D in Canada and there is a tendency to regard this as a luxury which can be discarded if business conditions are not encouraging or if corporate global considerations call for it.¹³⁵

Because of its specific interest in innovation, the Science Council investigated a sample of corporations conducting R & D in Canada. Cordell examined R & D in foreign-controlled firms and identified two distinct types of R & D units.¹³⁶ The *international interdependent laboratory* is mainly concerned with research and does little development. Its work is closely tied to the international research program. "This operation may or may not interact with the Canadian manufacturing facilities depending on a number of circumstances including the extent to which there is product rationalization."¹³⁷ Research in this type of unit rarely gives rise to an innovation developed and marketed abroad by the Canadian subsidiary. The *support laboratory* acts as a technical service centre and as a translator of foreign manufacturing technology (i.e., it facilitates the process of technology transfer from the parent). This unit is not concerned with new product or process innovation or developing new export opportunities for the Canadian subsidiary. Cordell found that when Canadian subsidiaries were allowed to export, rarely was the export activity based on an innovation developed in Canada.

The work by Cordell, however, dealt with the more "useful" foreign firms – the exceptional firms – and the situation with exports is, therefore, worse than the Science Council believed after its work in the early 1970s.

The exports of Canadian manufacturing industries have been shown by Hanel to be associated positively with their R & D effort and labour productivity.¹³⁸ He also drew the conclusion that:

"The bilateral trade between Canada and the United States reflects a specialization pattern of which the R & D effort is an integral part. The higher the relative intensity of R & D in the Canadian industry compared to the American industry, the higher the ratio of US imports from Canada compared with the US exports to Canada, i.e., the better the Canadian balance of commerce in the given industry."¹³⁹

The obverse is also true, foreign firms with no R & D in Canada (by far the majority) and reliant on the R & D of the parent firm and the technology transferred (sold) to them, create an environment detrimental to export effectiveness.

Only in theory are foreign subsidiaries free to develop export markets:

- In the Canadian machinery industry, Ondrack distinguished: "integrated subsidiaries" existing only to serve the Canadian market with a specified product chosen by the parent; they pursued a very limited range of activities, conducted no R & D activity, and were very aggressive competitors in the domestic market aided by their parent.¹⁴⁰

- "Holding company" subsidiaries had substantial autonomy within the guidelines set by their parent. They could in theory conduct their own R & D but needed special permission from the parent organization to expand, to change their product lines, or to export.

In practice, the parent firms were mostly concerned with short-term considerations relevant to the Canadian market and were not interested in long-range plans for export from Canada or changes in product lines produced in the Canadian subsidiary. Only unusually does a subsidiary develop a product highly differentiated from that of the parent or obtain a product charter for export.

Most of the *domestically*-controlled firms in Ondrack's sample were general design/production enterprises with the potential and ability to both innovate and export, but generally they were less profitable when size was held constant reflecting lower access to capital and technology. Many are struggling to stay alive and innovation is a secondary consideration.

In Canada, substantial R & D is supported by the federal government in research establishments. Cordell and Gilmour examined the problems of transferring technology from government laboratories to the goods-producing sector in Canada.¹⁴¹ Two fundamental impediments to the transfer of technology to manufacturing were found. First, most laboratories have no mandate to transfer technology to manufacturing and do little work of relevance to industry. Second, there are simply not enough potential recipients in Canadian industry to whom technology can be transferred. The competitive conditions in many Canadian industries, largely attributable to the oligopoly power of the large foreign firms, apparently join with other aspects of the industrial environment to militate against the emergence of strong innovative Canadian companies.

In 1973, only 831 Canadian manufacturing firms (2.7 per cent) had any intramural R & D. The median-sized research unit was 2 qualified scientists and engineers! Is this size viable? Only 367 R & D units had more than 6 qualified scientists and engineers. Ironically most of the larger units are found in foreign-controlled firms attesting to the even more dismal performance of domestic firms.

It has been assessed that a sales volume of approximately \$10 million per annum would be needed to support an intramural R & D expenditure of \$100 000 – a minimal R & D unit of 2 qualified scientists and engineers.¹⁴² In other words, firms employing fewer than 250 persons (5 per cent of the total) would have real difficulty in maintaining a productive R & D unit and would, as in most economies, contract the work outside.

The uniquely Canadian aspect of the situation is that *by far the majority of the 1550 firms capable of supporting intramural R & D are foreign controlled and most of them chose not to conduct R & D and product innovation in Canada*. This means they have no independent growth dynamic. They cannot and do not plan to grow through invention, innovation and the cultivation of new export markets.

Canada's secondary manufacturing sector is deficient in innovative and technological capability. Paradoxically it is largely controlled by a nation which is the greatest industrial innovator in the world and which itself is alarmed at its own comparative innovative performance. The United States sees its future prosperity resting on new technology and products which will be internationally competitive. Canada has little choice but to do the same and carve out areas of "distinctive capacity" which can sustain the country's standard of living. Without industrial innovation, a high-wage country such as Canada cannot hope to be a major exporter of manufactured goods. And,

“To lose the power to innovate in a changing environment is to yield control of the future to those who retain that power.”¹⁴³

Progress in industrial innovation and technology generation is deemed to be of central importance in industrial economies like the United States.

“ . . . a high-wage economy such as that of the United States in a world where new knowledge and technological innovations rapidly diffuse to lower-wage economies, must be able to innovate and adopt new technologies with equal rapidity if it is to stay competitive. American firms must in fact run faster and faster merely to stand still. For this reason, the status of industrial innovation and of the national R & D effort must be a central concern of the United States government.

“We grow and compete through the innovation of new products and production processes. Given our high wage rates and standard of living it could not be otherwise.

“It is, therefore, imperative that we improve our ability to couple technology and our goals. Although technology alone cannot solve our problems it is today a central ingredient in economic growth, competitive exports, and the solution of domestic problems.”¹⁴⁴

These remarks apply with equal force to all industrialized countries.

VI. Canadian Technological Weakness and the Dynamics of Change

A variety of evidence, in the previous chapters, establishes that the Canadian economy is plagued by structural distortions and deficiencies in trade, employment and industry, several decades old. More importantly, it has been implied that the situation is worsening because the Canadian economy is not responding to the far-reaching changes in industrial competence occurring throughout the global economic system. All “developed” countries face the same competitive pressures to progress technically and to maintain or improve their terms of trade, but most “developed” economies have proven themselves more able than Canada to advance.

Trade failure, structural deficiencies, and relative decline in the use of high-level skills in manufacturing are all part of the same syndrome. Technological failure is its most significant symptom. At its core is the distinctive *behaviour of foreign subsidiaries*, which is permitted by a vacuum of constraining policies in Canada. There is, of course, a modest development of manufacturing.¹⁴⁵ But, because great reliance has been placed on imports of technology in the form of finished components and design specifications, an indigenous technological capability is underdeveloped. From this stage onward, however, little industrial development will occur without improvement in the technological capability of Canadian manufacturing: failure to bring Canada more into line with other industrial countries may well result in real contraction of the present modest industrialization.

Dynamics of Technological and Innovative Capability

Technological capability is a broad-spectrum term describing “the ability to solve scientific and technological problems and to follow, assess and exploit scientific and technological developments.”¹⁴⁶ It embraces *innovation*, “. . . the technical, industrial and commercial steps which lead to the marketing of new and improved manufactured products and to the commercial use of new and improved production processes.”¹⁴⁷ It is important to note that technological capability is *not exclusive to the so-called high-technology industries*, rather it underlies production and product advances in all goods production. Furthermore,

“Commercial manufacture of a product of even moderate complexity requires elaborately developed specifications and design drawings for the product as well as for each component and every material incorporated into the product. Also required is the elaboration of detailed manufacturing and quality control procedures covering each of the phases of manufacture and the design of equipment to be used in the manufacturing process. To do all this and arrive at a commercially competitive product, requires technological capability. . . .”¹⁴⁸

Scientific and technology development functions thus define a limited part of technological capability. Of greater significance is *innovative capability* which is concerned with the design and engineering of new products and production systems, bearing in mind the perceived market segment in which sales will be made. Innovative capability will often make commercial use of available technology (whether the ideas are new or have been available for some time), but the ability to “assess and exploit” known technology is exercised in terms of an assessed market segment — consumer needs, tastes, and poten-

tial sales. Success is dependent on product design, price and marketing. In this way innovative capability is concerned with the technical utility of products and with other features including efficiency, reliability, and aesthetic appeal essential to their best market performance.

The “assess and exploit” function of innovative capability will be of even greater significance in future industrial systems. In this third wave of industrialization there is, on a world scale, already an enormous volume of raw scientific knowledge available for use in industrial products. Substantial industrial development work has already produced a great variety of industrial components, for example in electronic miniaturization, that could be used in new products and new product designs. Given this situation, the capability to identify a market and the relevant but existing technology, and then produce goods of superior design will be an important precondition for manufacturing development in Canada.¹⁴⁹ This does not mean that the search for scientific or industrial “break-through” technology should be viewed as unimportant, but innovative expertise including marketing capability will be a *sine qua non* of industrial success.

In the following discussion, technological capability includes scientific and innovative functions though stress is placed on the latter, singling it out as a separate area in which Canada lags and must achieve substantial levels of development. It should be noted that development of innovative capability is as feasible for subsidiaries as for domestic firms. Appropriate Canadian and corporate policies are all that is required.

Process of National Technological Advancement

While it is easy enough to recognize differences in levels of technological capability between Canada and other countries, understanding elements of the process that can drive an economy to greater technological capability is required before Canadian stagnation in technological development can be illustrated and before constructive policies can be devised.

The economic aspirations of Canadians are rooted in historical experience and increasing prosperity in the post-World War II period has generated substantial desire for real future gains comparable to highly-developed economies. Maintaining or raising the standard of living (expressed partly in consumer expenditures) is part of the national goal: international and domestic profits (or market share) are another component. Also the quality of social and economic infrastructure is significant because public expenditures (from domestic revenue) are made as part of the consumer’s real standard of living and to promote increased production and trade.

While national aspirations have many interdependent components, a “goal” can be described candidly in terms of GNP per capita. Canada’s problem, then, is management of national *resources* to converge on this goal. The task of management, as represented here, involves allocation of investment to the *natural resources* (endowed resources) or the *human resource* (generated resources) factors of production to achieve the best balance of payments situation with the goal of maximizing long-term national economic growth. Human resources are generated by technology and technology itself is traded internationally in terms of knowledge or products. Technology in

turn is increasingly involved in the discovery of previously unknown natural resources.

The Canadian economy is well endowed with renewable and non-renewable natural resources and has depended to an inordinate degree on their international sale to offset manufactured imports, and to create GNP level capable of maintaining Canada's standard of living. Japan, however, never had this option and has devoted itself to the alternative strategy of building technological capability through a well-directed education program and through investment in industrial R & D, information-systems, innovation, design and marketing. Thus Japan has compensated for natural resource deficits by generating human resources. Interestingly, the United States has met demands for increases in the standard of living by utilizing its own natural resources, buying those of others, *and* selling technology directly or more often indirectly through products and subsidiaries. Logically if the US economy is managed optimally it should be able to retain its standard of living lead in comparison with economies such as Japan.

The trade analysis in Chapter II may be reinterpreted to indicate the under-importance in the role of Canadian human resources to generate exports that, consequently, fail to substitute for imports of secondary manufactures.¹⁵⁰ If the human resource content of Canadian trade is to increase, so must the technological capability of Canada. Identifying the factors that will *stimulate* an increase in the level of technological capability is the problem. One would have expected that among the most important factors would have been *the level of labour costs*, that is Canada's labour costs (wages and levels of utilization) compared with those of other economies producing the same goods.

Wage rates are built-up through collective wage bargaining and can be an inflationary influence. The level of labour costs should be a driving force of economic and technological development. Similarly, decreases in costs outside Canada (exchange rate, productivity, etc.) generate a Canadian comparative labour cost disadvantage. Profit and other market-related stimuli can have similar technology-generating effects. When will the political process in Canada convert the public sector into a positive and leading force for technological change as is the case in other countries? This question must soon be resolved.

Unfortunately, there is a dearth of reliable data on the performance characteristics of Canadian business management, but *limited* entrepreneurial capability and insufficiently aggressive business (such as limited public sector commitment to technological change) probably have inhibited the stimulus to technology change created by rising wage rates. If this description is accurate the inflationary potential of increases in labour costs is greater than in many industrial countries.

An economy reacts to long-term increases in labour costs by attempting to improve productivity. It responds to the availability of technology that allows higher total factor productivity by using it. The increases in agricultural and manufacturing productivity show these changes do occur. Short-term improvements in efficiency are often possible with known technology, thus raising labour and total factor productivity to offset domestic or international threats to competitiveness. When new production investment is made, embodying technological change, further bias toward substitution of capital for labour occurs. But Canada has made a poor attempt at increasing its competitiveness and has been unduly complacent about wage levels compared with

levels in the US. Since 1976 the wage differential in favour of Canada has disappeared and changes in the exchange value of the Canadian dollar have not necessarily made a lasting impact on the price competitiveness of Canadian goods.

In advanced economies, as market advantages are increased by more efficient *processes* (early positions in the industrial cycle) or newer *products* (early position in the product cycle), large investments are made in technology-intensive activities: profit motives, preservation of a firm's/industry's competitive position internationally and sheer growth objectives of nations and firms are important stimuli to product and process technology.

The level of investment in technology generation or technology acquisition is an influence that incorporates both corporate and public components.

- *Public investment* to promote technology advance is accomplished indirectly (included in infrastructure factors) and directly in the form of government laboratories, design teams, management advisers, R & D expenses, etc. The larger the public investment the greater can be the technological response. Indications are that Canadian investment is incredibly small and technology connection between government and industry is poorly formed. In the case of Canadian public investment in recent decades, there has been a bias in favour of *social service* provision which while immediately increasing the real standard of living has little capacity directly to generate further resources. Furthermore, there has been limited effectiveness in educational programs (infrastructure) in comparison with other countries; in Canada this method of increasing technology output seems to have been mismanaged by too large an investment in academic programs and too little in technological and industrial training.

The development level of educational and economic infrastructure directly influences the degree of technology response to a relative change in labour costs and other stimuli. The underdevelopment of technological education leads to a reduced industry response. Similarly, advanced communications and public information systems affect the likelihood of innovation, imitation or adaptation to improve sales, and hence productivity. The Canadian situation is described below.

- In *Crown corporations, and provincial and local utilities*, the stimulus to innovation is probably problem-oriented in nature (technical or marketing problems). Canada is notable in the level of success achieved by AECL (CANDU reactors), Canadair (Challenger), Ontario Hydro (long distance electricity transmission), and even Northern Telecom (telephone switching systems for Bell Canada) should be included in this category.

- Although *corporate investment* in innovation is vital, Canada is poorly served by its industrial firms — low productivity, an apparent inability to “catch up”, market fragmentation, domestic and international uncompetitiveness are characteristic though not universal (primary metal manufacturing is progressive, pulp mills are not). Most secondary manufacturing is unprogressive but some firms are technology oriented (process and product), however auto production is concerned *only* with assembly line productivity.

In terms of corporate investment, the rational management problem is one of choice between and within sectors; choice in the investment level in activities, such as, production and marketing, design, R & D, and technology adaptation. Canada, in comparison with other countries, generally has under-

invested in those activities that assist “technology generation or acquisition”, judged on inter-sectoral or sectoral grounds. Achieving adequate levels of investment to maintain a responsive technological system, however, is constrained by the industrial subsystems that underlie it. Of particular importance are the patterns of industrial linkage and internal vs. external government purchasing. In Canada these flows of goods and services, rather than amplifying the power of stimuli for technological development, have dampened them.

Probably, infrastructure investments will always generate smaller effects than expenditures directly concerned with industrial innovation, but other factors cause lags in the response of, say industry, to pressures for technological change (in process or product or both). Some factors operating at the level of the firm are:

a) If the firm is a foreign-controlled subsidiary with truncated functions, which is not rationalized and not specialized in production, it is likely slow in implementing technological change. It will wait to receive a technical transfer from another corporate source (often mature technology), to purchase or license technology, and to undertake a substantial part of the technological program “in-house”.

b) Poor managerial capability and a low level of entrepreneurial acumen are characterized by a long response-time to changes in the operating conditions of the firm — less willing to take “direction changing” decisions quickly. The time taken to adopt, to adapt, to generate, or to buy new technology in order to seek new markets and to design new products may be longer for very small firms with smaller resources. Small firms however, have access to consultants so their tardiness in these areas is probably not so much a consequence of smallness as it is a result of poor managerial quality.

c) The less competition in an industry (approximating oligopolistic conditions), the greater the time lag large and small producers will take in implementing technological change.

In summary, foreign direct investment has been allowed into Canada in virtually unlimited quantities. The consequence is a lack of innovative activity in Canadian subsidiaries while mature industrial and product technologies have been transferred here. Oligopolistic conditions limit the speed of technical change by large firms. Small domestic firms are constrained by their own capacities and the inhibiting effect of public purchasing and investment. In addition, policies toward education have not supported the emergence of a modern industrial state.

Canada faces a technological crisis for which it is poorly prepared. The country must place less reliance on exporting natural resources and the slack will have to be made up by Canadian human resources — an educated, trained labour force generating knowledge that can be marketed in the form of industrial products. If Canada continues in its unique way, high costs, low productivity, insignificant innovation and generally, technological weakness will render the goal of maintaining the present standard of living unattainable. The signs of industrial regression will escalate.

Technological Evolution of an Economy

Industrialization is a complex set of evolutionary processes. Most importantly, the process of industrialization is inseparable from development and change

in technological capability. The process of technological advance of industrial systems has been described by Carrère in five stages or strategies, though the process is admittedly an evolutionary one.¹⁵¹ (See Figure VI.1.) The conceptual antecedent of Carrère's stages lies in the work of Christopher Freeman in his book *The Economics of Industrial Innovation*.¹⁵² It is important to look briefly at some of Freeman's ideas.

Freeman was interested in classifying manufacturing *firms* in terms of their innovation strategies. Of his six categories, the five relevant to this study, are described briefly.

The Traditional Firm

Completely lacking in capability and interest in product change, this type of firm sees no cause to change its product. The market does not demand it and the competition does not compel it. Technology may be based on craft skills and the scientific inputs to production are minimal or non-existent. The traditional firm, deficient in the scientific and technical capacity to initiate fundamental changes in product, is much more likely to appear in industries such as glove making, flour milling or baking. Nevertheless, this type of firm may occur in most branches of industry.

The Dependent Firm

Many firms accept an essentially satellite or subordinate role in relation to other stronger firms. The dependent firm makes no effort to *initiate* technical or product change except as a result of specific requests from its customers or its parent (if it is a branch). "Typically it has lost all initiative in product design and has no R & D facilities. The "small" firms in capital-intensive industries are often in this category and hence account for hardly any innovations."¹⁵³

A very large number of Canadian firms both foreign and domestically controlled fall into this category. All the Canadian automobile manufacturers are dependent firms.

The Imitative Firm

In this case there is some interest in product change but the firm is content to follow behind the leaders in established technologies. An imitative firm must possess certain advantages to remain competitive with the established innovating firms. These may include a "captive market" (e.g., another firm) or decisive cost advantages (e.g., lower labour costs). Without significant market protection or privilege the imitative firm must rely on lower unit costs of production to survive and grow. Some adaptive R & D is characteristic of this type of firm.

In Canada most firms with some R & D capability belong in this category. There are, of course, notable exceptions.

The Defensive Firm

This firm is a secondary innovator. It is not the first in the world to introduce a new product or process, but it does want to maintain its market position. The defensive firm may want to avoid the great risks of being the first to introduce a product, and, or, it may have strength in production engineering and marketing, yet lack the capacity for more original types of innovation. Such firms are usually heavily committed to R & D. They are typical of oligopolistic markets and their R & D is strongly oriented to product differentiation.

Figure VI.1 – Relationship Between Technology Development Strategies, Technology Resources and Industrial Development

Strategy	Emphasis	Cycle Phase	Major Characteristics	Industrial Development	Technical Skills	Technology Development Capability
Traditional	Local Technology	Local Products	No contacts with foreign technology Technology based on traditional skills No product changes (no demand for it)	Non-industrialized	Lower management training Technician training Vocational training General education	None – Gradual creation of an industrial mentality and climate
Dependent	Tertiary Technology (diffusion of existing Technology)	Mature-growth	Satellite role to technology stronger countries Following them with a long technology gap; importing know-how and technology assistance Copying (little product change)	Industrializing	Production engineering Project evaluation Industrial engineering and management Basic general engineering capability	Investment projects formation and evaluation (including evaluation and selection of technology)
Imitative	Tertiary Technology (diffusion of existing Technology)	Growth	Following the leader country with a short T gap; importing proprietary technology (patents, licences) Process improvements (increasing productivity) Foreign technology adaptation	Semi-industrialized	Adaptive development Consultant services Design engineering (adaptive design)	Adaptation of foreign technology
Defensive	Secondary Innovation	Growth - new	Following the leader country as closely as possible “Catch-up and over take” objective Foreign technology adaptation and improvement New technology packages and product differentiation	Industrialized	Strong R & D capability Design engineering Production engineering	Generation of new technology packages Adaptation and improvement of foreign technology
Offensive	Original Innovation	New Products	First in the world in the introduction of new products and processes “Maintain the leadership objective”: keep the technology gap Frontier research	Post-industrial	Frontier R & D	Generation of new original technology

Source: Adapted from Carrère

Japanese firms in consumer electronics and automobiles provide excellent examples of defensive strategies. They have shown great capability in the improvement of other countries' innovation but some Japanese firms appear to be moving toward offensive strategies in certain product lines.¹⁵⁴

The Offensive Firm

Typically this is a firm concerned with technical and market leadership in the introduction of new products. It is research intensive and depends heavily upon intramural R & D. The most critical technological functions for this firm are those centred on experimental development work. These include design-engineering and applied research. Any firm striving to lead in the introduction of a new product or process must have a very strong problem-solving capacity in designing, building and testing prototypes and pilot plants. Some linkage with fundamental research is quite common. The United States is exceedingly rich in these kinds of firms. IBM, Texas Instruments and Xerox are good examples. Canada is very seriously deficient in them.

No doubt firms have evolved from the traditional to the offensive strategy, but the individual firm may begin its life at any strategy level, and either stay there or move backward or forward. These days many small firms are launched with an offensive strategy often by personnel frustrated with the inflexibility or unprogressiveness of a large firm though later they may sink into a defensive position. Some large firms may be viewed in terms of divisions pursuing different strategies.

Freeman's classification is not without its shortcomings. In particular it largely glosses over the problems raised by the internationalization of capital. In many cases it may be specious to treat the respective national units of multinational firms as separate firms when to all intents and purposes they are integrated parts of large organizations. Many American subsidiaries in Canada if regarded as separate organizational entities are obviously dependent or imitative. Yet the same firms are really geographically separated branches of defensive or offensive firms. Nevertheless, multinational corporations vary widely in the way they are organized and in the degree of autonomy they accord their subsidiaries although many clearly have a dependent role.

As it now stands, a dependent assembly unit which is a subsidiary of a dynamic, offensive multinational firm, and a single-plant domestic firm employing freely available standard technology, would both be included in the dependent category. A possible basis for refinement might lie in allocating firms, both subsidiary and independent, to their position in the industry life cycle. There is some evidence as noted previously that many Canadian subsidiaries receive technology from their parents in the late growth or mature phases of the cycle.¹⁵⁵ On the other hand, other subsidiaries, while dependent on parents in many respects, may be recipients of technology in an early form of development and/or, allowed substantial freedom in product development (components of rationalized multinational corporations). Subdivisions of Freeman's categories that would recognize the intermediate status of some foreign subsidiaries may be possible but the practical difficulties of allocating firms are formidable.

Although it is inaccurate to think of individual firms evolving from lower to higher strategies, it makes a great deal of sense to think as Carrère does, of the technological capability of a *nation* evolving along a continuum. Each of

Carrère's stages is a set of technology development strategies which generalize the major characteristics and needs of technology development as it has occurred around the world in different countries and at different times. In this context, "strategy" is not to be equated with conscious planning. It is used in the sense of an after-the-fact description and generalization of events and developments (both planned and unplanned). The United States, for example, has evolved from the lowest to the highest strategy. Even though certain decisions made by the government were very important, it is not implied that there was central planning concerned with ensuring technological evolution.

The main task at the stage of *traditional strategy* of a non-industrialized country, is to create basic educational, including technical skills, and begin the slow process of creating an industrial mentality and climate. Almost all of the African and several of the Latin American countries are at this stage.

Unless it is prepared to go through the very slow process of *internal* technological and industrial development, a nation must seek technology abroad — following a **Dependent Strategy** — becoming an adopter in the international diffusion of technology. Typically, the technology is at the mature phase of the product life cycle, and dependent countries copy with little production adaptation. They import technical and management assistance. The most important developmental capability needed at this stage, however, is the ability to evaluate and select foreign technology taking into account the needs of the population and the economy, as well as available skills. Without the acquisition or development of such skills as production engineering, project evaluation, industrial engineering and management, a country's evolution to a higher strategy will be impeded. Until recently, virtually all industrialization in Latin America has been the product of dependent strategies. In Canada the automobile industry is a prime example.

The **Imitative Strategy** is a more advanced form of the dependent strategy distinguished by a conscious effort to adapt foreign technology after acquiring the skills required. Technology is acquired more quickly after its first appearance, there is less direct copying and implementation takes into account indigenous scales, needs, and capabilities. This strategy requires skills such as adaptive development, design engineering, product and process engineering.

Among the many examples of industrial growth based on imitative strategies, the case of Italy after World War II is especially interesting: although imitative strategies were adopted widely in a number of industries, many firms have been defensive or even offensive (see below). In research intensive activities such as electronics, aeronautics, and machinery industries, strong use was made of technology developed overseas by means of direct licensing and foreign direct investment. Success was achieved in the same way in traditional and intermediate-technology industries. Emphasis was placed on technology inputs other than research (i.e., design, engineering, marketing and management) and on securing the diffusion of existing technology throughout Italian industry. Superior design and styling were important to success.¹⁵⁶

Stimulated by a policy of nonpatentability of pharmaceutical products and processes, the Italian pharmaceutical industry provides a fine example of imitative strategy. Numerous companies emerged devoting themselves entirely to the imitation of foreign products.

"Mere imitation led to technical failure in many companies, but, in spite of the material difficulties, Italian industry managed within a relatively

short period of time to produce nearly all the raw materials or active principles in the international pharmacopoeia.”¹⁵⁷

In a **Defensive Strategy** the main emphasis turns to secondary innovation (innovative copying). Attempts are made to follow the leading industrial countries as closely as possible. Foreign technology is improved only a short time after its introduction. The capability is developed to create *new technology packages* and to be a seller of technology and differentiated products. This requires the development of a strong R & D capability and strength in design and production engineering.

It would be hard to find a better example of a defensive technology strategy than that provided by the Japanese petrochemical industry. The industry was not introduced to Japan until 1955, yet in twenty years, the industry has moved from an imitative, to a defensive, and to a limited extent, an offensive strategy. The example is especially notable because the rise of the industry reflects the results of a specific sectoral technology policy developed by government and private industry. At first, (1955–65), the Japanese industries were totally dependent upon technology imported from more highly industrialized countries. During the second half of the 1960s, however, these techniques were assimilated, adapted and improved, and the third stage in the 1970s has been to develop a petrochemical technology that is purely Japanese. In 1975 more than 80 per cent of the principal petrochemical products manufactured in Japan were still based on imported technology. Nevertheless, owing to its defensive strategy, the industry has achieved a certain degree of interdependence with the same industry in the US.¹⁵⁸

In an **Offensive Strategy**, importance is placed on original innovation and on the creation of new products and technology which will be sold (diffused) to other countries. The goal is to be first in the world in the introduction of new products and processes. This strategy requires the ability to carry out the sophisticated “frontier” R & D which leads to entirely new products and processes. Sweden provides a good illustration of an industrial country pursuing offensive technology strategies in specific industrial areas. The Swedish electronics industry follows a policy of deliberate concentration on selected specialized products. Competition with the mass consumer market is avoided and electronic components like semi-conductors are left to the larger countries which dominate world markets. Sweden concentrates on industrial electronics, producing a carefully selected range of products that are unique in concept and of exceptional quality and reliability. The industry is composed of a series of large firms backed by several hundred small ones making components, systems and sub-assemblies. An example of such firms is LKB-Produkter which makes research and analytical equipment for clinical chemistry. Employing 1500 scientists and technicians, this firm exports 96 per cent of its output. A better known firm is L. M. Ericsson with a long history of innovation in telecommunications.¹⁵⁹

Several qualifications about these strategies should be noted:

1. They are not discrete. They are artificial subdivisions of a *potentially* continuous process.
2. As the examples above suggest, a country may be in several stages or strategies at the same time. Only large nations, such as the US could ever aspire to an offensive strategy in all technological areas. Small countries have the resources to be defensive or offensive in only a few areas.

3. The strategies are not bounded by political systems, but the policies and instruments employed to reach technological objectives are politically bounded and vary among countries.¹⁶⁰ Some policies, however, even when well-intentioned, are not conducive to technological and industrial evolution, and development may be retarded.

4. Technological evolution is not inevitable. A country may enter into a dependent strategy, for example, but unless it adopts policies to create innovative capability even an imitative strategy will be unattainable. Such a country will be locked into a dependent stage and the process of evolution will grind to a halt.¹⁶¹ Canada has been pursuing policies which over the long term were bound to freeze its industrial status in the imitative stage.

The International Technology Market

Through its history Canada has relied very strongly on the import of technology (in its broadest meaning) and little on indigenous creation. Canada has been a receiving nation in the international technology transfer system and most firms have been and are dependent or imitative.

Despite the term technology transfer, technology in the possession of individuals, groups, firms or nations is traded, sold and purchased like other merchandise. Technology is a commercial item, though, when it leaves its R & D hearth to enter the commercial world, the transfer process is found to have some rather unusual properties because technology is somewhat different from other kinds of merchandise.

The nature of the market gives the seller considerable advantage in bargaining power over the buyer. Three characteristics of the technology marketplace are particularly worthy of note:

1. The process of commercialization of technology usually causes it to become embodied in components, machinery and equipment, labour skills and in total systems of production. In some cases it is embedded in, and even inseparable from, entire systems of distribution and marketing. Unlike other exchanges, the technology sale is frequently incomplete. A significant consequence is that the market for specific technology often has to accept being part of the market of a larger entity. Related inputs are sold in the form of a package. This market integration of different, but related inputs, creates non-competitive conditions for each of them, thus creating problems for the prospective purchaser of technology. He finds it difficult, sometimes impossible, to break down the total package, yet failure threatens his nation's technological and industrial development.¹⁶² Moreover, technology purchasing tends to create dependence of the purchasing nation, and this dependence tends to be cumulative.¹⁶³

2. The position of the prospective buyer in the technology market is inherently weak. In any market the prospective buyer seeks information on the properties of the purchase items in order to make appropriate and informed decisions. In the case of technology, however, the purchaser is seeking information about information. This creates a paradox. The information essential to an informed decision, is likely to be the same information the seller is trying to sell. Therefore, the potential customer faces a structural weakness as a purchaser with resulting imperfections in the corresponding market operations.

3. The supply of a particular technology is infinite. The use of a technology by a firm neither reduces its supply nor its availability in the present or future; the relevant cost for the use or sale of a technology is close to zero for the firm with ready access to it. But, for the prospective buyer, the cost of developing an alternative technology could be millions of dollars. Depending on market availabilities, the purchase price may lie anywhere between a few dollars and several millions of dollars and is determined solely on the basis of crude bargaining power.¹⁶⁴

Prospective purchasers are confronted by structural weaknesses of the technology market in their respective demand for knowledge.

Technology Transfer and Foreign Direct Investment in Canada

Canada deliberately chose to be a purchaser of technology by pursuing policies which placed it on the disadvantaged side of the technology market. By purchasing technology, in association with foreign direct investment, Canada has followed a path which has maximized its weakness as a technology purchaser and inhibited its technological evolution.

Under direct foreign investment the purchaser and the seller are one and the same. The host nation usually relinquishes even the limited bargaining power of the technology purchaser, leaving the terms of exchange almost entirely in the hands of the foreign source.¹⁶⁵

Thus Canada placed control of the process of economic development in secondary manufacturing in the hands of overseas sellers of technology. They decide *when* to sell, *what* to sell, and *how much* to charge. Often the subsidiary receives only part of a total production process, for example the production of a component, and, or, final assembly. Therefore, the subsidiary becomes partially or totally dependent upon, and interconnected with, the parts it does not receive. In essence, the transferred technology has a trailing edge which causes the subsidiary to be functionally and technologically incomplete. Furthermore, the controlling firm is free to transfer old (mature) packages, or parts of old packages to subsidiaries while the proceeds are used by the parent to support innovation.

Technology transfer operating under these circumstances has a number of negative consequences for host economies. Many of these have been investigated in Canada and at this point, the chapter moves back into regrettably familiar ground. Industry becomes incomplete and weak in innovative capability as it becomes increasingly linked to, and dependent upon, the resources of foreign firms.¹⁶⁶ Manufacturing in general and specific industries in particular become fragmented, structurally distorted and inefficient. By frequently receiving mature technology, Canada tends to be deprived of the skill-intensive stages of product and process development.

Canadian manufacturing has become underdeveloped in its capacity to produce or design replacement products in the medium- and high-technology industries, where foreign direct investment is greatest, and functional and technological dependence is most pronounced. Skeletal or truncated industries with a low technological capability become cumulatively dependent upon foreign industries: innovation becomes blocked (most industry cannot move into the defensive and offensive stages of technological development) and most firms are of Freeman's imitative or dependent type.

Technological Problems of Domestically-Controlled Manufacturing

The characterization of Canadian manufacturing, especially secondary manufacturing, as a dichotomy between larger foreign-controlled plants and the generally smaller independent domestically-controlled firms, while not perfect, is a good description of the prevailing situation. The direct (average) relationship between plant size and performance in Canada is in large measure attributable to the high level of Canadian ownership in industries using widely available mature technologies. These industries are technologically unprogressive wherever they are found. This Canadian pattern of ownership, however, must not be allowed to obtrude continually when analyzing the performance of other Canadian firms in other industries.

Why is the technological capability of Canadian firms so dismally poor? Two factors are of major importance: 1) Poor delivery systems of technological information to small Canadian firms, the inadequacy of Canadian management, and the low level of activity in product innovation that could be more concerned with import substitution; and 2) The disintegrated systems of production that prevail in secondary manufacturing in Canada.

Technological Information for Canadian Firms

Of the 27 500 small Canadian firms (100 employees) in manufacturing, less than 275 perform any R & D. Innovation for these firms is still possible, however, because known technology has to be converted into attractive, efficient, marketable products. Despite their size, but given technological access, small Canadian firms could succeed through engineering, design and marketing expertise. Even the mature product industries could succeed if their profitability and managerial style permitted support for these skilled functions.

Unfortunately, there is a technology gap between most Canadian-owned companies and foreign subsidiaries. Although subsidiaries are truncated, they are kept up-to-date, *as much as is considered necessary for their limited Canadian operations*, by their parent organizations. Canadian firms lack these information "pipe-lines" and are often woefully ignorant of technological changes and design and marketing possibilities that would enable them to improve their sales and productivity performance.

The reason often given is that very few Canadian firms have the resources to keep themselves well informed of developments in their field. It is suggested that they cannot afford to employ the adequate marketing, design and engineering skills necessary to prevent innovative backwardness. There are two immediate responses to this reasoning: a) Is it really "resources" or ineptitude that inhibit and prevent the use of adequate information and specialist services by Canadian management? and b) Are there features of the Canadian industrial environment that impose a heavy burden on small Canadian firms compared with their counterparts in other countries?

Canada is under-utilizing managers (Chapter III establishes that there are too few of them). The work of Technical Information Services (TIS), an agency operated by the National Research Council, shows that the productivity performance of many small firms could be greatly increased by means of even minor technological improvements or changes in plant layouts or organization. This suggests either inadequate training of many Canadian managers or too

few managers or both; firms do not even seem to perceive the value of using public services like TIS. In effect Canadian small manufacturers behave like the “dependent” firms they are.

This interpretation is supported by the work of Daly and Globeman on the diffusion of technology in Canada.¹⁶⁷ A pervasive technological backwardness of Canadian firms indicated by slower adoption of freely available process technology than occurs elsewhere tends to be confirmed. While their research framework does not allow adequate specification of subsidiary vs. domestic rates of adoption, these authors are convinced that Canadian technology policy should be primarily concerned with increasing the speed of technology flow to Canadian firms in order to increase adoption rates. It is difficult to contemplate how changes will occur in these rates, however, unless managerial competence and entrepreneurial drive improve and the utilization of technical skills increases.

Aspects of the information supply situation are major determinants of the adoptive and innovative behaviour of Canadian firms. Only a slight possibility exists that small-and medium-sized Canadian manufacturing firms will increase their innovative capability and become more productive unless they have access to a continuous systematic flow of information and advice on product and production technology and how to use it. Canadian policy circles do not seem sufficiently informed that compared with other (industrial) countries, small firms in Canada suffer from relative neglect with respect to the public technological assistance available to them. In Japan and several European countries, through technical centres and/or research associations oriented to specific industrial sectors, great assistance is afforded small firms to ensure that they receive a continuous flow of information and adopt available technology. Despite the valiant and worthwhile efforts of TIS, Canada has nothing equivalent to these industry-oriented agencies, acting as the technological interface between the many sources of new technology and the small companies.

The only course of action open to most Canadian firms is, independently, to purchase freely available technology “off-the-shelf” or to enter agreements with predominantly US firms to use their process technology under licence. But the Canadian licensee may not get exactly the information he needs and almost certainly does not receive it when needed.¹⁶⁸ Clearly the mechanisms of technology transfer are not the same as those employed by foreign subsidiaries.

Systems of Production: Technological Implications

In most industrial economies, firms of all sizes exist in complex production systems. Few firms, not even the largest, are totally self-sufficient. They depend to a greater or lesser degree on others for specialized goods and services which would be uneconomical if provided from within their own organizations. A vast number of linkages of goods, services and especially information comprise the bonds of such systems, and in industrial countries small firms tend to be strongly linked to the larger core corporations. The significance of the service or component links of small firms with large is that they normally are the channels along which strong influences flow toward improving technological awareness and innovative capability of small companies. The large firm relies on these links for specialized inputs.

Frequently, the large firm aids small firms through its attempts to raise its own technological capacities and improve the quality of its products. In the Swedish electronics industries, for example, hundreds of small firms supply specialized parts and components to larger firms.¹⁶⁹ In Canada as Spar Aerospace Products Limited, for example, has grown an increasing percentage of sales has been contracted out to Canadian sub-contractors and suppliers. "In this way, the benefits of Spar's technological achievements are being diffused throughout Canadian industry."¹⁷⁰ In other words, technological multiplier effects are generated. This example of the systematic diffusion of new technological competence is repeated too infrequently in Canada.

As noted in Chapters IV and V, the linkages of foreign-owned subsidiaries in Canada are strongly intra-corporate or directed by the corporations to non-local sources. The effect of these linkages, however, is to create an unproductive degree of disintegration in Canadian industrial systems affecting particularly the small firms supplying components. The infrequency of this type of interaction between large and small firms in Canada has perhaps the most far reaching implication for foreign (mainly American) take-over of large domestic firms. It implies that small Canadian firms have been isolated from potential sources of technological support and information.¹⁷¹ Even a policy change to generate more linkages with small domestic firms would not redress the situation. The tendency of large foreign subsidiaries to rely on mature products and technology causes them to be less stimulating to Canadian small firms than the large innovative, non-truncated firms of other countries are to the small firms in their respective economies.

Comparative Review of Canada's Technological Problems

The technological thesis of this study has been that dependence produces economic underdevelopment. Direct evidence on the truncation of foreign subsidiaries is major proof of the thesis and material and service imports particularly have a prime role in that assembly of evidence. But it is now clear that indirect evidence, or secondary impact of foreign control, is of greater significance in the long run: truncation creates innovation retarding effects within domestically controlled industry. Although Canada possesses some highly innovative small firms and some larger Canadian firms with the backward-linkages important to small firms, the problems of secondary manufacturing generally include:

1. The disintegrated nature of production systems attributable to the behaviour of foreign firms.
2. The mature technology used in a majority of Canadian plants, whether locally controlled or not.
3. The low level of entrepreneurial ability reflected by lack of aggressive marketing and development of innovative and/or redesigned products.
4. A fragmented market produced by there being too many foreign and domestic firms.
5. Low levels of managerial, scientific, and technological employment.
6. High wage, low productivity patterns of costs and performance.
7. A lack of national policy designed to balance growth in social services and to assist in the development of secondary manufacturing with better performance characteristics.

Many countries have higher levels of technological and innovative capability than Canada, but with the exception of Sweden and possibly one or two other countries, they also have lower production costs.¹⁷² Canada is very uncompetitive with respect to international trade, because *costs are too high relative to the general level of technological and innovative capability*. It is dangerous to combine high costs with low levels of technological capability: this is precisely Canada's situation. Canada stands in violation of the principle, illustrated earlier, that as production costs rise (even with high levels of productivity) competitiveness depends increasingly on the ability to raise levels of innovative capability.

Industrial countries vary internally in terms of cost/price performance, levels of technological and innovative capability, and industry "mix". Nevertheless, they have attained moderate to high levels of technological and innovative capability in the production of goods and systems through *quality and performance* in spite of high costs. Most have sensed a need to develop the performance maximizing and the capital-goods industries. The former compete on the basis of the highest technical performance per unit cost. Sales potential is determined mainly by technology (e.g., instruments, industrial machinery, satellite communication equipment, aircraft, etc.). The latter compete on the basis of lowest installed cost per function or capability. Often their output is unique being of the "one of a kind" or "one-shot" variety such as an underground transportation system, a pipeline network, an integrated steel complex, airports and power projects. While there are specific exceptions, Canada is weak in these areas.

For the moment industrial countries are still actively involved in every type of manufacturing and are not contemplating rapid voluntary surrender of any manufacturing to the less industrialized countries. Moreover, there are strong forces which will allow the continued survival of mature technology industries (both labour and capital intensive) in the advanced industrial countries. Among these forces are: cost advantages stemming from natural comparative advantages in resource and resource-related industries, the need to be located within the market areas served because of high transport costs on the input or output side of production; protectionist attitudes relating to strategic, political, economic and social considerations;¹⁷³ maintenance of competitiveness through the substitution of new capital intensive for older labour intensive methods of production (i.e., applications of new technology); and creation of new products (innovation) and shifting production from low quality items to higher quality items of superior design and styling. These forces are all possible bases for the survival and even growth of Canadian manufacturing provided reliance shifts, on balance, from traditional resource and geographic factors to innovative and technological bases of development.

Four broad factors act to retard the decline of Canadian secondary manufacturing and provide a breathing space.

1. Although it might seem only a matter of time before Canada is totally deindustrialized, the present *extremely* high cost situation is of recent origin. *Since Canada has only recently moved into this situation, it will take some time before the consequences fully work themselves out*: the most recent decline in the exchange value of \$US and \$Canadian will make this process quite complex.

2. Competitive strength varies from one industry to another. Canada's

performance reflects the dominance of its weak industries. Recent import and export statistics in end products indicate the range in the competitiveness of Canadian industries.¹⁷⁴ A few industries with competitive strength, however, have slowed the speed of decline in Canadian manufacturing.

3. Most countries with *lower production costs and lower levels of technological capability* than Canada do not participate in the full range of modern production activity. Only a limited number of products from a small number of developing countries, *so far*, have penetrated the markets of Canada and other advanced countries. Each country with *lower costs and higher levels of technological and innovative capacity* than Canada is specialized to a degree and has strength in some areas. In this respect Canada is no exception: despite the alarmingly large number of Canadian industries competitively inferior to their counterparts in other countries, there are some industries with competitive strength, e.g., certain resource-related industries and telecommunications equipment.

4. Lower production costs and higher levels of technological and innovative capability are not necessarily sufficient in themselves to permit effective competition in foreign markets. Or conversely, the fact that a country has high production costs and low levels of technological capability does not necessarily mean that its industries will be wiped out by foreign competition. Cost differences are never likely to be so large as to eliminate all Canadian producers in most industries from their own market because of various forms of protection which can either be natural (i.e., geographical), a function of product characteristics, or deliberately created. In the latter case tariffs, quotas, controlled marketing agreements, and non-tariff barriers of various kinds may be employed to reduce or stop competition from lower cost and higher performance industries alike.

Together, these four elements explain why Canadian industry despite its precarious position will survive in some form. This is small consolation since deindustrialization is occurring.

Technological Progress of the Semi-Industrial Countries

The importance of technological capability for economic growth is beyond question: "... economists appreciate today that the foremost input to economic growth is the advancement and utilization of knowledge."¹⁷⁵ L. D. Clarke refers to recent economic studies comparing technology-intensive industries with other industries in the US between 1957 and 1973. These studies show that:

- "(1) Technology-intensive industries grew 45 per cent faster;
- (2) Employment in technology-intensive industries grew 88 per cent faster;
- (3) Exports of technology-intensive industries grew at an average rate of 28 per cent per annum from 1973-75;
- (4) Productivity in technology-intensive industries grew 38 per cent faster;
- (5) The growth rate of the ratio of price to unit output grew 44 per cent less in technology-intensive industries."¹⁷⁶

There is a great danger, however, in seeking to understand Canada's situation by making comparisons mainly with obviously industrialized countries.

The industrial world is changing rapidly and semi-industrial economies are also striving to grow in industrial importance. Like Canada, they have dependent industrial positions, but unlike Canada they have less complete industrial structures or experience. Most of these countries are concerned with supplying their own markets and have adopted numerous variants of import substitution policy to achieve this. Their process technology is usually acquired abroad and delivered in a fully embodied state. Frequently it consists of complete up-to-date production facilities (delivered on a "turn-key" basis), for example, TV assembly or soft-drink bottling plants. In many cases (Brazil, South Korea, Taiwan, Greece, Mexico, Puerto Rico, Hong Kong), a large part of the industrial productive apparatus has been installed by, and is under the control of, transnational corporations.¹⁷⁷ Nevertheless, there are signs among many countries of a desire to change the nature of their relationship with foreign corporations. A growing list of controls and regulations over multinationals' activity is the consequence. Realization of the technological danger in being highly dependent on foreign sources has spread around the world in both under-developed (Brazil) and developed (Belgium) economies. One of the major fears of dependent economies is stated explicitly by Gilpin.

"The relatively free flow of technology which has characterized the past several decades may not continue into the future; this is a possibility that greatly concerns the Japanese and is forcing them toward a more innovative strategy. *At the least, if one is to acquire foreign technology, one must have technology with which to bargain and trade.*"¹⁷⁸ (Emphasis added)

The second basic Brazilian plan for scientific and technological development echoes this concern:

"... the multinational corporations should be induced to expend in Brazil part of their total outlays in research and development and, for this purpose, the Brazilian subsidiaries should be allowed to carry their own R & D budget and to sign contracts for project engineering with consultants operating in the country."¹⁷⁹

This reflects a wider objective, now established in Brazil and other developing countries (but so far not in Canada), of basing economic growth on domestic resources that include a national technological capability. The Brazilian plan reveals the belief "... that the national development only occurs at an acceptable pace when it is based on domestic resources — human, technical and financial."¹⁸⁰ Consonant with this philosophy is Brazil's conscious effort to develop national technological capability.

"The fundamental guidelines of the II PBDCT is therefore, the improvement of the technical level presented by the national enterprise, expressed by its managerial competence, efficiency in selecting and absorbing technology and in promoting R & D."¹⁸¹

Brazil seems to know what Canada should have known fifty years ago, and apparently still does not know.

While the first economic objective of industrializing countries is usually to increase their self-sufficiency in manufactured goods, increasing numbers of them are proving to be highly effective international competitors in a growing number of commodities. They achieve this by combining the most recent, optimal-scale manufacturing processes with very low to low wage rates, to produce high volume outputs. Textiles and clothing are important exam-

ples of competitive foreign industries but the range now includes such items as electronic components and sub-assemblies, home electronics, automobile parts, sporting goods, bicycle parts and bicycles, a wide range of plastic parts and goods, simple metal products, pottery, leather goods, shoes and many other items. The list will be extended in the future: and if, and when, the industrializing countries raise their levels of technological capability, more sophisticated products will be forthcoming.

International Changes in Location Patterns

Industrializing economies will, in the foreseeable future, possess an increasingly large share of the many industries presently concentrated in the highly industrialized countries. In a study undertaken five years ago in Japan, it was argued that care should be taken to gradually eliminate those industries which are labour intensive, polluting and most vulnerable to competition from countries like Mexico, Taiwan and Turkey. Especially significant was the recommendation that Japan should anticipate when it would no longer be competitive in ordinary passenger cars. Notwithstanding a high level of efficiency, it was calculated Japan would not be able to compete in price with new automobile plants in the developing nations by the late 1980s.¹⁸²

The potential shift of the automobile industry (parts and assembly) is only a foretaste of significant production transfers from the highly industrialized and industrializing countries in the future. Any industry which has reached technological maturity (e.g., steel, man-made fibres, textiles), and whose products are not bound to a market location by high transport costs, is a potential export base of industrializing countries. The rate and extent to which production transfers occur will depend on the willingness of the industrialized countries to let it happen, on their abilities to restructure their manufacturing sectors, as well as on their capacity to generate fresh avenues of technological change.

Faced with rising economic and social difficulties, the advanced countries may find it politically and economically expedient to blunt the challenge of the industrializing countries. Mature industries may be revitalized through innovation. Solid-state technology in television manufacture, for example, has simplified the circuitry of more complex colour TV as well as monochrome receivers; there is more extensive automation (automatic insertion of components in printed circuit boards, wave soldering equipment and computer-controlled automatic test equipment) and significant savings in labour costs have occurred.¹⁸³ This type of change is characteristic of the "third wave" of industrialization – high-skill positions replace operating jobs. For the US television industry, in a state of near collapse, these developments may mean it can compete with low labour cost manufacturers.¹⁸⁴ With the new capital-intensive technology, the most efficient scale of production requires very high levels of output. For this reason the Canadian industry, fractured into small units, is unable to benefit.

While TV assembly may be transferred back to some of the developed industrialized countries (as happened with pocket calculators) generally, it seems likely that the more labour-intensive production of components and sub-assemblies (which have a low ratio of transport to total production costs) will continue to be produced in the less industrialized countries. The ability

of a developed country to fight the inroads of industrializing countries will depend on its technological capability, especially its ability to innovate — an area in which Canada is singularly weak.

The long-term trend is clear despite this counter example: increasingly, internationally competitive proportions of a wide variety of mature industries will be located in the industrializing countries. The International Iron and Steel Institute, for example, is forecasting that between 1978 and 1985 in the Far East, steel-making capacity will grow by 27 per cent and in Latin America by 17 per cent, compared with less than 10 per cent in both Western Europe and the US. Steel from the new Third World capacity is expected to be cheaper than Japanese steel which, at present, has costs 15 to 20 per cent lower than American steel!¹⁸⁵

Furthermore, the industrializing countries are already reaching toward industries of greater technological complexity, thus beginning the slow process of developing autonomous technological capability. The remarkable rise of the Brazilian petrochemicals industry is worthy of close attention because it requires “massive capital investments and the implantation of advanced technology. *It represents a fundamental sort of industrialization.*”¹⁸⁶ (Emphasis added)

What Should Canada Do?

The output from semi-industrial countries is now scaling the Canadian tariff walls and competing effectively in the Canadian market. Already the death of a number of Canadian industries (e.g., TV-set production) is imminent and unpreventable. The threat of competition from low-wage countries is not, of course, a problem Canada faces alone. Even Germany, renowned for its strength in industrial machinery, is losing ground in its domestic market for standardized general-purpose machines to competition from industrializing countries.¹⁸⁷ But Canadian labour costs are very high by world standards; increasingly, Canada is an unfavourable location for manufacturing based on mature technologies, yet foreign-controlled firms dominating the medium- and high-technology industries are not for the most part, interested in using Canada as a centre for the development and production of new products.

Since innovations are aimed initially at perceived market needs in high income regions there are sound reasons why product development and early stage manufacturing is done at home. Some countries, especially Sweden and Japan, have responded to the power of US-based multinationals, for example, by building high-technology industries in selected areas, and thus ensuring some protection against the attrition of mature industries. Once again Canada has been unable to do this because (with very few exceptions) of its dearth of firms with offensive technological strategies. The Japanese are building their R & D capability in pollution control technology and in some areas are pulling ahead of their US competitors.¹⁸⁸ The Swedes are making progress in industrial electronics. Were Canada to specialize one obvious path to follow would be the development of technology based on particular Canadian needs and strengths, (e.g., geophysical instruments for mineral and engineering surveys, and technology for the surveillance of non-mineral resources).¹⁸⁹

Unless Canada can shift much of its manufacturing industry to defensive and offensive strategies and if the present problems of the world industrial

system continue or intensify, Canada could deindustrialize even more quickly than it has done so far. In effect, Canada needs policies which will restart the process of technological and industrial evolution that has only achieved a spluttering effectiveness since World War II. A strategy is required to create and secure technological capability so as to obtain for Canada a measure of technological sovereignty.

Goals for Canadian Industry

It is not difficult to see that the goals of an industrial strategy for Canada must be manufacturing *efficiency* and *competitiveness*. But returning even to the level of Canada's cost competitiveness of the 1960s would only slow down deindustrialization for, as our analyses have repeatedly shown, Canadian manufacturing was in relative decline during the 1960s. To bring costs down to a point where Canada is in the middle rank of advanced industrial countries, however, would necessitate overcoming high production costs associated with short production runs.

Canadian manufacturing would be in a better position if Canadian costs were reduced without any change in the level of technological and innovative capability (i.e., productivity increases are achieved by making better use of existing technology). But, the economy would still be less well equipped, compared with most advanced industrial countries, to make positive responses to the problems posed by the growing industrialization of the underdeveloped world. Furthermore, it would still be a weak competitor against other advanced countries which, with their higher levels of technological capability, are more able to replace dying exports with *new* products. In other words, Canada needs to be innovative like the advanced countries with their defensive and offensive firms.¹⁹⁰

Raising levels of technological capability has, historically, proved to be an evolutionary process. There is no experience of a country at the level of imitative strategy suddenly "leap-frogging" to offensive strategies. Furthermore, except in the largest countries, offensive strategies can evolve only in a limited number of areas. To ensure the emergence of offensive, innovative firms in selected areas, and to raise the level of technological and innovative capability of manufacturing, in general, will require supportive policies of substantial power.

This recognizes that a number of industries (e.g., steel, man-made fibres, internal combustion engines), presently of central importance in the industrial economies, appear to be technologically mature and their products are lodged in the mature phase of the product life cycle. As we know from Carrère's ideas, it is precisely these industries that are the first to enter the industrializing countries. Proven reliable and efficient, production systems can be purchased in totally completed form. They rely mainly on unskilled and semi-skilled labour, while their demand for professional and technical skills is limited. Often, newly industrializing countries have more up-to-date, large-scale and more efficient production facilities than the advanced countries (for example, compare the South Korean with the US steel industry). Low labour costs, combined with the most efficient mature technology, put the industrializing countries in a strong position to competitively undermine the advanced industrial countries.

It seems industrial countries like Canada have no choice; in the long term they must redirect their activities to technologically active areas, as well as revitalizing older industries by innovation wherever possible. The alternatives are either growing industrial and wider economic weakness, in the face of growing effective competition from low-cost producers, or the adoption of defensive neo-mercantilist policies which economically and politically could create more problems at national and international levels than they solve.

Innovations contribute to productivity increases and competitiveness and there is a significant positive correlation between industry rates of change in productivity and in output.¹⁹¹ As productivity in any particular sector increases, the price of its goods tends to fall significantly, sales increase and output grows. This means an industrial country can anticipate larger increases in employment in those industries with higher productivity growth. Thus, although industrial shifts related to technological change create problems of labour displacement, it seems that technologically progressive industries create more jobs on net balance than the technologically mature industries which are very vulnerable to secular industrial shifts at the global level.¹⁹²

Innovation is recognized as the major determinant of international competitiveness in manufactured products. Gilpin drives the point home in saying:

“In particular, a high-wage economy such as that of the United States in a world where new knowledge and technological innovations rapidly diffuse to lower-wage economies, must be able to innovate and adopt new technologies with equal rapidity if it is to stay competitive. American firms must in fact run faster and faster merely to stand still. For this reason, the status of industrial innovation and of the national R & D effort must be a central concern of the United States government.”¹⁹³

Canada has a long way to catch up but must attempt to establish the technological base on which employment and trade depend.

Innovative Capability

Canada can raise its technological status by investing in scientific R & D but this, with its long-term benefits, is not enough. Raising the “technological plateau” at which major industries function is as significant as achieving startling transformations in the scientific or engineering underpinnings of a few small sectors.¹⁹⁴ In this vein, product development activities must also receive major attention, as must a number of related non-scientific components of innovative capability noted previously and considered in a policy-context in Chapter VII. They include: product and process design; quality control; marketing and post-sales services; improved mechanisms for the transfer of technology; and the more developed application of management techniques. The importance of these areas of industrial innovation is illustrated by the role they have taken in the industrial development of other countries. Higher performance levels in these areas could only improve Canada’s ability to reduce imports of end products and to increase exports.

Unfortunately, the importance of design capability, for example, is often overlooked when economic arguments related to commercial and technological policy are developed. Yet, the pattern of industrial success in a wide range of economies in recent decades has hinged on the ability of firms to develop

and market new products. Design and marketing functions, as noted, combine both market perception, technological feasibility, and functional excellence of the final product (even the arrangement of the production line). There is an immediacy in this route to industrial development because existing technology is usually the starting point and Canada has a very large scope for innovation in medium- and high-technology products.

Only firms capable of competing and making profits on the basis of their present products and processes can survive to become more innovative firms. Therefore, initiatives are required to promote lower costs through *productivity gains* and, in the long run, through new products and higher levels of technological capability: without an improvement in productivity many Canadian firms will not survive long enough to raise their levels of technological capability. But over the longer run, firms, which do not become technologically progressive and/or innovative in design, will find survival very difficult.

The Canadian Manufacturers' Association is aware of the relationship between the two policy directions, noting that: "Operations and cash flows from standard products are needed to support the development of new products."¹⁹⁵; and, "... the need to have a better cost and price performance must be the motivating force of our industrial strategy. Unless our performance improves in this regard, even the most imaginative plans for a particular industry or the most attractive incentives for investment will not succeed."¹⁹⁶

The discussion of industrial goals thus returns to the need to increase productivity: three ways are possible and all have a technological base. The first is to reduce the cost of the inputs to the manufacturing process, i.e., material inputs, equipment, services, and wages. The second is to make improvements in the way inputs are transformed into outputs. This involves changing or improving technology product design, labour relations, and management. The third is to increase the value of outputs through such means as improved products advertising, use of trademarks, and improved distribution.

Technology Policy and Conventional Alternatives

Canada must start the process of creating technologically self-sufficient sectors within manufacturing. But technology policy cannot be treated separately from industrial and commercial policy: both technological and commercial policies are really specialized branches of industrial policy. From the evidence considered, Canada is sorely in need of an industrial development strategy and given the way economic activity has been changing in recent decades, technological development must be a central objective. Furthermore, commercial policy should be considered with, and supportive of, the industrial aims adopted by Canada.

Technology development strategy, concerned with all policies that bear, in one way or another, on technology development, is defined by its objectives, not its instruments. Thus, to a great extent, technology strategy is concerned with ensuring *coherence* between sets of policies of very different origins, which may not be seen by those who propose them as being associated with technology. Financial, fiscal, trade, development and other policies may have unintended or unconsidered effects upon technological activities. In the future these impacts must be considered very carefully. In practice many non-

technological policies probably have had unfortunate consequences for technological activity in Canada. Fundamentally, the lack of sensitivity of economic policymakers to technological implications makes the issue of forging a technological development policy such an urgent necessity in Canada. Canada's confusion about its attitudes to foreign direct investment is a prime example but policies related to business conditions, employment subsidies, and taxes are also important.

Free Trade as an Option

Conventional economic thought suggests that converting Canada's tariff stance to one of free trade would indirectly improve the performance of Canadian secondary manufacturing and that, eventually, technological capability would be a component of this. After reviewing this argument, it is felt that this move would be counter productive now although in better world market conditions and as a long-term strategy, it might have some appeal if the economy had developed an advanced technological capability.

While subsidiaries in Canadian secondary manufacturing are increasingly regarded by their parents as serving only the regional (Canadian) market, many inputs to these plants are not obtained locally. Consequently, many Canadian domestic firms are by-passed as suppliers of components and fabricated parts. As noted this deprives part of Canadian industry of significant stimuli to technological progress with the net result that technological progress in Canadian secondary manufacturing is poor, productivity increases are lagging, and manufacturing employment is stagnating. Foreign firms thus act as the vehicle for deindustrialization both in terms of employment and technological capability.

This set of relationships prevails while there is nominal *tariff protection*. In fact, as we have shown, Canada imports large quantities of industrial end products on a duty-free basis and many segments of secondary manufacturing illustrate the negative effects. What would happen to the more protected secondary manufacturing industries under progressively freer bilateral or multi-lateral trade? It seems inevitable that a large number of Canadian businesses both large and small would fail under the impact of cheaper foreign goods from more efficient producers in developed industrial economies (specifically the US) or from lower-wage producers in the Third World. Eventually, the price of some Canadian goods would be competitive on world markets because of further decline in the exchange value of the Canadian dollar stimulated by greater balance of payment deficits. Most secondary manufactured goods, however, would still be difficult to market outside Canada because of their mature technological form. In the long run such a situation might provide incentive, through necessity, for more aggressive marketing and industrial development. But what of the short-term social costs, in particular unemployment and massive industrial dislocation?

What is the evidence for believing that such a devastating scenario would follow from the move to free trade in secondary manufacturing? The logical place to consider this question first is in an industry where North American integration has already occurred: the automobile industry. While greater output and productivity in the Canadian automobile assembly industry resulted from the Auto Pact, it is also quite evident that the industry in Canada has

suffered further truncation and reduced technological capability. "Decision-making has declined in the Canadian sector of the auto industry and other executive, planning, administrative, design engineering and office occupations have also been lost, or at least their expansion reduced. After the Auto Pact, research and development, testing, and purchasing were centralized at United States head offices."¹⁹⁷ The analysis of employment change in Chapter III found, for example, that the industry's professional and technical status is the worst of Canada's higher technology industries.

It is neither coincidental nor accidental that as the Canadian auto industry has become a regional assembly component of a rationalized North American industry, Canada's trading deficit in auto parts has grown. Independent producers of original equipment (parts) in Canada have suffered because the Auto Pact does not encourage use of Canadian-made parts in Canadian assembly. In addition, they are unable to obtain an equitable share of the market, because of the preferential purchase arrangements of US vehicle manufacturers that favour "tied" parts producers, local producers, and competitive suppliers from Mexico, Brazil and Japan.¹⁹⁸

The position of Canadian independent auto parts producers sets a pattern likely to be repeated many times over if Canada agrees to increasing integration of the North American market without first functionally integrating large and small firms while the possibility still exists. The collapsing Canadian TV industry provides another illustration of the way failure in one industry spreads to affect firms in other industries. A duty remission scheme mooted for imported televisions and parts invites the industry to restructure itself as an assembly industry that minimizes the amount of manufacturing undertaken and this, in turn, reduces the linkage with firms in related industries, and the levels of technological capability in yet another industry-complex. The television parts industry is collapsing in concert with the disintegration of TV-set production. Three thousand jobs have been lost since 1973, and foreign-controlled TV-set producers are being stripped of their design capabilities (e.g., GTE Sylvania Canada Corporation and RCA Limited) and are increasing the inputs of components from abroad.

These examples reflect the known or certain effects of specific free-trade proposals developed on an industry basis. They appear to preserve some jobs, yet by so doing they guarantee long-term failure of the industry in Canada because of the strategies adopted by transnational corporations to ensure their own survival or to maximize their success in North American or global terms. These schemes, thus, yield no benefit to domestic Canadian firms engaged in component supply; similarly they provide the means whereby managerial, design and other technical jobs drift out of Canada to foreign head offices. The only extrapolation one can make is that when foreign, especially American, firms are presented with an open or industry-limited form of free-trade they will take actions that assist the process of deindustrialization in Canada. This process will be taken as far as possible, consistent with the low-level employment or production guarantees built into the agreements.

Further identification of the costs of entering broader-scale free trade with the US have been developed elsewhere.

"Based on the regional changes in the location of production in the United States that reflect a southerly shift in the industrial economy of North America. . . . this is a poor time for the northern periphery of the

continent to hope to establish that its industry can adapt to open North American competition and survive at its present level of national importance in a market dominated by multi-locational firms, headquartered in the United States.”

The argument stresses

“... locational patterns of North American corporations and the various consequences for Canada of their strategies. Canada has recently been badly served by high-wage gains and a highly valued dollar (both having an origin in the resource sector but with major impact on manufacturing), though recent decline in the Canadian dollar helps to restore a measure of parity on wage costs immediately north and south of the border. But in the long run Canadian industry will still be found vulnerable under free trade or with reduced tariffs until performance improves and a counterweight is produced to the increasing market accessibility, lower wages, other lower costs, and greater productivity of plants in the South of the United States.”¹⁹⁹

Rationalization of Manufacturing Firms

Canada needs to reverse the patterns of poor exports in secondary manufacturing, low productivity, low level of innovation, small corporate R & D expenditures, and weak systems of industrial linkage in secondary manufacturing. If Canada is to do this and develop a “Canadian” industrial capability (independent of the US) based on domestic interconnected competence, then:

“Government assistance will be needed in creating large Canadian corporations — rationalizing the existing structure of firms in industries so as to produce a world-scale Canadian company in each of those industries in which imports are large for example. This at any rate has been the experience of European countries in their own efforts to concentrate their industry and achieve the economies of industries.”²⁰⁰

The arguments behind the creation of large firms include:

1. Attaining (static) efficiency in production, given a particular technology, has a profound impact on competitiveness. This can be accomplished by using the best large-scale technology, producing a range of products in economical production runs, and relying on the firms’ own managerial, and professional services.²⁰¹

2. Large companies can maintain autonomous technological capability and can have basic effects on the profitability and progressiveness of small firms by generating streams of demand for products and stimulating technological change. Since the majority of foreign businesses in Canada will probably never allow their subsidiaries to develop an independent technological capability and the freedom to develop and compete on the basis of technological innovativeness, then the best long-term hope for Canadian secondary manufacturing lies with large Canadian “core” companies capable of: a) linking Canadian manufacturing firms into a functioning industrial system, thus revitalizing “small business”; b) deploying offensive and defensive technology development strategies in order that Canadian firms can compete domestically and internationally and function as an active agent in raising the technological capability of Canadian manufacturing.

Arguments in favour of rationalization have been aired fairly well over the years in Canada as have counter-arguments that the technological and industrial system arguments are of major importance. "But this is not to deny the present and expected future success . . . of a small number of usually small, specialized high-technology firms (for example, electronics), whose success is probably closely related to their flexibility and large research and development commitment."²⁰² It has been suggested moreover, that small firms, in fact, may have advantages over large firms at some stages of the innovative process. It seems that explanations of high efficiency in R & D for small firms is related to higher levels of entrepreneurial ability "superior technical personnel in the smaller firms, greater cost consciousness, and . . . better communications within the smaller enterprise."²⁰³

There are dangers in the strong encouragement of rationalization and specialization. It can lead to monopoly power that is undesirable. But once a more advanced industrial organization is in place, monopoly can be curbed by subsequent reductions in tariffs in order to generate efficiency gains from international competition and specialization.

VII. Framework for a Strategy: Canadian Technological Development

Having examined Canada's technological problems in considerable depth, outlining the way the country has become technologically and industrially dependent with its manufacturing but a pale reflection of the progressive sector the country needs, it is now important that attention be directed to the possible components of a strategy for national technological development. It has been possible to draw on the policy experience of many industrial and industrializing countries but Canada's particular problems have no twin elsewhere in the world. Thus the policy framework which follows is an essential Canadian response reflecting not only a particular constellation of problems but also Canadian institutions, and political realities.

This chapter builds on the conclusions drawn in previous chapters. Central to it is the concept of technological capability and its major component *innovation* which were fully explored in Chapter VI. The technological strategies which are explored in the following pages are aimed at increasing innovative activity in a wide range of industrial undertakings, not only those associated with high-technology products or new automated productions systems.

The Nature of Technological Policy

Technological policies are designed to improve the effectiveness of the production, diffusion, transfer, and utilization of technology.²⁰⁴ They are directed to three activity areas:

- 1) to the behaviour and decisions of firms that affect demand for technology;
- 2) to the supply of new technological knowledge and technological services; and
- 3) to linkages between the production system and domestic and foreign sources of technological knowledge.

Demand for technology arises because knowledge is needed for new products and processes and in turn, this implies technological capability in the firm in order to use new technology effectively, to choose between alternative sources of knowledge and equipment, and to adapt or improve technological inputs. Demand is articulated by technical and design groups within firms. A sound administrative organization and information system concerned with technological and market possibilities is required. Technology passes through an assimilation process within a firm. The *absorption* of technology is closely related to demand because it includes activities such as:

- 1) production research, plant optimization, product development, the search for minor innovations, the adoption of quality control standards, trouble-shooting, and other technical activities carried out within the firm;
- 2) the purchase of scientific and technological services directly linked to productive activities; and
- 3) obtaining through diffusion processes information about practices in other firms.

Two activity categories are responsible for the *supply* of information to producers: 1) industrial R & D units, research centres, universities, etc. concerned with *generating or adapting* knowledge to be incorporated in *production*; and 2) technological service units of firms, government departments and

separate firms whose function it is to assist producers to *use* new technology more efficiently.

These and other units also act to *link* the demand of the production system with the sources of knowledge. Various forms of extension services (like TRIS), consulting engineering firms, design and service engineering firms, industrial information systems, etc., are involved in ensuring a flow of new ideas.

Technological policy is required when there is a breakdown in the efficient generation flow and utilization of technology and/or a poor distribution of benefits of technology development. Policy measures are necessary because of Canada's marked disadvantage in the world-wide technological ordering of countries.

Explicit technology policy is directed to improving a country's technological functions and activities by such means as increasing the number of civil engineers, designing tax incentives to encourage more industrial R & D, or improving the transfer of technology from government laboratories to industrial firms. *Implicit technology policy* has also been recognized and consists of policies which have unconsidered and/or unintended effects upon technology. Only rarely are these effects taken into account in the design of policy and policy instruments, and policy makers have for the most part only the slightest awareness of them.

The number of *non-technological* policies which may impinge on technology and its development is very large. There are high level policies such as articles or sections of general laws (agriculture, health, mining, etc.), industrial promotion laws, general and sectorial development plans, international commercial agreements, wage and social security policies, etc. Low level policies and decisions include the credit system, foreign exchange regulations, characteristics of investment decisions, foreign trade policy and regulations, purchasing, decisions by state enterprises and large private enterprises (especially foreign owned) and in general, decisions by government agencies with some autonomy in their behaviour that may affect technology functions and activities.

Any evaluation of existing technology policy must take account of the technological implication of other measures in order to see if explicit technological policy has been deflected from its goals. In practice, the limited success of many specific explicit technology policies in the past is strongly tied to a pervasive failure in Canada to evaluate and reconcile the relationships between explicit and implicit technology policy and between implicit policy and the economic environment.

Those aspects of the socio/economic system that are unalterable in the short term are often known as contextual factors. The STPI project (Science and Technology Policy Instruments) has suggested, as an operational consideration, that if a particular characteristic may not be altered significantly over a period of four or five years, it should be regarded as a contextual factor.

The most important contextual factors are those that:

"... a priori appear to have some effects on scientific technological functions and activities either directly or indirectly through their influence on the organizational structure to implement policies. The effects can take the shape of constraints and limitations to what an explicit scientific and technological policy may attempt to do or achieve, or they may imply

drawbacks and obstacles to the way the organizational structures function, thus having an influence on the effectiveness of instruments.”²⁰⁵

Some contextual factors are invariant and express a country’s physical and spatial characteristics (resource endowment, size, climate, etc.) which for all practical purposes are unalterable. Others refer to the socio-cultural structure (culture traits, value norms, etc.), which can be changed to some degree over the long term. Finally there is the class of contextual factors, resulting from long-term cumulative policy making. In this case it is acknowledged that the economic system reflects policies implemented over a long period of time, for example, characteristics of the industrial structure, of industrial branches and of firms; the behaviour and attitudes of entrepreneurs.

Many contextual factors carry a negative connotation and a major long-term policy goal must be to change them. Cumulative policy making over several decades, for example, has led to a poorly structured economy in which there are too few pressures on firms, and little ability to undertake worthwhile technological activities. Past policies have created a dichotomy between foreign and domestically-owned firms which vitiates technology policy, because *“Technological improvement cannot be expected without a rational industrial policy frame.”*²⁰⁶ (Emphasis added)

Technology policy requires coherence between policy making at the government (macro) level and decision making at the level of firms, research centres, consultants, etc., (the micro level). As shown in Figure VII.1 the connections between government policy and the decisions made at the micro level traverse ground occupied by many implicit technology policies as well as the vast array of contextual factors. Thus, to produce effective technology policy and instruments requires an understanding of all the elements in the technology system, and all the interactions between them, at the national, regional and industrial levels.

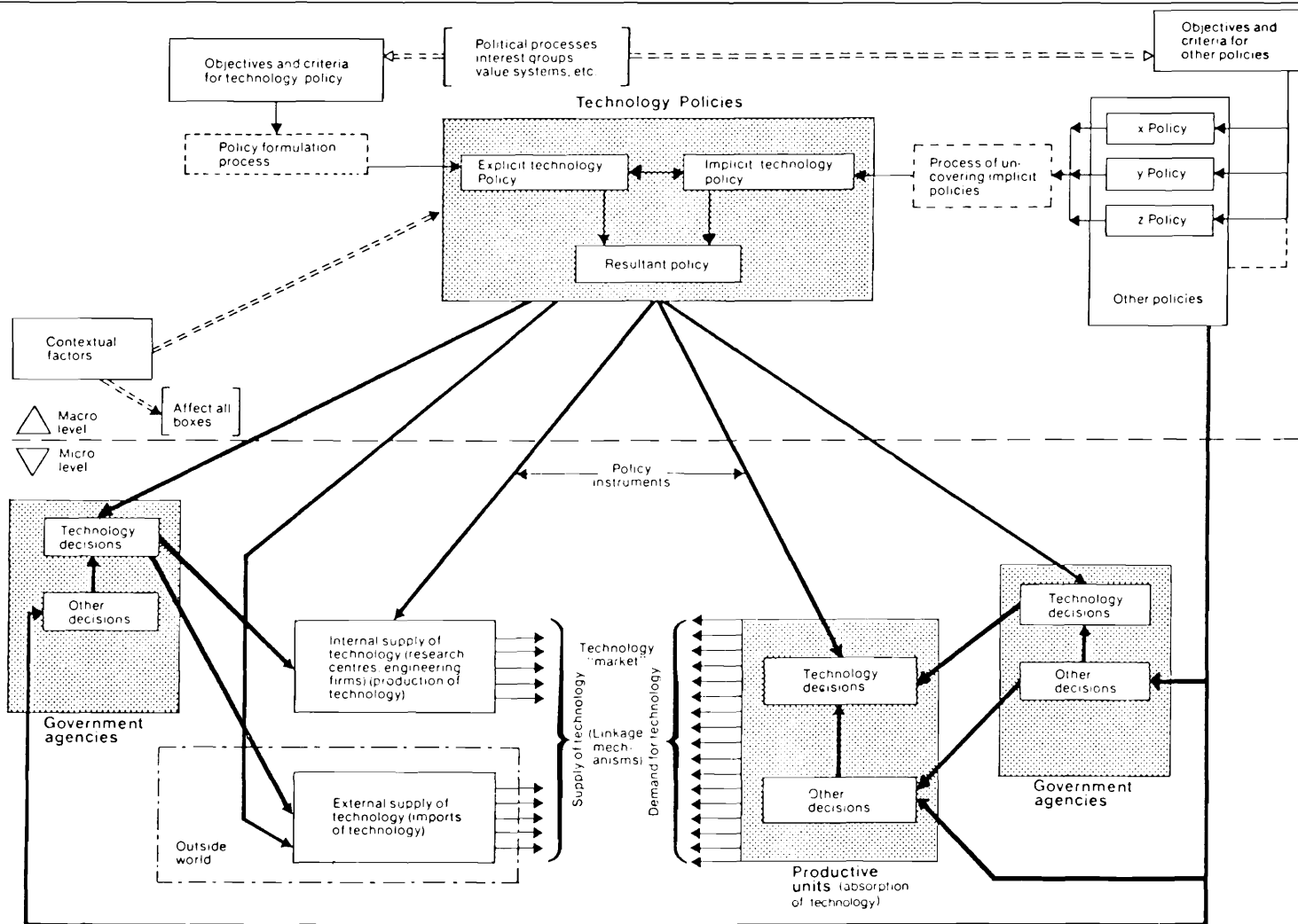
A New Environment for Development

This study does not articulate a fully developed, comprehensive technology development policy for Canada. Further research is required before such an exercise is contemplated. But enough is known about the Canadian technology system and its problems to allow the identification of certain broad policy directions that will have to be followed if Canada hopes to maintain a serious interest in manufacturing industry.

Through its own past policies Canada has created an environment inimical to the attainment of high levels of technological capability and operational efficiency. At present, powerful barriers to the creation of an efficient technologically progressive manufacturing exist.

A set of explicit technology policies by itself will be inadequate to the task of achieving a rise in levels of technological capability and an improvement in the competitive position of manufacturing. What is needed is a broadly-based industrial development strategy designed to sweep away the long standing impediments (contextual factors) to the emergence of internationally competitive firms in Canada, and to provide a new framework in which technological policies will impinge favourably on decision making at the level of the firm.

Figure VII.1 – Context of Technology Policy



Source: International Development Research Centre, *Science and Technology Policy Implementation in Less-Developed Countries: Methodological Guidelines for the STPI Project*, IDRC, Ottawa, 1976, p. 32.

Past Canadian economic policy paid little or no heed to the role of technology in development and this omission, which has continued to the present, is in fact one of the major contextual factors which an industrial development strategy for Canada must overcome. Fragmentation in many Canadian industries renders them incapable of generating the productivity improvements and technological progress, Canada so urgently requires. Foreign-owned firms, technologically dependent upon parent firms will inevitably have difficulty in being responsive to Canadian initiatives to promote greater innovation.

This study has described and analyzed many negative contextual factors in the structure of manufacturing and of individual industries, in weakly developed inter- and intra-industrial linkages, and in low levels of managerial and technical competence, entrepreneurship and innovative activity. Industries and firms are truncated and technologically dependent. Vital elements of industries, such as design capability, and related activities are weak or missing. There is a unique size-ownership dichotomy producing a sort of technological dualism, with a plethora of small, often inefficient technologically-isolated Canadian firms on one side, and larger, but still inefficient, technologically-dependent foreign firms on the other.

Canada must extract a performance from its manufacturing which will not be forthcoming without policies that depart radically from the past. In addition, the contextual factors exerting such negative effects on technological capability and competitiveness, will not be removed without a national industrial strategy devoted to their removal. Far-reaching positive re-structuring of the manufacturing sector is required: this is unquestionably the most important step that can be taken toward technologically dynamic manufacturing. Technological guidelines, however, must be woven into a wider industrial strategy because the main reason Canada must restructure its manufacturing, is to create an environment that can sustain technologically progressive firms. It is imperative, furthermore, that a wider industrial strategy incorporate the concept of *Canadian technological sovereignty*, as advocated by the Science Council of Canada since 1967.

A Wider Industrial Strategy Incorporating the Concept of Technological Sovereignty

Technological sovereignty means the development and control of the technological capability to support national sovereignty. The Science Council has suggested areas in which Canada needs to exercise *technological sovereignty*:

“Firstly and most importantly we need to be master of those technologies essential to survival in the Canadian physical environment – a vast space with varying climatic conditions (e.g., housing, energy). Secondly, we must encourage the indigenous development of those technologies where we have a geographical advantage (e.g., natural resources extraction and processing, oceans and arctic technologies). Thirdly, we must be in control of those technologies which support national unity (e.g., transportation and communications). Finally, we should further the development of those technologies where we have historically shown excellence (e.g., nuclear energy, electrical transmission, communications).”²⁰⁷

The Science Council also outlined certain principles, the acceptance of which it regards as essential to the achievement of technological sovereignty.

1. Canada must control and improve upon technologies considered vital to Canada.

2. In areas where Canada needs to be technologically sovereign, Canadian ownership of private firms must be deliberately encouraged.

3. Through its policies, the Canadian government should support the development of indigenous technological capabilities in selected areas. A "buy Canada" principle should be reflected in policy formulation to ensure the long term well-being of firms deemed essential to support technological sovereignty. Most industrialized countries have in place policies which favour indigenous companies over foreign firms.

4. A number of proficient, technologically progressive firms of international stature should be encouraged: achieving the corporate strength required to compete effectively in overseas markets necessitates the rationalization of Canadian industry.

5. The development of a range of small innovative, technical firms should be encouraged. These will complement the larger Canadian "core" companies and promote entrepreneurship.

6. Major programs addressing socio-economic needs and involving significant components of science and technology need to be set in place.

7. Canada's basic research effort should be strengthened to ensure scientific capability and to increase the stock of highly-qualified manpower essential to the support of technological sovereignty.

On the basis of the understanding of Canada's industrial difficulties developed in this study, of our appreciation of the role of technology in industrial development, and of the nature of technology policy, we can expand upon the Council's brief indications of technological sovereignty and can explore in greater detail some feasible policies and policy instruments.

Technological sovereignty implies selective technological development as well as the creation of an environment conducive to a general improvement in Canada's technological capability. As such it is a technological development strategy, although as the Council realizes when it talks of the necessity of rationalizing Canadian industry, one which must be couched in the framework of a wider industrial development policy taking account of many more variables. Although the Science Council has suggested adhering to certain principles in order to achieve technological sovereignty, those principles may be strengthened and expanded.

Building on work by Sagasti we offer seven principles which we regard as essential to the development of sound coherent technology development policy.²⁰⁸ Drawn from the most exhaustive research yet undertaken on technology development and policy, and oriented by the particularities of Canada's dilemma, these principles are the minimum common denominator for agreement if the subject of technological, and thence industrial, development policy is to be treated seriously.

1. *Technological progress which is the set of ongoing processes that create, diffuse, and utilize knowledge is of the greatest importance to the socio-economic development of all countries.* During much of its past, Canada, while anxious to enjoy the wealth associated with a high level of econo-

mic development, was at best, only dimly aware of the contribution made by technology progress to high levels of social and economic development over the long term. Public policies largely ignored the role of technology in development and the consequence of a failure to develop an indigenous technological capability has been technological dependency associated with economic underdevelopment. After recognizing the significance of technological development, Canada must overcome the negative effects of technological dominance exercised from abroad through policies which will undo damage from neglect. Such policies must be directed to increasing autonomous technological capability, to regulating the import of technology, and to increasing the demand for indigenous technology.

2. *The importance of technology to economic development necessitates the creation of an explicit, coherent technology policy as distinct from science, labour, economic and other policies. But technological progress is not an end in itself and technology policy must always serve to support the achievement of social and economic goals.* Many non-technological policies have an implicit negative effect on technology development; hence, in addition to taking positive specific steps to increase the technological and innovative capability of manufacturing, Canadian governments must review non-technology policies in order to identify their implications for technology development. Negative implications and contradictions between policies must be eliminated before implicit and explicit technology policies and policy instruments can become coherent.
3. *Government "intervention" at all levels is essential to reach the goals implied by technological sovereignty.* In so far as government intervention, in the form of long standing policies and attitudes, is largely responsible for the current industrial dilemma and for Canada's technological weakness, only government "intervention" in the form of new policies and instruments is equal to the task of reversing the effects of several decades of misguided policy.

By itself, the marketplace has proved unable to promote technological development and to ensure its correspondence with social and economic objectives. Government actions must be directed to regulating technology imports, to strengthening the bargaining power of Canadian firms when purchasing technology from abroad, and to promoting stronger links between Canadian technological activities (e.g., sources of product and process innovation, government laboratories, consulting firms) and Canadian producers thus fostering technological research oriented to Canadian social and economic needs (e.g., efficient transportation systems, housing appropriate to our environmental conditions), and to promoting heightened levels of technological capability in goods production.

4. *Canada will always import most of its technological needs. Policies of self-sufficiency in technology can lead only to backwardness, therefore policies to enlarge Canada's indigenous technological capability must be based on a strategy of selective interdependence.* The Science Council

has indicated some of the criteria to guide selection: technologies essential to survival in the Canadian environment, technologies related to activities rooted in a geographical advantage, technologies which support national unity, and technologies in which we have historically shown excellence. It is important that the selection of areas of specialization also take account of the possibility and convenience of importing technology, as well as the possibility of exporting technology that might be produced. Selective interdependence must be coordinated at the regional level.

5. *The formulation and implementation of technology policy requires action concerning both the demand and supply of technology.* Canadian policy, traditionally, has been biased toward increasing R & D as a precursor to innovations in processes and products. The impact, which has been limited, has never affected more than 400 to 500 firms in Canada. More importantly these explicit technology policies were never coordinated and bound together into an industrial strategy. They encouraged the generation of new knowledge without consideration of the possibility of stimulating demand for new products, processes, and capabilities, and with inadequate exploration of the linkages between innovations, productive activities, and economic goals.

Action on demand should reflect commonly held perceptions of national and regional social and economic needs and the sources of demand should be involved in defining and setting up a technology policy (e.g., the Department of Northern Affairs, federal and provincial transportation ministries, the Department of National Defence, municipal governments, etc.). This implies a need to establish a new network of institutional interconnections which will serve to prevent discordance between supply-oriented and demand-oriented industrial policies. The "major programs" suggested by the Science Council could and should provide an appropriate vehicle for integrating technology supply and demand.

6. *A technology development policy for Canada must take account of the differing characteristics of various industries and regions: a technology policy common to all industries and regions will be of limited value.* It is important to design differentiated policies that reflect:

- 1) the types of technology involved (e.g., innovations vs. science);
- 2) the need for technological activities;
- 3) the distortions created by the ownership structure;
- 4) the number and size of enterprises; and
- 5) the characteristics of the technology market.

This means a set of policies differentiated by industry, and where appropriate by region (province).

The regional component recognizes not only differences in human and natural resources but also in the political form of Canada. At the best of times, industrial development is an exceedingly demanding exercise, but in a country of divided political jurisdiction it is even more difficult. Pressures for greater decentralization in economic decisions are strong with the provinces asserting themselves in areas they consider vital

to their interests. Some have already formulated and begun implementing industrial development strategies. Thus, a national industrial development strategy embodying the concept of technological sovereignty can be effective only if it accommodates provincial needs and objectives. Indeed, the only practical means of deriving an industrial strategy for Canada may lie in the coordination of provincial industrial strategies conceived within a framework of commonly agreed criteria and constraints. The role of the federal government lies in coordination (for which a new agency may be desirable) and in the creation of an environment conducive to the goal of industrial and technological development.

7. *Technology policy is affected by changes in external and internal factors of a non-technological nature, hence it must be kept flexible and should be implemented gradually.* Technology policy must be protected from undue effects of changes in other policies: but, at the same time, technology policy must be dynamic.

Lines of Action

Flowing from these guiding principles, several lines of action for the formulation and implementation of a wider industrial strategy can be defined incorporating technological sovereignty. These are:

1. Increasing the demand for Canadian technology.
2. Increasing the capacity to develop technology.
3. Increasing the capacity for technology absorption at the level of the production unit.
4. Regulating technology imports.

Increasing the Demand for Canadian Technology

The low level of technological capability in Canada in part reflects the weak demand for Canadian technology. A concerted effort to raise the level of demand means re-directing to Canadian sources demand presently oriented to external (foreign) sources and generating more demand for technological activities, especially those related to national needs. Opportunities exist both in the public and private sectors. The former is our main concern but some broad policy thrusts relating to the private sector will be noted.

Canadian manufacturing industry exerts a weaker demand for indigenous technology than occurs in developed economies. Unfortunately manufacturing, which will both raise levels of demand for Canadian technology and increase its capability to create (supply) technology, will not make its appearance without a fundamental restructuring of the industrial sector. But the low level of demand for Canadian technology by manufacturing reflects the basic structural deficiencies of industries and firms (both domestic and foreign). As the major problems and impediments are contextual, there are no quick, comprehensive remedies for the private sector: the creation of restructured firms in a new environment conducive to such restructuring is the only way to significantly raise private sector demand for Canadian technology on a permanent basis.

The policy initiatives should create profitable, efficient, technologically progressive firms. Only with the existence of many such firms will the prob-

lem of low demand for indigenous technology be permanently overcome. Reduction and ultimately elimination of the structural imbalances in Canadian manufacturing is required. This means measures ensuring the growth of the presently under-represented research-intensive industries; creating greater autonomy (including technological) in foreign subsidiaries, i.e., policies to de-truncate industries and firms; encouraging growth of domestically-owned and controlled "core" companies able to compete internationally and domestically on the basis of their technological excellence; raising the productivity and competitiveness of Canadian manufacturing in general (rationalization and specialization); and encouraging all businesses in Canada to increase the Canadian content of material and service inputs. None of these goals, except the last set, refers directly to raising the demand for Canadian technology. This would be an indirect effect of a restructured manufacturing sector comprised of possibly fewer, but stronger, firms.

For more direct and thus much more immediate effects on the level of demand for Canadian technology, the public sector is the key. The purchasing powers of government departments and agencies are probably the most obvious means of raising the demand for indigenous technology because the state is one of the main purchasers of goods and services. This purchasing power can be an important tool in achieving development objectives: enhancing technological capacity through the direct purchase of research and development services; supporting both technologies related to national needs, and engineering and consulting services; and extending preferential treatment to domestically-produced goods, especially those incorporating Canadian technology.

In 1974-75, the three levels of government in Canada purchased goods and services valued at \$15.5 billion; if the expenditures for Crown corporations and other public enterprises are included, total governmental expenditures on goods and services were approximately \$27 billion. When harnessed to industrial and technology department policies and objectives, this very considerable purchasing power can be a powerful tool for industrial development.

Government purchasing may be employed to increase the demand for Canadian technology in three distinct ways. Whenever possible they should be coordinated. The first may be described as a "Buy Canadian" philosophy, giving Canadian goods and services preferential treatment and especially, favouring goods incorporating Canadian technology. Government purchasing would allow domestic firms to improve on their innovation, production, and marketing capabilities and help them to overcome scale, production-run length and technology handicaps. The first step toward a more effective use of government purchasing should involve a thorough appraisal of the purchasing philosophies at all levels of government. Such an appraisal will indicate ways in which government purchasing may be used to strengthen Canadian manufacturing, in particular, the domestically-owned sector. Special attention should be paid to coordination between governments and between departments and agencies, to aggregate markets which, though large, are often fragmented between governments and agencies, and thus deprived of much of their potential to stimulate the growth of strong Canadian firms. There are areas with large *combined* public expenditures, such as defence, health and education, in which the technological and industrial opportunities should be

identified and supported through coherent policies. Perhaps most important of all, public purchasing policies should offset the possibility of making short-term gains (e.g., buying a cheaper foreign article) against the possibility of making long-term development gains, even if it means buying a higher priced domestically-produced article.

In any new government procurement policy, residual "Canadian content" purchasing must be upgraded to eliminate discrimination against Canadian-owned businesses and favouring of products manufactured to a foreign design. Although purchasing Canadian goods, based on foreign technological capability, is better than not buying in Canada at all, the full potential of government purchasing is not being used if it fails to stimulate and support within Canada the development, designs, production engineering, and the several other activities involved in innovation. The greatest value of government purchasing is its capability to foster technological and design capability; it is the best long-term guarantee of healthy manufacturing firms and job and career opportunities in manufacturing. Canadian content is not enough; procurement must also contain a "Canadian technology" guideline.

To improve the capability of Canadian firms to respond to and benefit from government procurement requirements, governments must ensure that firms are given enough "lead-time" to prepare themselves to respond competitively. We allude to the purchase of large technological packages, some of which are the "one-shot" variety. Canadian firms should be given preferential treatment in the form of considerable advanced warning of future government needs in order to prepare (i.e., organizationally, technologically and in other ways) to compete for a government purchase contract against stronger, established foreign producers (often with "on-the-shelf" technology). The current equipment replacement program of the Canadian Defence Forces provides an excellent example of the importance of the "lead-time" principle.

The Department of National Defence has announced that a large number of new naval vessels will be required over the next ten to fifteen years. Expenditures of around \$2 billion have been mentioned. This is an excellent opportunity to revitalize the Canadian shipbuilding industry by enabling it to reorganize into a number of specialist producers possessing technological depth. The effects on the producers of related sub-systems would also be beneficial. Without adequate advance information on government requirements and without a clear government intention to use its defence purchasing as a tool to strengthen and develop Canadian manufacturing, Canadian shipbuilders will find themselves in an unequal competitive struggle against large experienced foreign producers capable of responding quickly once a call for tenders is made. The Canadian industry, at best, may get some of the work (Canadian content), but not the opportunity to develop a strong technological capability or to rationalize in such a way as to create stronger more competitive firms.

Second, government purchasing can be tied to policies reflecting national or provincial economic or social needs. The federal and provincial governments should involve industry in the development of technologies essential to solving economic and social problems, and to furthering national interests. The federal government's experience with this approach provides ample proof of its value in developing industrial strength, including technological capability. Some of the greatest Canadian successes in creating new industrial and

technological capability have occurred when the federal government has specified a priority in development and acted in entrepreneurial fashion. Canada's well developed capability in nuclear power is a clear example of what the state can do when it perceives a need, provides a market, and facilitates the development of the appropriate technology. Thanks to the demand generated by government in relation to an identified need, there are now firms in Canada with capability and experience in such areas as reactive vessels, steam generators for a low pressure CANDU system, heat exchangers, zirconium alloys, large pressure tubes, nuclear pumps, nuclear fuel and many others. The federal government's communication satellite program has had similar beneficial effects on manufacturing industry.

The lessons to be drawn from these governmental development initiatives have long been apparent to the Science Council. Since at least 1968, it has been advocating the use of "major programs" as an important tool for strengthening Canadian science, technology and industry, while at the same time responding to national needs.²⁰⁹ Major programs were conceived as,

"... large, multidisciplinary, mission-oriented projects having as a goal the solution of some important economic or social problem . . . Research and development will naturally play leading roles in these major programs, but it must always be remembered that the objectives will be the implementation of solutions to problems or the fulfilling of needs and that the programs will be concerned with the production of new goods and the initiation of new services."²¹⁰

Such programs, financed by the federal government should affect entire regions, should last over decades, embrace a variety of technologies, and be planned to maximize the benefits to Canadian industry and the Canadian workforce. Renewable energy and an improved national transportation system are just two obvious major areas in which the federal government should take the lead in identifying needs and establishing programs to meet them.

The third way in which government may employ its spending power to strengthen domestic manufacturing is by using the considerable power it possesses as a financier of investment projects. Around the world, governments are increasingly becoming joint participants with private industry in very large, and often high risk projects. The Syncrude project is one such example. When governments participate financially in development projects, their leverage as financial agencies should be recognized as an important policy instrument for increasing the demand for indigenous goods, services and technology. Indeed, the financing of investment projects by governments, which is likely to grow in importance, may well be one of the most effective mechanisms to insert the technological perspective in development planning and possibly the best way of generating a demand for local technology. This instrument requires the explicit incorporation of criteria related to technological development in the evaluations of the proposals for government financing. Criteria to evaluate the impact of an investment project on local technology should be applied from the implementation to the project execution phase.

In addition to technological criteria for project evaluation, the intervention of government as a financing institution may be directed toward 1) the provision of risk capital for the development and/or improvement of techno-

logies of local origin, 2) provision of preferential credit to users of local technology, including design engineering and consulting services, and 3) provision of financial support to research units in industry and technology research institutes. The employment of such instruments may be supplemented by legal and administrative measures and incentives in order to produce a substantial increase in demand for Canadian technology.

Developing the Production of Technology

In the recent past, Canadian policies have been oriented to developing the production of technology, but success in raising levels of technological capability and promoting innovation has been limited. The reasons lie in the poor adaptation of the policies of the 1950s and 1960s to the factors causing Canada's recognized deficiencies in technological and innovative capability. These negative (contextual) factors were either ignored, unnoticed, or taken as an unalterable fact of life (it is a matter of opinion which of these was more relevant) and the innovation policies assisted only the few able firms. Policies to promote technology development were not designed to overcome the major obstacles to higher levels of technological and innovative capability in Canadian industry.

Only about 500 firms participated in the programs oriented to technology supply (the "alphabet soup" – Defence Industry Productivity (DIP), Program for the Advancement of Industrial Technology (PAIT), Industrial Research Assistance Program (IRAP), etc.). Government policy was oriented to the small number of firms known to be performing some kind of R & D. The bulk of these firms are foreign-owned and for many much of their so-called R & D is of a trivial nature, and even, when not trivial, largely concerned with adapting technology and products to Canadian production and market conditions.²¹¹ These programs have been of limited utility; after all, during the period when they were in effect, Canadian manufacturing was manifesting signs of growing debilitation. Some firms may have been given the initial resolve to undertake some new R & D activity, but even that is doubtful. The federal government's activities on the demand side have always been much more effective in stimulating technology development. The guarantee of a government market, e.g., in the form of a military contract, has been far more effective in fostering the growth of new products and enhanced technological capability.

The very limited success of explicit policies oriented to the supply side reflects among other things, a fundamental misunderstanding of the contribution of research and development to industrial strength and excellence. Policies were based on the idea that R & D creates industrial strength, when in fact it is industrial strength which creates a fertile ground for research and development. In the Canadian context, technological and innovative capability are not likely to improve significantly until the contextual factors responsible for high cost, inefficient, uncompetitive firms, are removed. The only way to develop the production of technology in Canada is first to set in place policies to overcome these factors – generating a new environment conducive to the growth of efficient and competitive firms and industry. Then, explicit technological policies could be effective.

Rationalization, Specialization and Core Companies

The way to increase the supply of technology created in Canada lies solidly

and squarely in the problem of how to promote the emergence of strong, competitive firms. How is this to be accomplished? There is almost universal agreement that the key lies in a set of coordinated policy measures designed to achieve rationalization and specialization in manufacturing.²¹² These measures are essential to higher levels of productivity and competitiveness, which in turn are prerequisites for the creation of more firms able to compete successfully in overseas markets, the existence of which is regarded as necessary to a vital manufacturing sector.

Rationalization means vertical or horizontal integration created, principally, by means of mergers and joint-ventures. Its justification, as outlined earlier, is found in the achievement of economies of scale not presently realized in an industry fragmented by too many (therefore weak) producers, or in the economic efficiencies associated with specialization, or both. It almost always involves the restructuring of an industry, or a complex of industries, in the sense that the number of firms is reduced either through elimination or amalgamation. Specialization means reduction in the range of activities, or concentration on a narrower range of products with a view to achieving the higher levels of efficiency that are associated with greater production-run length. Most commonly it is associated with restructuring internal to the firm as distinct from inter-corporate changes, but it may involve re-allocation or rationalization of activities between firms. Both rationalization and specialization, if sensibly employed, result in concentration of effort and resources, and thus facilitate greater efficiency.

From the outset the possibilities for rationalization and specialization are conditioned by the ownership pattern of Canadian manufacturing. Massive foreign penetration severely constrains the potential for rationalization in Canadian manufacturing, particularly in those industries where it is most urgently needed (the research-intensive and a number of the resource-related industries). Rationalizations involving the subsidiaries of transnational corporations would imply the following consequences.²¹³

1. Merging truncated (functionally incomplete production units) firms with the hope that the fewer, but larger, remaining firms would be able to "detruncate".
2. Asking subsidiaries to behave as if their corporate ties have been severed when in fact they still remain.
3. Firms which are in competition with one another outside Canada would be corporately united within Canada.
4. Involving American firms in a situation likely to provoke the invocation of American anti-trust enforcement.

Given these conditions, the possibilities for rationalization involving foreign-controlled firms are limited.²¹⁴ The best prospects for strengthening the performance of the foreign-owned sector, reside in strategies to achieve greater *specialization* and consequently greater technological capability within the firm. A major task for the policy makers lies in devising a series of related instruments which will achieve this objective. More specifically they should consider the following questions. Is greater specialization in the foreign-controlled firm, dependent upon freedom to develop export markets? What are the present constraints placed on foreign-controlled firms with respect to export activity? What kind of policy measures would serve to reduce these constraints? Greater specialization should be associated with greater

Canadian technological content: what policy measures and instruments would be required to 1) induce foreign-controlled businesses to substitute domestic for foreign inputs, or 2) create an environment in which such substitution would be desirable? Does the answer lie in inducing subsidiaries to develop an autonomous technological capability in Canada?

The prospects for rationalization involving Canadian-controlled firms is much better. Many domestic firms would no doubt welcome opportunities to become more internationally competitive. Unfortunately, the number of potential candidates for useful rationalization measures is small: there are, however, some Canadian firms, already large and competitive, or with the potential to become so, which can be seriously considered as the focal points for merger activities or other forms of rationalization intended to create Canadian "core" companies.

By a "core" company, we mean a firm that is Canadian controlled, or, at the very least, is jointly controlled by foreign concerns and Canadians: it should not be narrowly specialized; it should have the capacity to innovate, in the sense that it deploys offensive and at the least, defensive technology development strategies; and it should be competitive in foreign markets or have the potential to become so. This last condition is crucially important. There are two ways in which it may be satisfied:

1. Through association between a Canadian firm and a foreign firm that not only has established foreign markets but also has access to technological and other information. This is likely to be feasible in the large number of industries dominated by foreign-controlled firms none of which is strong enough to compete internationally.

2. Another basis for core companies rests in identifying firms whose international competitiveness and long-term success will rest on technological excellence, i.e., on design capability and innovation and ability to create advanced technology. This type of core company will, therefore, possess or be able to develop autonomous technological capability, that is, be able to generate or adopt and exploit new technology. We are talking of integrated firms capable of generating the required cash flows to support and sustain research and development.

Core company should not be interpreted as meaning a vast multinational firm. Internationally competitive — yes: technologically excellent and progressive — yes: but gigantic so as to rival Phillips or ICI or IBM — no. This is neither necessary nor practical. A growing body of opinion suggests that bigness in most types of manufacturing has reached its feasible limits and is now creating more problems than it solves. In fact it has been argued that the pattern of change in technology will favour smaller firms and production units and encourage experimental entrepreneurship. It is expected that by the end of this century, industrial structures will tend toward two main types, with many big corporations overlapping uncomfortably:

"(a) a steadily-decreasing number of steadily-higher but low employment and automated "public-utility-type" plants in steel, some basic chemicals, some basic engineering components, plus the infrastructure for the data banks, telecommunications systems, solar energy, etc. (all of these will have the constant economic problem that they will be able to produce at lowest cost only when they are pumping out their products in such glut that low market prices may make their whole operation seem a

loss-making one); and (b) a rapidly-increasing number of steadily-smaller new entrepreneurial businesses that will be best-fitted to experiment in using the exciting new low-marginal-cost products (above all computerized and telecommunicated knowledge) in the most imaginative way.”²¹⁵

These arguments are consistent with ours concerning the “third wave” of industrialization (in particular Chapter III) and serve to point out the dangers of retrogressive thinking when considering the future of Canadian manufacturing. Our model of an internationally competitive firm for Canada should draw on the best predictions of the future rather than our knowledge of what has been successful in the 1950s, 60s and 70s. It would be tragic if attempts were made to emulate an obsolete model of organization and production. *An industrial strategy must take Canada into the 21st century and not make it a late entrant into the mid-20th century form of industrialization.*

By world standards, core companies may be medium-sized and flexible industrial organizations based on emerging opportunities and emerging Canadian needs, tied in production relationship to smaller technologically-based Canadian companies. This latter requirement is only one factor out of many which points to the need for an industrial strategy with a small business component. Some thought is given to small business policy later in this chapter.

There appear to be two major avenues for the creation of technologically-based Canadian core companies.

1. By identifying existing, strong firms in promising technological areas. IT&C has already identified technological advances on the verge of significant growth, and firms capable of providing a foundation for extensive Canadian participation and perhaps even leadership. There are promising opportunities in fibre optic telecommunications systems, micro-computers for specialized applications, computer-aided design and manufacturing, biomedical engineering, and medical instrumentation. These are emerging opportunities. There are existing and growing areas in which Canada already has strength and where performance can be greatly improved via a core-company strategy. Canada has an advantage in “. . . high technology, high engineering, high product skill, tailor-made machinery. For example Canada has considerable expertise in areas like hard rock mining and pulp and paper technology.”²¹⁶

While technological opportunities, existing or potential, are important, even more significant is existing or potential technological capability in domestic firms. Without this, markets cannot be exploited. Existing or potential technological capability is resident in the fewer than 40 Canadian-controlled companies that spend more than \$1 million per year on R & D, and in a greater number of small firms that are aggressive and possess patents. A number of the latter may be potential future core companies.

2. Coordination of the core company philosophy with the major program concept of the Science Council. Meeting identifiable social and economic needs through the structure of a major program would involve the procurement by government of research, development, services and goods from the private sector. To maximize long-term industrial development effects, government should employ its procurement power to support core firms as centres of excellence in particular spheres of production or technological capability, thus generating a strong domestic production and technology base and a

strong platform for competing in international markets. Ready examples include the creation of core firms related to Canada's defence needs, e.g., in the production of ships suited to Canada's particular needs, or the technology Canada needs to exploit cold ocean resources. Fundamental to the process of creating core companies is recognizing the effective size of domestic markets: the development history of Northern Telecom reflects the strength derived from the domestic market provided by Bell Canada.

In some cases one firm may be a core company, in other cases mergers, joint ventures, and cooperative arrangements are obvious means for achieving this end. Direct involvement of government in the rationalization process can and should be avoided. Nevertheless, government must accept the responsibility for the creation of an environment which will prove encouraging to private sector initiative. The very strong and very special reasons which might require more direct government involvement would centre in the firm belief that Canadian control of a certain technological area is essential to national economic independence. It is commonplace for governments to bring key high-technology areas under national control. The French government, for example, is determined to break US domination in high-technology industries such as computers, nuclear power and telecommunications because of their importance to national economic independence. Rather than developing distinctive French technology as in the past, the French are now buying American technology as the basis of their industry entering world markets. The key to the French strategy is the market control possessed by the government in certain product areas: tremendous pressure can be brought to bear on private firms in order to secure compliance with its wishes. For this reason some interesting mergers have occurred. The first French government success was in persuading Honeywell to reduce its holding in its French subsidiary from 66 per cent to 45 per cent and merging the company with *Compagnie internationale pour l'information*. This new company has first claim on government data processing business. The \$7 billion, five-year modernization of France's telephone system, under the control of the state-run Post and Telecommunications Office provides another example. In this instance, International Telephone and Telegraph Corporation and the L.M. Ericsson Group sold controlling interests in their French telephone equipment subsidiaries to Thomson CSF, the French conglomerate.

The implication for Canada from these French activities — representative of policies the multinationals are facing around the world — is that the core company concept is being invoked, as is the major program concept, in the pursuit of technological sovereignty. If the French believe that providing the appropriate environment for private decision makers is insufficient when will Canada ask if it, too, is in the same position?

Sector Strategies

In addition to core companies, *sector strategies* are also required as part of a wider coherent industrial development program, because of the vast differences in the problems confronting industries as well as in the solutions required. A few industries might benefit from freer trade, others would suffer enormously; some require bilateral arrangements, others perhaps need the protection of cartels. The problems vary so much from one sector to another

that an industrial development policy generally applied may well benefit none while harming some.

Forest products and machinery illustrate contrasting sets of reasons industrial strategies are needed. The significance of the forest production industries lies in their absolute importance in the Canadian economy. They employ nearly 250 000 persons directly, and an even greater number of workers is indirectly dependent upon them for employment. A sectoral strategy, in this case, should have as its objective large-scale integrated operations across the entire industry group. Without rationalization, factors such as raw materials costs, ability to modernize production plants, and the installation of anti-pollution equipment, could become critical for future competitiveness.

In *machinery*, over 50 per cent of output emanates from foreign-controlled firms (numbering about 230), which produce a very broad range of products. As noted earlier, the industry is fragmented and many firms are limited in the scope of their activities. They are obvious candidates for every measure that can be used to induce them to specialize. The Canadian-controlled sector of the industry provides ample scope for both rationalization and specialization. There are areas of strength and high technical competence such as packaging equipment, nuclear valves and pumps, materials handling equipment for bulk commodities, and several others with the potential to provide focal points for future development. But international competitiveness in machinery often requires much more than technical strength. Frequently a firm's competitiveness rests in its ability to sell a total "package" of goods and services including machinery, engineering services, distribution facilities and the availability of concessional financing. Expertise in custom-engineering can also be a significant requirement, thus design capability can be an important ingredient of success. The organization of firms into consortia may also be vital since much foreign demand for technology translates itself into needs for "turn-key" projects requiring the combined resources of several firms.

Canadian-controlled companies should be strengthened to enable them to build an autonomous technological capability and to bring together the wide range of skills and resources required for success in foreign markets. Mergers, joint-ventures and specialization will play a critical role, provided there are specific plans for rationalization, realistic goals, and substantial tax incentives for research, development and engineering.

Small Manufacturing Firms

Every sector requires detailed examination and policy measures appropriate to its needs and potential but in the process, special attention should be paid to the differing needs of small and large firms. While the previous discussion is oriented to large scale rationalization, if we wish to maximize the capability of Canadian manufacturing to create technology, we should pay separate attention to the needs and potential of small manufacturing businesses. In advocating technological sovereignty for Canada, the Science Council has called not only for the creation of core companies, but also for the development of a range of small innovative technical firms.

There are many sound reasons why small business should be fostered. Serious consideration should be given to the establishment of a separate identifiable small business policy. Small businesses are very important in pro-

viding employment opportunities in small centres. There is a tendency to associate industrialization with larger urban agglomerations and to forget that manufacturing is found at all levels of the urban hierarchy. Many small centres (4000–5000 people) are dependent upon manufacturing for employment. Such dependency is dangerous when employment is provided by one large firm, or two or three medium-sized enterprises. It is preferable for small towns to seek diversity in their manufacturing bases. At the same time, the growth of stronger small businesses in smaller centres would help reduce the severity of assumed external diseconomies of large urban centres.

Some regions are highly dependent upon industries characterized by relatively small firms, e.g., furniture and leather industries in Quebec and food processing in the Maritimes. Policies to strengthen these industries could make a valuable contribution to regional economic development. This line of thinking has been advanced strongly by the Canadian Federation of Independent Businesses, which seems almost to regard small business development policy and regional development policy as synonymous.²¹⁷ Similarly, Peterson believes a revitalized small business sector could play a pivotal role in overcoming Canada's long standing regional disparities.²¹⁸ He recommends that:

"Greater emphasis needs to be placed upon encouraging true regional self-sufficiency which is based on appropriate-scale technology. Measures of industrial productivity should be developed to reflect the effect of all inputs into the production process. The blind substitution of capital for labour must be discontinued."²¹⁹

Other reasons for paying special attention to small manufacturing firms are that they constitute the majority of firms and provide a significant proportion of Canadian employment in manufacturing; they are mostly Canadian owned and controlled; they contain Canada's greatest reservoir of entrepreneurship, and no doubt contain among their numbers firms with the potential to become important producers in their field.

Small businesses tend to be more flexible and yet in many lines of production their efficiency is just as great as large firms because of product specialization. The minimum efficient plant size in most kinds of manufacturing is quite small.²²⁰

On the other hand, to their disadvantage, small firms may lack marketing strength and competitive "muscle" which usually increases with size. Small firms, however, can gain the advantages of sheer size through cooperation. After all, as Peterson points out, all businesses can be viewed as "... a collection of small plants under common ownership and administration."²²¹ There is no reason why small firms cannot be collected together in consortia (apart from their unwillingness) to take advantage of the small scale economies enjoyed by bigger firms. Peterson refers to:

": joint marketing and distribution of complementary products in a complete product line, or as a package (such as a "turn-key" factor)

: joint investment in specialized or general purpose equipment which a single small company cannot afford given its manufacturing volume."²²²

and provides many examples of successful small business consortia abroad.

Canada prides itself on its free enterprise system which is epitomized by small enterprises. They provide unique opportunities for creative business activity, particularly the exercise of entrepreneurial talent. Small business

enables many people to have wide ranging, personal experience in an industrial society which is increasingly characterized by impersonality and social alienation. They are in a better position than large firms to cater to the diverse and individualized needs and tastes of consumers. By creating productive units of varied character, they play a significant role in preventing society from becoming ingrown by continually injecting vitality into it.

All these reasons suggest we should be vitally concerned with fostering a strong small business sector in Canada and should begin to overcome its current problems. Many small firms in all countries tend to be technologically backward and unprogressive, as noted earlier, but some are fruitful sources of intervention and innovation. Many of today's large technologically-based firms had their origin in single proprietorship firms with one or two founding innovations. Also, technologically and in other ways, a vital role of small firms is as a complement to large firms, by providing specialized goods and services which cannot economically be provided from within large firms. Probably establishing more, competitive large firms will have substantial spillover effects for many small companies.

A number of parallels can be drawn between Canadian manufacturing today and Japanese manufacturing in the 1950s. The Japanese noted their small firms were lagging behind large corporations in the modernization of production technology and facilities resulting in "... a dualistic structure of the economy."²²³ The productivity levels and the per capita wages of small firms were far below those of the large corporations. A series of policies aimed at protecting small businesses through the encouragement and organization of small business groups, the elimination of excessive competition, and the modernization of facilities have led to the progressive dissolution of the structural dualism in the form of vastly improved economic performance.

One of the most important reasons why the Japanese have looked after the welfare of their small firms lies in their understanding of the symbiotic relationship between large and small firms and the importance of this relationship to the efficiency and competitiveness of large firms. The Japanese refer to the assembling or assembly industries, namely general machinery, electrical machinery, transportation equipment, and precision machinery industries. They have a multilevel structure of specialization. Most of their finished products are assembled by large corporations with the component parts or material subcontracted to a large number of small businesses. According to a government survey:

"... each assembling principal directly employs, on average, more than 100 small businesses as subcontractors. In turn, approximately 80 per cent of these small businesses re-subcontract their products to other small businesses and the number of subcontractors of each original small business is, on average, more than ten. And the value of components or materials that each assembling principal subcontracts to small businesses accounts for 30 per cent of their production costs."²²⁴

It is precisely this type of large firm – small firm interaction that is severely disrupted and reduced in Canada because of foreign ownership and truncation. Lack of interaction contributes significantly to the technological backwardness of many small Canadian firms.

The Japanese identify three major reasons to justify their practice of subcontracting from "assembling" industries to small businesses. First, the in-

creased number and types of components needed by the growing "assembling" industries enhances the demand for a wide range of goods best suited for small-scale production in which small firms have great capability. Second, small firms have developed production or processing expertise and sometimes unique technology. Third, in times of rising demand, they provide extra production capacity. From the Japanese standpoint "... small businesses have played an important role in sustaining the system of specialization and through such a role, have co-prospered in the development of assembling industries."²²⁵

The Japanese experience of subcontracting between large and small manufacturing firms lends support to the arguments of Macrae and others that new modes of industrial organization will lead to the end of big business as we have known it. Macrae even suggests that big corporations will devolve into confederations of entrepreneurs arguing that "the age of multinationals is coming to an end, which is one of the subsidiary reasons why the age of most really massive business corporations is likely to be ending too. *The age of entrepreneurial subcontractors and licensees will succeed it.*"²²⁶ (Emphasis added)

It is to be hoped that Canadian policy makers will pay the closest attention to these observations. If the Japanese experience is any guide and if Macrae is correct, small firms will play an increasingly important role in all industrial economies. Furthermore, one of the strongest reasons for policy to create viable small business is that the very same policy contributes to the strength of large firms, and thus to the strength of the entire manufacturing sector. In other words small business policy should not be viewed as peripheral to a national strategy of industrial development. It must be seen and treated as a central component of a coordinated effort to improve the condition and performance of the entire manufacturing sector.

Thought must be given to ways of inducing large firms to contract more work to small firms and of encouraging small producers to sell their products under cooperatively-owned common trademarks and registered designs. There is also much merit in the suggested creation of a Canada Ventures Corporation controlled by the federal government and responsible for the development of small Canadian-owned manufacturing firms. The Canadian Federation of Independent Business and commentators like Peterson have made many carefully considered suggestions on ways to strengthen small business, ranging from changes in the small business tax incentive, to Credit Guarantee Corporations, and laws to protect and promote the use of small subcontractors. There is, however, no need to repeat their arguments and wide-ranging sets of recommendations: formulators of a small business policy for Canada will find much to think about in public statements already made which contain many elements essential to a coherent approach.

World Trading Enterprises

Smallness in manufacturing is not without disadvantages, one of which is weakness in marketing, especially abroad. We have already suggested the possibility of establishing consortia of related firms as a means of improving the competitive position of small firms, without destroying their independence. The world trading enterprise is similarly useful. Again, Japan provides an

example of such organizations playing a significant role in industrial development. Shinohara notes:

“Japan’s general trading companies are unique: they have telecommunications equipment and intelligence gathering networks that rival anything the CIA or Pentagon can come up with, enormous market strength in international markets, ability to procure massive capital at home and abroad and excellent organizational capability as demonstrated in the way that they have mobilized many manufacturers to enter overseas markets. . . . The arrangement in which manufacturers give their undivided attention to technological advance in their field while the traders concentrate on the “knowhow” and “soft-ware” technology of overseas sales is an excellent demonstration of economy of scale.”²²⁷

The trading companies are not well capitalized themselves but obtain large loans, often from banks linked to them in the broader conglomerate business structures. The significance of these companies is readily apparent when one learns that the ten largest accounted for 56 per cent of all Japanese exports in the period 1975–76.

Japan, perhaps, may be regarded as an inappropriate model for Canada to follow because of its historically close business-government relationship and its activist tradition of state industrial and technological planning. But to enlighten the skeptic, we would point to the historic significance of world trading enterprises in such industrial economies as Britain, France, the Netherlands, Denmark, Sweden, Belgium and Germany. Many European companies have their origins in now defunct colonial empires but have gone on to become modern, flexible and extremely effective agents of technology commercialization from their home countries, promoting wide ranges of goods and organizing associated technical inputs. They have, as befits their origins, been particularly active in creating markets for European goods and services in developing countries.

Canada lacks firms which engage in such general trading activities in the developing or developed world. This country could enjoy potential benefits if this deficiency were rectified. Such firms could conceivably be the instruments through which smaller technology-intensive firms are connected to a market wide enough to make on-going innovations successful. In the same vein, general trading enterprises could promote the export of Canadian manufactured goods more effectively, thereby facilitating the necessary restructuring of our manufacturing.

Increasingly Canada will be looking to Third World countries to market manufactured goods. Exports to these countries have a potential to grow more rapidly than sales to developed countries. Many developing nations are embarking upon vast national development programs to create modern industrial economies based on their greatly increased international purchasing power (e.g., OPEC countries). This could mean opportunities for Canada to export capital goods and “turn-key” projects. Canada has certain advantages, including technology, in these areas.

At the moment, Canadian policy measures promote direct investment to commercialize Canadian technology in the Third World. In view of the growing widespread recognition of the disadvantages of foreign direct investment to host economies, and consequent policy measures to dilute, control, and change the behaviour of, or even abolish foreign subsidiaries, Canadian incen-

tives for direct investment in Third World countries should be discontinued, and alternatives implemented: offering, for example, grants to investigate licensing and consulting possibilities. A range of effective subsidies should then be developed to assist the early growth of Canadian trading enterprises (perhaps covering the costs of operation of new foreign offices for example, for a period and up to a limit) perhaps establishing a bonus payment from the government for each successful sale of Canadian-owned technology in certain target areas.

Probably more than changes in incentives will be needed. Policy makers will have to turn to more direct pressure on a number of large Canadian business firms to consider undertaking the development of such world trading networks. In association with such pressure, the Canadian banks are capable of providing extensive financing for these efforts though possibly government guarantees, for such loans will be needed. Conceivably, the Canadian Development Corporation could take the lead in developing the core of a Canadian world trading enterprise able to commercialize Canadian technology.

Increasing the Capacity for Technology Absorption at the Enterprise Level²²⁸

Technology absorption, the assimilation and improvement of technology already employed by firms, involves activities such as: production research, plant optimization, product development, the search for minor innovations, adoption or improvement of quality control standards, access to scientific and technological services directly linked to productive activities, and to information about practices in other firms.

The technological isolation and backwardness of Canadian-controlled firms has been identified: the vast majority are small, and weak in design and marketing capability, and their difficulty in remaining technologically up-to-date and efficient seems to be more severe than is the case for small firms in other industrial countries. Thus, it is of major importance that Canada establish mechanisms designed to increase this ability to absorb existing and new technology and combine them with intelligent design and effective marketing if Canadian-controlled firms are to survive and play a useful role in developing Canada's industrial potential. Small firms would be the major beneficiaries, but help along these lines should be afforded any firm which might benefit, regardless of size. An appropriate step would be the organization of improved, broadened, and enlarged information and technical extension services aimed at: increasing the capacity for technology absorption at the level of the firm; improving the technical level of personnel; and offering information on the latest developments in specific fields of interest.

When Canadian and European technological infrastructures are compared significant differences become apparent. The industrialized European countries each have large numbers of what may be described as sector-oriented technical centres. Canada lacks equivalent institutions. The European technical centres reflect and recognize the great differences among the technologies of different industries or clusters of industries. Research is rarely the main function of the associations or centres but some do engage in it. Their main function is to improve the productivity or the operational efficiency of the customer firms by:

- 1) Acting as the technological interface between sources of new technology (from government labs, universities, other industries, other countries,

etc.) and the companies within a specific sector of industry, thereby keeping them fully informed of possible useful changes in product design or process technology;

2) Adapting new technologies to meet the needs of the firms in their industry;

3) Advising and assisting firms in ways to improve upon their use of existing technology and management;

4) Undertaking R & D relevant to their industries with the emphasis on development;

5) Standardization and testing services.

In Canada, various kinds of technological assistance are offered to manufacturing firms. The federal government through IT&C has taken several initiatives designed to alert Canadian manufacturers to new technology. There is the "New Products Bulletin" of IT&C, Industrial Research Institutes, which encourages industry to use the equipment and expertise of universities, and the ten Centres of Advanced Technology which have arisen and have encouraged universities to establish centres of expertise in specific areas of technology. Additionally, there is the Enterprise Development Program which indirectly encourages the adoption of existing technology by industry through the funding of studies to analyse production problems and possible solutions. But it is clear, even from these capsule descriptions, that *these institutions and activities neither singly nor in aggregate parallel the European sectorally oriented technical centres.*

Canada's closest equivalent is found in NRC's Technical Information Services (TIS) which provides assistance for the technical development of medium and small industries in Canada on a woefully small budget (\$1.9 million in 1977-78). This is the only federal government organization in Canada with the basic objective of increasing the productivity of Canadian manufacturers through better utilization of existing technology. TIS does excellent work, but it is quite unable to deliver all the production advice and assistance needed by its potential market. In the first place, it is far too small, employing only 40 field officers to service 27 500 potential clients. Second, it is oriented toward all industry offering only general advice and assistance to manufacturers: its officers do not specialize in particular industrial sectors.

Canada urgently needs a technological infrastructure which will encourage and assist small- and medium-sized manufacturers in the following areas:

1. To become better informed about existing and new process and product technologies.

2. To absorb existing and new technology, thereby improving their operational efficiency and competitiveness.

3. To link firms with new product ideas, with product design and marketing specialists in order to strengthen Canadian capability in these two critical areas.

We urge serious thought be given to the establishment of sectorally-oriented technical centres, knowledgeable of the problems faced by small firms in their respective industries. These centres would act as technological interfaces between the many sources of technology and information and the many companies that can benefit from improvements in operational efficiency and from changes in product design and process technology.

Ideally, such centres should be established collectively by the industries that would use them and should be financially supported, at least in part, by these industries. While some government assistance and encouragement may be necessary to initiate and sustain such technical centres, full value will only be realized if they are actively supported by the user firms.

Centres could be located in areas with significant geographic concentrations of firms in specific industries. This would mean the majority, initially, would be located in Ontario or Quebec but with time, as special regional industries develop, they would become dispersed.

Great value would be derived from increasing the size of TIS. With regional offices across Canada, it could continue offering general production advice and assistance on an expanded scale to manufacturers wherever they are located. Where a technical centre for a particular industry existed in Canada, TIS field officers could draw upon specialized competence of a technical centre for distant clients in the same industry.

Regulating Technological Imports

As in the past, Canada will obtain most of its technology from abroad and nothing can or should be done to greatly alter this state of affairs. To ensure the future presence of an effective manufacturing sector, Canada must move from exceptionally high, technological dependence on foreign technology to technological interdependence. Uncontrolled purchasing of incremental technology must give way to imports consonant with and complementary to industrial development goals.

Foreign technology, as technology, is not a problem for Canada but the way in which foreign technology is obtained, how and when it is put to use, and the ways in which it is related to the Canadian economic system leave much to be desired. Canada has failed to capitalize on opportunities afforded by purchased foreign technology for the creation of an indigenous technological capability. In addition, Canada has relinquished many industrial growth opportunities — income, expertise and jobs — which flow, as countries around the world demonstrate, from the use of foreign technology.

The majority of the advanced industrial countries depend heavily on imported technology. Remove foreign technology from Switzerland, Sweden or France and they would cease to be of industrial significance. The industrial success and strength of these and many other countries is inseparable from the use of imported technology. Most advanced industrial countries, however, have shown greater technological innovativeness than Canada. This innovativeness has made an important contribution to comparative advantage in certain lines of activity. But *how* they imported their technology and how they embedded it into their industrial production systems has been at least as decisive.

Canada must regulate the import of technology in order to maximize the realizable social and economic benefits and to minimize the disbenefits. Specific objectives should guide regulation.

- 1) Technology interdependence as opposed to technological dependence;
- 2) Selective development of an indigenous technological capability; allied with,
- 3) Selective development of internationally competitive firms and industries.

These objectives, reflecting the three general principles for technology development advanced in this chapter, denote that regulating technology imports must be part of a wider industrial and technology development strategy.

To dispel the fears of the ultra-anti-nationalists, it must be clear that regulation of technology imports is *not* intended to:

1. Bar technology imports, or except under certain circumstances, discourage them. The thrust is to control *how* a technology enters Canada in order to influence its impacts in preferred directions. Technology imports themselves are not the decisive issue: rather it is the manner of import which is critical.

2. Provide an indirect means of reducing foreign control and ownership of Canadian manufacturing for its own sake: competitiveness based on efficiency and technological capability is required. If foreign-controlled firms contribute in these ways, as a number now do, they are more than welcome; indeed, more welcome than domestically-controlled firms that are technologically unprogressive and inefficient. But, insofar as foreign control militates against competitiveness, efficiency and the development of an indigenous technological capability, the regulation of technology imports especially in the form of foreign direct investment, will in the long term decrease the relative size of the foreign-owned and controlled manufacturing sector.

We do *not* embrace autarchic principles: we advocate broad initiatives capable of contributing to the goal of a more progressive manufacturing base. To the extent that a greater indigenous technological capability is vital to that goal then greater self-sufficiency is necessary.

The Foreign Investment Review Agency

The Foreign Investment Review Agency (FIRA), with some redirection and reorganization could become the policy instrument to carry out the regulatory functions we have in mind.

FIRA, established in 1974 under the provision of the Foreign Investment Review Act, was the legislative descendent of the Gray Report on foreign investment. At the present time, the Act requires government to review two types of foreign investment.

“(1) most acquisitions of control of Canadian business by non-Canadians, and

(2) the establishment of new Canadian business by non-Canadians who either do not already have any business in Canada, or do not have any business in Canada to which the new business is or would be related.”²²⁹

FIRA'S function is not to deter foreign investment by its review process. “The Government of Canada continues to welcome foreign investment that will contribute to the healthy growth of the Canadian economy. . . . The primary purpose of FIRA was and remains to ensure that significant benefit to Canada results from foreign investment.”²³⁰

The Act sets out five criteria by which to assess the benefit to Canada of a proposed investment:

“(1) the effect on the level and nature of economic activity in Canada including the effect on employment, resource processing, use of Canadian parts, components and services and exports;

- (2) the degree and significance of participation by Canadians in the business enterprise and in any industry or industries in Canada of which the business enterprise forms a part;
- (3) the effect on productivity, industrial efficiency, technological development, product innovations and product variety in Canada;
- (4) the effect on competition within any industry or industries in Canada;
- (5) the compatibility with national industrial and economic policies taking into consideration industrial and economic policy objectives enunciated by any province likely to be significantly affected.”²³¹

Since its inception FIRA has been the object of limited praise and much criticism, which has varied with the fluctuating fortunes of manufacturing or the publicity surrounding some of the larger or more complicated cases it has reviewed. Its opponents have been sharply divided in opinion. The provincial governments were, and still are, almost unanimously opposed to it. Their position is simple: no obstacles should be put in the way of their attempts to promote economic growth and create jobs. Many businessmen perceive FIRA as another example of unwarranted government intervention in the workings of the private sector, and as such yet another cause of Canada's deteriorating business climate. Some nationalistic spokesmen viewed FIRA as being too little too late especially because until October 1975 its activities were confined to acquisitions, whereas the chief source of the growth in foreign direct investment comes from re-investment and expansion of foreign firms already in Canada. These activities, unless they are “unrelated” to existing activity do not come under FIRA review.

Others eventually found fault with the finer, but nevertheless crucial points of the legislation: the control measures may be incapable of discriminating or even distinguishing between foreigners and nationals. As the number of applications for review has increased and as the review process has speeded up, some observers view FIRA as a clearing house for acquisitions and new foreign businesses. They suspect it of facilitating foreign investment rather than obviating the disbenefits frequently associated with it. Even though FIRA has approved more than 80 per cent of all foreign bids to take over or set up businesses in Canada, the depressed state of the economy and the high level of unemployment have encouraged renewed calls for its abolition. FIRA is alleged to scare away foreign direct investment despite the absence of proof and despite the fact that multinational corporations are quite accustomed to dealing with review procedures.

During the past few years, new Canadian direct investment abroad has exceeded the value of new foreign direct investment in Canada: clearly circumstances more significant and deep-rooted than FIRA are responsible for major shifts in investment patterns. FIRA is alleged to be preoccupied with the ownership of firms, when in fact its role is simply to ensure that foreign investments are not detrimental to Canada. Some critics imply the agency's reputed concern with ownership is costing jobs, when in fact evidence indicates that over the short term more jobs have been created through its intervention than would otherwise have been the case.

No grounds exist for assuming that FIRA is not operating efficiently and effectively in respect to the charge placed upon it. Only detailed information on the cases handled by the agency could justify reversal of this conclu-

sion and, unfortunately, that information is confidential. The essence of FIRA's mandate is to resist foreign direct investment where it adds nothing to national economic objectives, and to ensure that Canada derives the maximum benefit from foreign direct investments, considered to be of value and consistent with national economic objectives.

The main question to be asked is not whether it is doing its job properly, but was it given the right job to do? FIRA was given a job which was important and necessary in the light of our understanding of the effects of foreign control and ownership in Canadian industry, but the responsibilities placed on FIRA were, and are, far too limited to realize the hopes invested in it. During the debate on FIRA in the House of Commons, Alastair Gillespie, then Minister of Industry, Trade and Commerce, said:

"At no time in our history have we had a better opportunity than we have now to build a distinctive Canada. . . . It is a question of political will, no more, no less. The Foreign Investment Review Agency is an important part . . . in expressing that political will. The kind of Canada we want to build must be more than a mere appendage of foreign corporate giants south of the border and resource-hungry multinational firms of other industrialized countries."²³²

If FIRA was intended to contribute to new goals for Canada along the lines described by Gillespie, it was a step in the right direction but within, and by itself, it was totally inadequate. In light of the findings and opinions of the Gray Report and of the conclusions of this study regarding the contribution of foreign direct investment to Canada's industrial deficiencies, FIRA by itself was too little too late.

If Canada was just beginning its climb to industrialism, if foreign direct investors were just beginning to enter, and if a comprehensive industrial development strategy were in place, FIRA would be a most appropriate policy instrument. But, FIRA was put in place totally lacking in the essential guidance which only a national industrial development strategy could provide, at a time when Canada was already a "mature" industrial country, and when foreign interests already totally dominated Canadian industry. The problems of Canadian industry were already too firmly entrenched and too severe for FIRA to effect even the slightest amelioration. The authors of the Gray Report were aware of this: they knew that the problems stemming from decades of foreign ownership and control could not be cured by FIRA. The role of FIRA was simply to stop them from getting worse. In fact, it is doubtful if FIRA is even capable of this; at best, it can only slow down the rate at which the detrimental effects of foreign ownership worsen.

The only cure for the ills of Canadian manufacturing will be found in a coherent industrial development strategy. Within such a strategy there would be an important place for a redirected and reorganized FIRA, also responsible for regulating technology imports.

At present FIRA can be described as a good policy instrument in search of the appropriate policy. In the absence of a national industrial development strategy, FIRA is denied adequate guidelines for sound decisions on proposed foreign investments. Its task is to determine whether or not a proposed investment constitutes a "significant benefit" to Canada; yet, in the absence of national priorities and goals almost every proposal is likely to promise significant benefit.

Rare is the new foreign business investment and (as it appears from the scant information released by FIRA) the take-over which does not create new employment. Equally rare is the proposed investment that does not involve the purchase of some Canadian parts, components and services; and, by definition, it is almost impossible for a new manufacturing activity or one expanded as a result of acquisition not to cause some further processing of Canadian resources if there are some Canadian material inputs to the production process.

It is difficult to see how the vast majority of the cases reviewed can possibly be incompatible with national and provincial industrial and economic objectives. The only discernible unequivocal national economic objective is growth and the philosophy of most of the provinces is more of anything as long as it creates jobs and income. In other words, given the present set of criteria for evaluating "significant benefit" and given the lack of an envelope policy for the Foreign Investment Review Act, FIRA could hardly fail to detect benefit accruing to Canada from the vast majority of applications in the manufacturing area.²³³

The agency can do more than simply accept or reject proposals: it has bargaining power and there is reason to believe it strives to increase the benefits to Canada from foreign investment, but the Gray Report was rightly explicit on the shortcomings of a review and bargaining process operating in a policy vacuum.

It is beyond the power of FIRA to do anything other than reject proposals or extract additional gains from foreign investments which are being added indiscriminately across the full spectrum of manufacturing activity. It is powerless to prevent long-term disbenefit to Canada from foreign ownership and control because, first, its mandate has no bearing on foreign-controlled firms already in Canada²³⁴ unless they expand into new, unrelated activity,²³⁵ and second, it can influence new foreign direct investment only over the short term. Within a matter of time, all foreign-controlled firms entering Canada through its review process join the large mass of long-standing foreign firms and like them (and Canadian-controlled firms) are quite free to pursue their activities as they see fit.

FIRA impinges on no more than the initial short-term conditions of entry, but, ironically it is not the short-term effects of foreign direct investment which pose the problem for Canada. The long-term disbenefits of uncontrolled foreign direct investment have more than outweighed the short-term advantages. Empirical data and analysis verify this thesis. Thus, FIRA is in the position of merely trying to minimize the short-term disbenefits while the long-term disadvantages to Canada continue to increase.

A New and Expanded Review Agency as an Integral Component of a Comprehensive Industrial Strategy

The regulation of technology imports should be an indispensable and integrated component of the industrial and technological development strategy so crucial to the revitalization of Canadian manufacturing. *The function of such regulation is to provide a defensive perimeter around the work of repair, reconstruction, and enhancement of Canadian manufacturing, keeping out foreign technology and other factors of production in a form harmful to our plans and objectives, while allowing entry and welcoming factors of produc-*

tion from abroad, including technology in a form capable of existing in harmony with or even furthering our plans and objectives. A flexible defensive screen, administered by an agency empowered to differentiate between factors identified as harmful or beneficial in light of changing needs of Canadian manufacturing and the objectives of an industrial development strategy, is required.

We advocate a comprehensive industrial strategy resting on the following lines of action:

1. Increasing the demand for Canadian technology.
2. Increasing the capacity to develop technology.
3. Increasing the capacity for technology absorption at the level of the production unit.
4. Regulating technology imports.

Some indication has been given of the types of policies required. These broad policy thrusts, or their more refined and articulated derivatives, should provide the policy setting, the lack of which has vitiated FIRA's ability to be a force for constructive long-term change. They should provide the criteria to guide a review agency to fulfill its regulatory and bargaining roles. In addition, while a new "FIRA-type" agency screens the inflows of factors of production from abroad guided by the coherent policies and goals of an industrial strategy, the strategy itself will, among other things, be directed to the task which no foreign investment review agency can ever undertake — the task of undoing the harm done to Canadian manufacturing by many decades of uncontrolled foreign direct investment and the technology imported in association with it.

The four guiding principles interlock: remove any one, including control of technology imports, and the industrial development strategy they are capable of supporting will ultimately collapse under the weight of contradictions in the "real" world of industrial decision making.

The short-term goal of regulating technology imports is necessary to achieve compatibility between the behaviour of foreign companies, access to foreign technology, and Canada's industrial development priorities and objectives. The long-term goal is to create a successful manufacturing sector. Our understanding of Canada's longstanding industrial problems leaves no doubt that a strong manufacturing sector requires greater Canadian industrial and technological capability in the growth industries of the next 20 to 30 years (the "third wave" of industrialization) than was the case with the foreign-dominated growth industries of the post-World War II period.

Canada should not attempt to dismantle or take-over the existing foreign-controlled component of its manufacturing although it should attempt to modify the behaviour of foreign firms in ways that will reduce or even obviate detrimental ramifications for the Canadian economy. There are, however, limitations to the extent existing transnational firms are free or able to turn away from present modes of behaviour.

The long term, the ultimate and the only solution to Canada's problems from its uniquely high degree of foreign ownership, lies in the successful promotion of competitive Canadian-controlled firms and industries, i.e., positive development of Canadian firms.

Regulation of the process of technology import, coordinated with an industrial development strategy building on Canada's existing strength, can

transform industry's relationship with foreign technology. We must first articulate our needs and either create or actively seek the best technology, under the most favourable conditions attainable. The more success we have developing Canadian industries through proven technological capability, the greater will be our ability to exact from the foreign sellers of technology conditions least damaging to the national interest.

Guidelines for the Regulation of Technology Imports

An agency is required combining two overlapping functions: 1) the regulation of technology imports by means of a review of foreign takeovers, new foreign business, licences and joint-ventures; and 2) ensuring consistency between technology imports and the means and objectives of the strategy. The agency would continue practically all the functions and activities presently performed by FIRA as well as acquiring important new ones.

The review and regulation of technology imports would be of paramount importance in the work of the agency. The following principles should guide the review process.

1. To secure the maximum possible advantages for Canada from imported technology.
2. To coordinate and harmonize imported technology with the selective development of Canadian technological capability, in particular, and with the means and objectives of an industrial development strategy in general.
3. To increase the bargaining power of Canadian buyers of technology.
4. To reduce the negative effects of technology imports.

Because technology is most often imported in association with foreign direct investment, and because technology is by no means the only aspect of foreign direct investment with ramifications for the Canadian economy, the agency should be an investment review agency, as FIRA is now, but with technology review and regulation playing an important role.

Categories of Investment to be Reviewed

In order to ensure surveillance of the major means of technology transfer into Canada, the categories of investment reviewed by FIRA should be extended to cover

1. Takeovers of Canadian firms, whether Canadian or foreign controlled, by foreign interests whether already established in Canada or not.
2. New businesses established from abroad (foreign interests making a direct investment in Canada for the first time).
3. New unrelated businesses established by foreign-controlled firms already in Canada.
4. New licensing and franchising agreements and joint ventures involving an enterprise already in Canada (foreign or domestic) and a business enterprise entering Canada for the first time.

The Gray Report examined the desirability of reviewing major new investments by existing foreign controlled companies in Canada; existing foreign-controlled companies even if they are not planning major new investments; major new investments abroad by Canadian-based multinational companies. With the exception of major new investments by existing foreign-controlled firms unrelated to their present interests (as covered by FIRA), we agree with the Gray Report's reasons for excluding these categories from review.

Coordination of Review with Industrial and Technology Development Strategy

Close coordination between the investment and technology review process and the industrial strategy is essential. Every effort must be made to avoid conflict between the means, priorities, and goals (short and long term) of the industrial strategy and the decisions made by the agency with respect to foreign investments and technology. To achieve such coordination, and at least to avoid conflict, the review agency must possess the freedom to respond flexibly to proposed investments, licences, joint ventures, etc. As with FIRA, the basic criterion of “significant” benefit must guide the agency in its decisions and recommendations. But the agency, responsive to the priorities of an evolving strategy, will necessarily interpret this criterion in much more particular and variable ways – taking whatever decisions are necessary to ensure consistency with strategy objectives. In the course of encouraging an industry to rationalize, it would make no sense to allow entry of a new foreign firm whose presence would only intensify the need for rationalization, even though the industry might satisfy all of FIRA’s present criteria.

To function effectively, the agency would require information on the status and progress of each industry in terms of the short- or long-term objectives of an industrial strategy. Additionally, every industry should be classified according to priorities and to means agreed for its development. IT&C, or a subdivision of the review agency working in collaboration with IT&C, could be responsible for updating information on industries and their classification. An industry’s classification would direct the review agency’s decisions. Classification would place high value on the following:

- 1) a capability equal to or better than foreign capabilities (existing strength);
- 2) a potential to have a capability equal to or better than foreign capabilities (potential to grow);
- 3) vital to Canada’s social and economic needs.

The classification of industries must take into account strategy objectives and priorities, industrial strength or weakness, progress as measured against set goals, and place each industry in a category which defines the constraints on foreign investment and the conditions attached to technology transfer from abroad.

For the sake of illustration, we will consider a three-category classification of industries.

Category A – Industries not open to foreign investment or takeover. To meet strategy objectives, they are “protected” against direct investment, but are open to foreign technology through licensing agreements and joint-ventures.

Category B – Industries open to foreign direct investment, but only investments that promise an autonomous Canadian technological capability. These are also open to licensing agreements and joint ventures.

Category C – Industries open to foreign direct investment which will be reviewed and stringently regulated according to criteria which will evaluate significant benefit and ensure consistency with the objectives of an industrial strategy. These industries are

also open to licensing agreements and joint ventures that should be sought in preference to direct investment.

No industry would be allocated permanently to one category. Priorities and objectives will change though time and continual monitoring would provide the information necessary to review the appropriateness of an industry's category. The vast majority of industries, at any one time, would be in Category C.

In suggesting a classification of this nature (many variants can be considered), we are again drawing intellectual support from the Gray Report. We are proposing merely more explicit and formal procedures to mould an association between the process of regulating the import of technology and a key sector approach to industrial development. While the relative development of internationally competitive industries is central to the strategy, it is also necessary that measures are taken to engender greater efficiency and competitiveness among all industries including those whose future prospects are likely to be limited to the domestic market. It should be stressed, however, this is not an alternative: concentration of national resources on some activities is mandatory.

There are dangers in providing protection. Canadian control is no guarantee that the firms in an industry will operate efficiently, or that they will conduct their affairs in the national economic interest. Moreover, restrictions on the inflow of categories of investment to particular industries could deprive the country of foreign technology and other inputs if they can only be obtained through foreign direct investment. For these reasons, we advocate the constant monitoring of industries in respect to such variables as efficiency, competitiveness, innovation, technological performance, and so on. The allocation of an industry to any particular category must always be regarded as temporary and subject to change in the light of the findings of the monitoring process. While these are profoundly important reasons to ensure greater Canadian control of future growth industries than was the case in the last thirty years, it is necessary to exercise vigilance to ensure that the benefits of "protectionism" do not turn sour and that valuable foreign inputs are not rejected merely for the sake of maintaining domestic control.

Licensing Agreements and Joint Ventures

The provision of temporary "protection" from foreign direct investment does not imply a blockage of the flow of foreign technology into Canada, quite the contrary. While the major goal must be to increase the capability of Canadian industry to create technology, the bulk of new technology will continue to come from abroad. "Protectionism" means obtaining technology separate from foreign direct investment and implies reliance on licensing agreements and joint-ventures. For certain designated industries, at certain times, licensing agreements and joint-ventures will be the only permissible way of obtaining foreign technology: but even for "un-protected industries" these methods are to be preferred over technology and purchasing associated with foreign direct investment. The agency must be able to agree to a direct foreign investment only when all possibilities for an acceptable licensing agreement and joint venture have been exhausted. This implies the review agency must have: 1) an important negotiating function with foreign sellers of technology; and 2) an awareness of, and must seek, alternative sources of technology.

Negotiation with foreign sellers of technology to obtain licensing agreements and joint-ventures will involve the review agency in "technology unbundling". In almost every country that has seriously considered technology development policy, "technology unbundling" is a key component of the process of regulating the import of technology. The essence of the task is to differentiate between the modular and peripheral aspects of a technology examined from an engineering viewpoint.

"The modular component is that which is specific and inherent to the process under study, which distinguishes it from other similar processes or products and which can assume the form of equipment (special reactor), materials (catalyser), procedures (operations manuals), designs (circuit specifications) and so on. The peripheral component is generally common to different processes or products (electric installations, unit operations, etc.) and is relatively more freely available than the modular component. It should be noted that the definitions of modular and peripheral technology make sense only for a specific project, and that which is modular in one project can turn out to be peripheral in another."²³⁶

"Technology unbundling" is fundamental to:

(a) the development of a capacity for the absorption of technology, "... since it leads to a better identification of the components of technical knowledge and their degree of complexity, allowing the enterprise to master the technology it imports."²³⁷

(b) strengthening the traditionally weak bargaining power of technology purchasers because they obtain greater knowledge of the technology under consideration and a detailed analysis of its components.

(c) the development of an indigenous technological capability, and

(d) ensuring compatibility between technology imports and national industrial development objectives.

A central function of a review agency should be to identify the modular component in the technology associated with any investment proposal and whenever feasible to seek a licensing agreement or a joint-venture for the modular technology on the most favourable terms possible. This will involve the agency in bargaining with potential investors and/or sellers of technology as well as potential technology purchasers, and, at times, seeking 1) alternative sources of technology amenable to transfer through a licensing agreement or a joint-venture, and 2) suitable Canadian licensees and participants for joint-ventures. This implies the agency should become a much more active intermediary in the process of transferring foreign technology to Canada than FIRA is at present.

The most attractive feature of licensing agreements is that they generally involve fewer restrictions on the activities of the licensee as compared with a branch plant, and thus possess a greater potential to create beneficial spread effects. Both licences and joint-ventures gain for Canada, the benefit of foreign technology while allowing the technology purchaser considerable influence over the industrial activity that is added to the economy. In general, the licensee is left with some autonomy in matters such as management, procurement of inputs, sales and pricing. He may be totally free to "shop-around" for the peripheral technology, and to pursue better alternative sources of the technology at a later date.

To extract the maximum benefit from licensing arrangements the Canadian licensee must be able to select wisely (and it would be one objective of an industrial strategy to assist in this), absorb the technology effectively, adapt and modify it, and ultimately improve upon it. Thus licensing agreements that restrict the benefits flowing to a licensee, if he improves or develops the technology, should be avoided whenever possible. An appealing quality of licensing arrangements is that they frequently do not lead to a continuing relationship among the companies entering into them. Thus unlike the subsidiary of a multinational enterprise, the licensee is not perpetually tied to a single source of technology, with, as we have demonstrated in earlier analysis, such unfortunate consequences.

A joint-venture is intermediate between direct investment and a licensing agreement. Although it is not quite as desirable as licensing, it can bring considerable benefit to Canada. Other countries have demonstrated the possibility for a government to intervene in the process of technology purchasing and transfer, to satisfy national objectives. Of course, successful interventions depend to no small extent on the presence of existing industrial strength. This is a major reason for joining regulation of technology imports with a strategy designed to strengthen industry. Strong firms and industries have greater bargaining power than weak ones, and the ability of a review agency to negotiate acceptable agreements with foreign technology sellers is likewise enhanced if Canada possesses competitive industries with technological capability. This is one reason why we suggest that only a small group of carefully selected industries should be totally protected from direct foreign investment on a temporary basis. Stronger than other industries, or with the potential to become so, they should present fewer difficulties in finding suitable licensees and participants in joint-ventures. In the case of unprotected industries, particularly those for which the hope of creating internationally competitive firms is almost non-existent, the possibilities of obtaining technology through licensing of joint-ventures will be much weaker. Nevertheless, the agency should always explore the alternatives to foreign direct investment.

It will not be sufficient for the agency to play a part in increasing technology procurement through licensing, joint-ventures and other arrangements. It should also be a central function of the agency to review the terms of all "arm's length" agreements including those for which it was in part or wholly responsible. Licensing agreements and joint ventures may carry restraints similar to those associated with foreign direct investment, e.g., tied procurement and export restrictions. Contractual techniques can lead to a licensee being effectively controlled by a licensor. All agreements should be reviewed by the agency with a view to improving the contractual terms for Canada.

The Long Term vs. the Short Term

Control of technology imports must hold attainable long-term goals constantly in view. Instead of fuelling long-standing problems through responsiveness to short-term economic urgencies and political pressures, technology regulation must be pertinent to their solution. Many would say FIRA has succumbed to the seduction of the short term: however, in the absence of solid proof this allegation should be rejected. However, the temptation will always be great (painfully so when the economy is depressed and unemployment is high) to yield to pressure and approve almost any foreign investment that will

create jobs and income in the immediate future. Such understandable short-sightedness must be stubbornly resisted if the goal of viable Canadian manufacturing is ever to be attained.

The use of foreign direct investment to reduce the distress of unemployment, to achieve growth at the community, provincial or national level, and to meet short-term political expedencies is understandable, but lamentable for, as the evidence shows, the uncontrolled increments to foreign ownership are cumulative in effect. Every increment, unrelated to national development needs, reinforces the distress symptoms for which foreign direct investment is viewed as a solution. Most towns, cities and provinces want economic growth, and it is not always easy to convince them that what constitutes a step forward in their eyes may constitute a step backward from the viewpoint of national economic welfare. Difficult as it may be, we must build a general understanding that the quality of growth is as important as quantity. And if we exercise vigilance over the former, the latter will take care of itself.

The Gray Report anticipated some provinces would be suspicious of a central government creating an important new tool for influencing economic development at their expense. "A review process could conceivably, depending on its coverage, partially circumscribe a province's ability to seek out foreign direct investment."²³⁸ With regional development objectives included among FIRA's evaluation criteria, there was further ground to anticipate provincial apprehension. Ontario and Quebec might be concerned about favouritism toward the less industrial provinces, while Eastern and Western Canada might be concerned the review process would discriminate against their interests in favour of Central Canada.

Although provision was made for provincial consultation in the FIRA review process, the reactions of several provinces confirmed the fears expressed in the Gray Report. Most provincial governments have never been happy with the existence of FIRA and, notwithstanding a widespread suspicion that it has become an investment channelling agency, the majority would be happy to see it abolished.

There is considerable irony in this situation. When foreign direct investment was uncontrolled — most of Canada's economic lifetime — it proved a detriment to all provinces except Ontario. Canada's spatial economic structure exhibits classic symptoms of a core-periphery process of economic development. In this process, the core region of a national territory (Ontario and Quebec) enjoys accelerated economic development to the detriment of its peripheral regions. In Canada, this process has been augmented by the degree of United States ownership of manufacturing industry. Happy to abdicate industrial development to foreign capital and technology, Canada inherited the industrial locational patterns of dependence. Until ten years ago, the locational consequences of foreign ownership were ignored and yet another significant detrimental ramification of Canada's "industrial development policies" went largely unnoticed. But for Canada as a whole, United States-controlled jobs in manufacturing are three times more concentrated geographically than jobs that are Canadian-controlled. Ray has shown,

"... that 45 per cent of United States-controlled employment is within one hundred miles of Toronto, compared with 31 per cent of the Canadian-controlled employment. Within 400 miles of Toronto is located 83 per cent of the United States-controlled employment, but only 70 per

cent of the Canadian controlled. The disparities between the distribution of Canadian over foreign-controlled manufacturing employment whether measured by country or province, or by distance from Toronto, indicate the widening of the centre-periphery dichotomy in economic development in Canada associated with foreign ownership of manufacturing industry.”²³⁹

These findings have sobering implications for provinces opposed to regulation of foreign direct investment: they imply opposition to regulation of a factor which has played a significant role in contributing to their underdevelopment. However, locked into the “staple trap” by long-term Canadian policy and faced with the lack of any coherent national plan to achieve a more balanced distribution of industrial activity, their attitude should not be regarded as illogical. The peripheral provinces have always managed to attract some foreign direct investment (mostly in resource activity). Their attitude was and still is: almost any activity, foreign or domestic is better than none. In their eyes, FIRA has probably possessed only negative attributes — doing nothing positive for them, yet placing a restraint on their efforts to promote development and economic diversification in areas where, historically, these have been hard to achieve.

Despite their present antipathy toward FIRA, there is some reason to believe the provinces would agree to a redirected and reorganized review agency along the lines suggested provided it is an integral part of an industrial and technology development strategy. A strategy committed, among other things, to the principle of selective development of existing and potential industrial strengths with a view to securing a more balanced distribution of industrial activity across Canada.

We are not referring, simply, to a series of new programs for the Department of Regional Economic Expansion: we are talking about specific sectoral development programs which have the fullest support of the provinces, which are responsive to provincial aspirations, which to a large extent are controlled by the provinces and which, at the same time, are integral parts of a national development strategy. An investment and technology review agency, within this wider context, could make a lot of sense to the provinces, including Quebec, and even Ontario, which after all, although so often the envy of the poorer provinces, has the lion’s share of a threatened industrial species — truncated secondary manufacturing.

External Threat and Canadian Opportunity

Recent well founded speculation, surrounding the possibility of restrictions on the export of “frontier technology” being imposed by the US government, might at first suggest the time is inopportune to increase controls on the import of technology. We believe, however, that it is more realistic to take the opposite interpretation, and to suggest the opportunity is coming to slacken our technological dependence while increasing our technological capability.

The United States is no longer technologically dominant to the extent it was in the 1950s and 1960s. Aided to no small extent by the wise use of purchased technology from the United States (a major reason why the Americans are considering technological protectionism), Western European countries and Japan has succeeded in developing technologically offensive

and defensive strategies in areas where the Americans were once unchallenged. For example, European firms are ahead (or soon will be) of American firms in nuclear and other energy technologies intended to cope with resource scarcities, as well as in pollution control, recycling and construction devices. America's competitors have been steadily increasing their R & D expenditures. There has been a striking decline in the proportion of America's GNP spent on R & D since the mid 1960s, while expenditures in Western Europe, especially West Germany, have grown rapidly. "German and Swiss R & D as a percentage of GNP surpassed the American level in 1973: and West German, Swiss, Dutch (and Japanese) privately funded R & D as a per cent of GNP have come to surpass that of America."²⁴⁰

The United States has begun to grasp the significance of its relative decline²⁴¹ and appears to be ready to set in motion policy measures tantamount to a comprehensive industrial and technological development policy. This time around, however, when the fruits of a resuscitated industrial R & D effort are ripe for harvesting they will not be so readily shared with the Japanese and Europeans. The United States intends to extract the maximum benefit from its R & D investments; and appears ready to restrict the export of commercially valuable technology.

This may well restrict the possibilities of obtaining suitable licensing agreements and joint ventures with American firms, but it is most important to remember there are now significant and rapidly growing alternative sources of technology, and these are more willing than the Americans have ever been to enter into licensing agreements and joint-ventures. Sixty per cent of the foreign ventures of continental European firms are joint-ventures (10-20 per cent with foreign governments). "Europeans are not subject to home-country anti-trust laws in foreign operations; they can agree not to compete or to enter joint-ventures with other firms, local or foreign, more easily than can American companies."²⁴²

Restrictions placed on the export of technology from the US provide another justification for a Canadian industrial and technological development strategy; indeed, they intensify the need for it. Since such a large proportion of our industries, which produce R & D intensive goods, is American controlled and very heavily dependent upon technology sold by American parent organizations, export restrictions could be very damaging to Canadian industry. The commonly encountered technology gap between American subsidiaries and their parents would widen. This would have "... adverse effects on the export potential for Canadian manufactured goods and a corresponding rise in import competition in the domestic market."²⁴³ American branch plants, always insufficiently active in export activity, would increasingly confine their operations to the Canadian market, and curtail expansion of their activities.

"Moreover, any product development activity would probably cease and they would increasingly become mere assembly plants for components imported from their US parents. In the longer term, such plants would likely become little more than warehouses for the distribution of imported end products to the Canadian market."²⁴⁴

The addition of major tariff reductions into this situation could only too easily spell the demise of Canadian manufacturing.

Gloomy as this scenario may be, it must be regarded as an opportunity and a challenge, rather than a catastrophe to be lamented. There could be no

stronger incentive for Canada to achieve a healthy manufacturing sector by building competitive technologically competent Canadian firms. If the federal and provincial governments and Canadian industry are prepared to respond by doing everything in their power to develop firms and industries with technological capability, Canadian industry could establish competitiveness in domestic and export markets while lifting the great burden of the foreign ownership problem.

Of course, Canada could fail to grasp the significance of the moment and take the worst step of all – seek special exemption from any US embargo on technology transfer. This might avert a short-term crisis, but it would serve to perpetuate the existing weakness and vulnerability of Canadian industry. In the fullness of time, economic historians may view it as the last lost opportunity to avert the deindustrialization of Canada and the economic submergence of a resource-dependent region into the greater integrated economy of North America.

Epilogue

Our discussion in this chapter provides only guidelines for the technology and industrial development strategy Canada so badly needs. They are intentionally broadly based. The strategy, for which it is hoped they will form the foundation, requires articulation in the form of specific policies and instruments. Before such articulation is possible there is need for policy oriented research, much painstaking thought, and consultation and cooperation among many interest groups. At every stage of the process leading to sound prescription, the federal-provincial structure of this country, regional economic aspirations, and the need to minimize direct government intervention in the private sector, must be continually borne in mind.

Despite the urgency attached to the task, it must be done carefully — and this requires time. Moreover, it is a job which will never be finished: the only constant is change and strategies must be adapted periodically to encompass the effects and implications of new trends and events.

When Canada sees fit — at last — to create an industrial strategy, ten, possibly fifteen, years will pass before solid gains are apparent. The creation of core companies, the build-up of technological capability, and rationalization of industries cannot be accomplished in a few weeks or months. But a fast spreading malaise is all too evident in our industry now and, if not checked in the near future, it may so weaken our industry that an industrial strategy may come too late. Fortunately, measures can be taken quickly that are consistent with the principles we have tried to elucidate and that are capable of yielding improvements in the condition of manufacturing in the near future. Immediate action on incentives for the formation of consortia is a case in point; redirection of government procurement policy along the lines suggested is another. Measures that would quickly increase R & D activity, incentives to increase exports, and several other steps could also be most beneficial.

While we urge steps that will produce badly needed, tangible results fairly quickly, we also strongly warn against regarding these measures as sufficient, in themselves, to remedy the basic problems. The very foundations of industrial Canada are threatened. We are entirely convinced that only fundamental change directed by a coherent strategy can prevent collapse and begin the process of reconstruction.

Notes

II. Trade Imbalance and the Problems of a Semi-Industrial Economy

1. Brian Griffith, *Invisible Barriers to Invisible Trade*, Trade Policy Research Centre, London, 1975, p. 11.

2. These data, however, do not describe the degree of foreign control because net flows are not divided into debt and equity components, and no accounting is provided of the degree to which foreign-controlled flows have been diverted for Canadian investment.

3. This is explored later in the context of trade in business services.

4. Canada has lost its relative size as leading nickel producer. Australia, South Africa, the Philippines, Greece and Botswana have become the growth areas. Canada is not the world leader in copper, its most important single mineral. There are many new producers whose economies are highly dependent on exports. Prices have reflected over-supply and slack markets. In newsprint, Japan, Sweden and the USSR have emerged as major exporters and the US has increased its levels of self-sufficiency. Australia, South Africa, Argentina and Mexico are making similar efforts. All these production changes combine to reduce the size of Canada's market share and lowered utilization levels are the consequence. In lumber production Brazil, Chile, and several African countries, Australia and New Zealand, assisted by lower wages and faster regeneration cycles, have been selling at the expense of Canada's former share. Siberian softwood resources are enormous and constitute a major future threat to Canadian exports.

5. While grain production and fish have good expansion prospects in international sales, Canada is also a major foodstuff importer.

6. Included are: man-made fibres, chemicals, petroleum and coal products; industrial machinery; mechanical handling equipment, other industrial machinery; agricultural machinery; all locomotives and rolling stock; road transportation equipment; aircraft and parts; other vehicles; communications equipment; heating, refrigeration and air conditioning equipment; measuring and control equipment; tools; office machinery; pharmaceutical supplies; photographic goods. This definition of technology-intensive activities varies from other related concepts in use for apparently similar purposes. As noted the attempt is made to group those industries that manufacture technology-intensive products with industries that are highly technologically dependent in the processes employed. For this reason a specific criterion, such as the level of research and development activity undertaken in an industry, is not an adequate base for inclusion though other work may use it. The data for R & D in Canada are not available on a product basis, only on an industry basis. Nevertheless, research workers concerned specifically with technology-intensive products may be attracted to these data. A major problem in such a use, however, is that the technological content of products is not well measured, by current R & D expenditures, because the long-run stream of expenditures generates products with a large technology content. Nevertheless, the US Department of Commerce has used "R & D expenditures per unit of sales" to define technology-intensive products and has collected data, relevant to particular products, from firms. Although attempts have been made to apply their results to Canadian industry, they are fraught with the basic problem always encountered in using performance statistics from another economy to categorize the activities of Canadian firms. The decision to use the broader spectrum definition of *technology-intensive activities* is taken here in order to gather in those trade sectors generally acknowledged as being well described by this rubric. The results are an identification of technological performance reflecting only Canadian expertise.

When the two definitions are compared in practice, the Canadian economy has done much worse when judged using the US classification of technology-intensive industries, though this is on a very small base. The Canadian economy, however, has a very different structure from the US. Canada's comparative advantages/disadvantages allow that, when the decline in the high-

	Trade Balance				
	(\$ million)			%	%
	1964	1965	1975	1964-75	1965-75
US definition of technology-intensive industries	-351	-588	-2670	610	354
Canadian high-technology industries	-2195	-2719	-7691	250	183

technology component of the trade balance is measured, a wider range of chemicals, petroleum and coal products, machinery and transportation equipment must be included than in the US-based definition. When applying the US-based definition to US trade, the American trade surplus of about \$17.5 billion in 1975 should be contrasted with Canada's \$2670 million deficit.

7. Actually \$592 million.

8. Ontario Ministry of Treasury, Economics and Intergovernmental Affairs, *Canada's Share of the North American Automotive Industry: An Ontario Perspective*, Toronto, 1978.

9. Arthur J. R. Smith, "Canada's Competitive Position: An Appraisal of Basic Trends", *Canadian Business Review*, Vol. 3, No. 1, Winter, 1976, pp. 1-5.

10. Although the net effect of the Auto Pact has been variable, as noted, its gross impact has been to increase the total value of Canada-US auto trade from a little over \$2 billion in 1966 to \$12 billion in 1975.

11. Smith, *op. cit.*

12. Smith, *op. cit.*

13. This applies whether GNP or value of secondary manufacturing shipments is used as the base of the ratio.

14. Resource-based manufactures include wood products, paper products, primary metal products, non-metallic mineral products and petroleum and coal products.

15. Secondary manufactures include all manufactured products except resource-based manufactures.

16. Due to the extensive revision and regrouping of 3-digit SIC industries in 1960, it is impossible to arrive at a meaningful measure of the value of shipments of high-technology manufactures prior to 1960.

17. Market penetration was derived using the formula:

$$\frac{I}{Q + I - X} \times 100 = \text{percentage of domestic market served by imports}$$

where I = imports; X = exports; Q = domestic production.

18. Figure II.17 underrepresents the market penetration in consumer electronics since Canadian domestic production is artificially inflated by the import/warehouse operations of some manufacturers. For example, domestic production of television sets now consists mainly of installing complete imported chassis into Canadian-made cabinets.

19. Economic Council of Canada, *Looking Outward*, (Information Canada, Ottawa, 1975) for example includes nominal tariffs and calculated "effective tariffs" that consider the level of protection if tariffs were removed. See p. 194 ff.

20. *CANDU*, telephone system, satellite communications systems, small aircraft, etc.

21. Comparison of unlike industry groups is a problem, for example, US wood/furniture is less concerned with lumber products than their Canadian counterpart, although these concerns have been minimized.

22. This section relies on a report prepared by IT&C, *Productivity and Competitiveness in the Canadian Economy*. Unpublished discussion paper, Ottawa, 1976.

23. David J. Fowler, *A Comparison of the Performance of Canadian and US Manufacturing and Mining Industries*, Unpublished PhD Thesis, Faculty of Management Studies, University of Toronto, 1976.

24. James G. Frank, *Assessing Trends in Canada's Competitive Position: The Case of Canada and the United States*, The Conference Board in Canada, Ottawa, 1977.

25. IT&C, *ibid.*

26. F. M. Scherer, "The Determinants of Industrial Plant Sizes in Six Nations", *The Review of Economics and Statistics*, Vol. 55, 1973, pp. 135-145.

27. Pierre L. Bourgault, *Innovations and the Structure of Canadian Industry*, Background Study No. 23, Science Council of Canada, Information Canada, Ottawa, 1972; David J. Fowler, *A Comparison of the Performance of Canadian and US Manufacturing and Mining Industries*, unpublished PhD Thesis, Faculty of Management Studies, University of Toronto, 1976.

28. Fowler, *op. cit.*, pp. 234-275.

29. See John N. H. Britton, "Locational Perspectives on Free Trade for Canada", *Canadian Public Policy*, IV, 1978, pp. 1-19; and John N. H. Britton "Canada's Industrial Performance and Prospects Under Free Trade", *Canadian Geographer*, XXI, 1978, pp. 351-371.

III. Jobs in Science, Technology, and Management

30. Radovan Richta, *Civilization at the Crossroads*, International Arts and Sciences Press Inc., Czechoslovakia, 1968.

31. Daniel Bell, *The Coming of Post-Industrial Society*, Basic Books, New York, 1973, p. 487.

32. Economic Council of Canada, *Fifth Annual Report*, Queen's Printer, Ottawa, 1968; Economic Council of Canada, *Living Together, A Study of Regional Disparities*, Supply and Services, Ottawa, 1977.

33. While the technical basis of the work reported in this section is disputed by recent economic analysis the fundamental conclusions are not under contention. For further detail, see Paul T. Davenport, *Capital Accumulation and Economic Growth*, PhD dissertation, Department of Political Economy, University of Toronto, Toronto, 1976.

34. Dorothy Walters, *Canadian Growth Revisited, 1950-67*, Economic Council of Canada, Staff Study #28, Queen's Printer, Ottawa, 1970; Edward F. Denison, *Why Growth Rates Differ*, The Brookings Institute, Washington, DC, 1967; Edward F. Denison, *Accounting for United States Economic Growth, 1929-1961*, The Brookings Institute, Washington, DC, 1967; Edward F. Denison, *Accounting for US Economic Growth 1929-69*, 1974.

35. Walters concluded that Canada's low productivity could increase only if technological sources of growth were improved – the knowledge related factors. She was very specific indicating this improvement would depend on such influences as "increased efficiency in the organization of factors of production; other gains from higher levels of management skill and proficiency; larger economies of scale and specialization, promoted perhaps by commercial policy; gains in efficiency via a reduction in factors constraining competition; and all those factors which create a mobile, flexible, responsible and efficient economy." See Walters, *op. cit.*, pp. 28 and 51.

36. Arthur J. Cordell, *The Multinational Firm, Foreign Direct Investment and Canadian Science Policy*, Background Study No. 22, Science Council of Canada, Information Canada, Ottawa 1971; Bourgault, *op. cit.*, A. J. Cordell and J. M. Gilmour, *The Role and Function of Government Laboratories and the Transfer of Technology to the Manufacturing Sector*, Background Study No. 35, Science Council of Canada, Information Canada, Ottawa, 1976.

37. Economic Council of Canada, *op. cit.*, p. 37.

38. J. I. Gershuny, "Post-industrial Society: The Myth of the Service Economy", *Futures*, Vol. 9, 1977, p. 9.

39. Victor R. Fuchs, *Productivity Trends in the Goods and Service Sectors 1929-61*, Occasional Paper 89, National Bureau of Economic Research (NBER), 1964.

40. David S. Worton, "The Service Industries in Canada", *Production and Productivity in the Services Industries*, V. R. Fuchs, ed., NBER and Columbia UP, 1969, pp. 237 ff.

41. The *immediate production* sector is defined as primary and secondary industries and *non-production* is equivalent to "tertiary";

Primary: Agriculture, fishing (including trapping), forestry and mining

Secondary: Manufacturing, utilities, construction, transport, and communications.

Tertiary: (a) Trade, finance, insurance and real estate, public administration and defence

(b) Services

These three categories coincide with the definition in Economic Council of Canada, *Living Together: A Study of Regional Disparities*, Supply and Services Canada, Ottawa, 1977, p. 64. The subdivision of tertiary activity is omitted from that work.

42. Occupational data have been analyzed for several other countries. Unfortunately, the classification systems used by the UN statistical office in compiling data from various countries have changed slightly over the years — as have national definitions in response to UN attempts at standardization. At the last full Census (1971), Canada implemented sweeping changes in its classifications and there is some difficulty in studying trends in all occupational classes on a consistent basis.

43. The Canadian pattern of change according to the Canadian Labour Force Survey is similar to that of the United States. Although the Survey seems to provide a picture more consistent with trends, it overstates the size of Canadian quaternary employment because of definitional differences among data. If the 1971 Statistics Canada figures had been based on 1961 codes, comparison would have been easier.

44. This is based on the fact that Canada had not achieved a higher level of effectiveness in education already, and on the assumption that the effect of the Canadian population age-structure on demand for classroom places does not explain the difference.

45. Harold Crookell, "The Transmission of Technology Across National Boundaries", *The Business Quarterly*, 38, 1973, pp. 52-60.

46. The guides to performance used are relative change in SE & M employment and engineers alone, and Canada/United States employment of engineers (1970-71) and SE & M (1970-71).

47. It is important to note that the OECD definitions of R & D activity are much broader in concept than those employed in Canadian statistical sources. In 1971 there were fewer than 19 000 employed in Canadian R & D, including 2500 scientists and 4800 engineers: the situation was not very different in 1973.

IV. The Dependency Syndrome: General Dimensions

48. Abraham Rotstein, "Canada: The New Nationalism", *Foreign Affairs*, Vol. 55, No. 1, October 1976, pp. 97-118.

49. This point is given more substance in Chapter V.

50. Some observers believe that the advocacy of economic policies which will further reduce Canadian economic and political independence, is the consequence of the Americanization of Canadian economics. Watkins noted, "As the neo-classical economies now filter into Canada via the United States — for our intelligentsia has a branch plant mentality suitable to life in a branch-plant economy — Canadian economics has similarly moved rightward. At the moment, the commitment of Canadian economists on issues like free trade, stamp them as being even more *laissez-faire* than their American counterparts. Ultimately, as Keynes insisted, it is ideas that matter and the subser-

vience of Canadian economics to American economics to an extent more thorough than in the days of the British Empire, hardly bodes well for the Canadian future." See K. J. Rea and S. T. Macleod, eds., *Government in Canada*, Methuen, Toronto, 1969, pp. 390-397.

Drache believes the widespread failure of Canadian economists to give attention to Canadian dependency derives from the replacement of Canadian political economy in the Innis tradition by a social science based upon reconstructed theories of elitism, managerialism, bureaucracy, and the imperatives of technology. Daniel Drache, "Rediscovering Canadian Political Economy", *Journal of Canadian Studies*, Vol. XI, No. 3, August 1976, pp. 3-20.

51. For a synthesis of changing perspectives and understanding of economic growth and development, see Harold Brookfield, *Interdependent Development*, University of Pittsburgh Press, and Methuen, Pittsburgh and London, 1975.

52. For a few examples of this work, see A. G. Frank, *Capitalism and Underdevelopment in Latin America: Historical Studies of Chile and Brazil*, Monthly Review Press, New York, 1967; J. Friedmann, "The Spatial Organization of Power in the Development of Urban Systems", *Comparative Urban Research*, (1) 1972, pp. 5-42; N. Girvan, "The Development of Dependency Economics in the Caribbean and Latin America: Review and Comparison", *Social and Economic Studies*, 22 (1973) pp. 1-33; C. Furtado, *Development and Underdevelopment*, University of California Press, Berkley, Los Angeles, 1971; Stephen Hymer, "The Multi-national Corporation and the Law of Uneven Development", *Economics of World Order*, Jagdish Bhagwati, ed., MacMillan, London, 1972, pp. 113-140; Kari Levitt, *Silent Surrender*, MacMillan, 1970.

53. In a recent paper Wänborg of Försvarets Forskningsanstalt (Swedish National Defence Research Institute, Stockholm) observes that Canada is subject to very pervasive influence from the United States, "... perhaps more so than any comparable state." In comparing the Soviet Union's influence over Finland, with US influence over Canada, he finds that the cultural and commercial influence of the USSR over Finland is mild compared with US influence over Canada.

Canada, as a state, "... is subject to as much state influence by its big power neighbour, the United States as Finland is by the Soviet Union in addition to which Canada is also under very heavy US economic and cultural influence whereas Finland is subject to little such influence by the Soviet Union." See, Manne Wänborg, *Finlandization and the Counter-Example of Canada*, Försvarets Forskningsanstalt, Stockholm, July 1976, Mimeo.

54. Tom Naylor, *The History of Canadian Business, 1967-1914*, 2 vols. James Lorimer and Company, Toronto, 1975.

55. For example, L. R. MacDonald, "Merchants Against Industry: An Idea and Its Origins", *Canadian Historical Review*, Vol. LVI, 1975, pp. 264-281.

56. The US had a similar clash, but in that case the industrial capitalists (the North) prevailed over the merchant capitalists (the South).

57. Wallace Clement, *The Canadian Corporate Elite*, McClelland and Stewart, Toronto, 1975, p. 64.

58. Attributed to M. Watkins, 1970, Clement, *Ibid.*, p. 63.

59. Clement, *Ibid.*, p. 63.

60. Nevertheless, there were strong signs of industrial maturation during the second half of the nineteenth century. It is open to question whether or not any industrial protection was required. See J. M. Gilmour, *Spatial Evolution of Manufacturing: Southern Ontario, 1851-1891*, Department of Geography Research Publications, Toronto, University of Toronto Press, 1972.

61. Naylor, *op. cit.*, Vol. 1, p. 84.

62. Clement, *op. cit.*, p. 74.

63. Lyndhurst Collins, *Industrial Migration and Relocation*, unpublished MA Thesis, Department of Geography, University of Toronto, 1966, pp. 45-46.

64. H. Marshall, F. A. Southard, K. W. Taylor, *Canadian-American Industry: A Study in International Investment*, Yale University Press, New Haven, 1936, p. 29.

65. National-size markets made accessible by continent-spanning communications and railroad systems was one economic rationalization; Galbraith has suggested efforts to reduce, regularize or eliminate competition were the main motivations.

66. A. W. Currie, *Canadian Economic Development*, Toronto, University of Toronto Press, 1942, pp. 155-156.

67. Collins, *op. cit.*, p. 52.

68. Ontario, Select Committee on Economic and Cultural Nationalism, Final Report on Economic Nationalism, Ontario Legislative Assembly, Toronto, 1975, p. 31.

69. *Ibid.*

70. For example in 1962 in electrical products, 14 of the 20 largest plants were foreign owned and in machinery 16 of the first 20.

71. Richard E. Caves, *Diversification, Foreign Investment and Scale in North American Manufacturing*, Economic Council of Canada, Information Canada, Ottawa, 1975.

72. Ontario, Select Committee on Economic and Cultural Nationalism, Final Report on Economic Nationalism, *op. cit.*, p. 32.

73. *Ibid.*, p. 32.

74. D. M. Ray, "The Location of United States Manufacturing Subsidiaries in Canada", *Economic Geography*, 1971, pp. 389-400; D. M. Ray, *Dimensions of Canadian Regionalism*, Department of Energy, Mines and Resources, Geographical Paper No. 49, Ottawa, 1971.

75. The concentration applies to secondary manufacturing; resource-related firms are dispersed in a fashion similar to that of Canadian-controlled firms in the relevant industries.

76. John N. H. Britton, "Patterns of Business Linkage: The Significance of Foreign ownership and Economic Change in Canada", *International Geographical Union, USSR, Papers of Novosibirsk Symposium on Industrial Geography*, 1976, pp. 77-83; Maurice Yeates, P. Lloyd, *A Study of the Impact of the Area Development Program in the Southern Georgian Bay Area, Ontario*, Policy and Planning Branch, Department of Energy, Mines, and Resources, Geographical Paper No. 44, Ottawa, 1970.

77. Similar findings have been made in Scotland. Attempts are now being made there to offset the effects of recently established branches by supporting small- and medium-size indigenous firms. See, for example, Scottish Council (Development and Industry), "Centralization: Scotland's 20th Century Nine of Diamonds?", Edinburgh, SCDI, 1969.

78. Government of Canada, *Foreign Direct Investment in Canada*, Ottawa, Information Canada, 1972, pp. 405-407.

79. Abraham Rotstein, *op. cit.*, pp. 106-107.

80. Statistics Canada does not recognize an industrial group called the electronics industry. However, IT&C recognizes an industrial grouping called the electrical and electronics industry, for convenience referred to in this study as the electronics industry. It is composed of the following SIC "3 and 4 digit groupings": 331 and 332 small and major appliances; 333 lighting fixtures; 334 radio and television; 335 electronic components and communication equipment; 336 electrical industrial equipment; 3391 batteries; 338 insulated wire and cable; 3399 miscellaneous electrical products; 318 office and store machinery; and 3911 instruments and related products.

81. Bourgault, *Innovation and the Structure of Canadian Industry*, *op. cit.*, p. 89.

82. When duty remission is taken into account the average real duty (value of duty paid divided by the value of total imports) is somewhat lower. For example, in 1975 the average nominal duty on office machines and equipment was 12.24 per cent. However, 38.10 per cent of all imports entered duty free resulting in an effective duty rate of 7.57 per cent. In com-

munication and related equipment the average nominal duty was 14.84 per cent and the effective duty rate — 11.66 per cent.

Note: The concept of average real duty should not be confused with that of effective protection, which has been defined as the percentage increase in value added per unit of output, made possible by the tariff structure. See James R. Melvin and Bruce W. Wilkinson, *Effective Protection in the Canadian Economy*, Special Study No. 9, Economic Council of Canada, Queen's Printer, Ottawa, 1968.

83. Ontario, Select Committee on Economic and Cultural Nationalism, *Foreign Ownership and the Electronics Industry*, Kates, Peat and Marwick, Toronto, December 1973. This report is used extensively in this section.

84. *Ibid.*, p. 67.

85. *Ibid.*

86. S. S. Grimley, "Canadian Factors in the Generation and Evaluation of New Product Ideas", *The Business Quarterly*, 39, 1974, pp. 32-39.

87. Ontario, Select Committee, *Foreign Ownership and the Electronics Industry*, *op. cit.*, p. 73.

88. *Ibid.*, p. 79.

V. Export Failure and Import Dependence: Origin and Impact in Canadian Manufacturing

89. Robert Gilpin, "Science Policy for What: The uniqueness of the Canadian situation", unpublished paper presented to the Science Council of Canada, 1970.

90. Daly and Globerman state, "... given existing tariff levels, subsidiaries do not act in any fundamentally different way from domestically-owned firms." D. J. Daly and S. Globerman, *Tariff and Science Policies: Applications of a Model of Nationalism*, Ontario Economic Council, Research Studies, University of Toronto Press, Toronto, 1976, p. 98.

91. Furthermore, it should be remembered that official US policy also can have an important bearing on the export health of Canadian industry. In late 1971, for example, in an attempt to reduce the trade gap, the United States introduced tax credits for US businesses that increased domestic US capital investment. A surcharge was introduced on imports and tax deferrals were established for half the profits made on exports (Domestic International Sales Corporation). These measures likely increased the problems of the Canadian industrial sector and reveal in another way the vulnerability of the Canadian economy to the level of foreign ownership.

92. A. E. Safarian, *Foreign Ownership of Canadian Industry*, McGraw-Hill, Toronto, 1966.

93. *Ibid.*, p. 20.

94. *Ibid.*, p. 304.

95. See also S. W. Kardasz, "Some Effects of Foreign Control of Industrial Behaviour and Performance in Canada", *Policy Formation in an Open Economy*, Robert A. Mundell, B. E. Van Sneelenberg, eds., Vol. 2, University of Waterloo, 1972, pp. 415-20.

96. *Ibid.*, p. 305.

97. Economic Council of Canada, *Looking Outward, A New Trade Strategy for Canada*, Information Canada, Ottawa, 1975.

98. Industry, Trade and Commerce, *Foreign-owned Subsidiaries in Canada, 1964-1971*, Information Canada, Ottawa, 1974. The data are obtained from firms which volunteer it. These are referred to as the "Reporting Corporations". The same corporations need not report from one year to the next. Therefore, any trend analysis must be treated with extreme caution. The survey covers activities other than manufacturing, with the result that all the aggregate values provided in the report are of no value for analysis of manufacturing. Additionally, manufacturing is disaggregated into only seven groups. This probably obscures many important trends.

99. Logging, wood industries, pulp and paper, and also the furniture industries, mostly primary manufacturing activities producing intermediate

goods specifically for export, are included. In most cases of foreign direct investment backward vertical integration dictates that resource-based materials are produced for later (forward) processing in the US, Europe or Japan. Thus the basic purpose of the exercise is export. These exports should not be confused with the performance of secondary manufacturing industries for which exports generally reflect human resource advantages dependent on the innovative character of end products or their cost.

100. Even this figure is probably an inflation because a number of primary manufacturing industries, including food and beverages, are concealed in the remaining groups.

101. "Manufacturing establishment" is a statistical concept: it is the smallest size unit used in collecting industrial data.

102. Information obtained from Statistics Canada, *Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969 and 1970*, Cat. No. 31-401, Information Canada, Ottawa, March 1976.

103. The median would be more appropriate, but data are not available to permit its calculation.

104. United States, Emergency Committee for American Trade, *The Role of the Multinational Corporation in the United States and World Economies*, Washington, DC, 1972. An analysis of the domestic and international operations of 74 US corporations.

105. Figures on the "tied" exports of Canadian-controlled firms do not exist. Some Canadian corporations, particularly the larger ones would make use of them but there is no doubt that tied sales are much less important to them than to foreign-controlled operations.

106. Collins, *op. cit.*, p. 68.

107. Robert B. Stobaugh and Associates, "US Multinational Enterprise and the US Economy", Harvard Business School, January 1972 in *The Multinational Corporation Studies on US Foreign Investment*, Vol. 1, United States Department of Commerce, Government Printing Office, Washington, DC, 1972. For a shortened version of Stobaugh's work see Robert A. Stobaugh, "How investment abroad creates jobs at home", *Harvard Business Review*, Vol. 50, No. 5, September/October 1972, pp. 118-126.

108. Safarian, *op. cit.*, p. 149.

109. In all 12 industrial groups where imports account for more than 20 per cent of output, Canadian-controlled corporations own less than 60 per cent of total group assets.

110. Foreign Direct Investment in Canada, *op. cit.*, p. 183.

111. *Ibid.*

112. John N. H. Britton, "The Influence of Corporate Organization and Ownership on the Linkages of Industrial Plants: A Canadian Enquiry", *op. cit.*

113. Britton, *ibid.*, p. 314.

114. *Ibid.*

115. *Ibid.*

116. *Ibid.*, p. 323.

117. *Ibid.*

118. The United States and Canada import electronic and other component inputs from low-cost producers (e.g., Japan). There is little alternative in electronics and optical systems; Canada, however, also imports components made in the United States.

119. See, M. H. Yeates and P. E. Lloyd, *Impact of Industrial Incentives: Southern Georgian Bay Region*, Policy and Planning Branch, Department of Energy, Mines and Resources, Ontario Geographical Paper No. 44, Ottawa, p. 19.

120. Bourgault, *op. cit.*, pp. 319-320.

121. John N. H. Britton, "Patterns of Business Linkage: The Significance of Foreign Ownership and Economic Change in Canada", *International Geographical Union, USSR, Papers of Novosibirsk Symposium on Industrial Geography*, 1976, pp. 77-83. See also John N. H. Britton, "Organizational,

Economic and Environmental Influence on the Spatial Behaviour of Manufacturing Firms", *Contemporary Industrialization Problems for Spatial Analysis and Regional Policy*, F. E. Hamilton, ed., John Wiley and Sons, London, forthcoming.

122. Britton, "Patterns of Business Linkage", *op. cit.*, p. 80.

123. In dealing with the importation of these services strong reliance is placed on Myron J. Gordon, "Canadian Manufacturing: A Strategy for Development", *The Business Quarterly*, Winter 1974, pp. 52-57, and on unpublished material furnished by Gordon.

124. For a summary of this debate, R. J. Barnet and R. E. Muller, *Global Reach*, Simon and Schuster, New York, 1974, pp. 296-302.

125. United States, "An American Trade Union View of International Trade and Investment, AFL-CIO", Washington, DC in *Multinational Corporations*, a compendium of papers submitted to the Subcommittee on International Trade of the Committee of Finance of the US Senate, Government Printing Office, Washington, DC, 1973.

126. United States, *The Role of the Multinational Corporations in the United States and World Economies*, Emergency Committee for American Trade, Washington, DC, 1973.

127. Robert B. Stobaugh and Associates, "US Multinational Enterprise and the US Economy", *op. cit.*

128. This is not to say that labour totally lacks a case. Barnet and Muller rightly point out that there are other ways to protect markets than by building factories abroad. "Companies could have put more money into research and development in the United States to replace the diminishing stock of basic innovative ideas on which future production depends. Such an investment policy would have had a greater domestic multiplier effect than foreign investment. We could also ask what would have happened to the US employment picture if US firms had not been so ready to sell off their comparative advantage to their competitors by licensing technology to them for quick profits." Barnet and Muller, *op. cit.*, p. 119.

129. Stobaugh, "How investment abroad", *op. cit.*, p. 119.

130. Really just a variant of the product life cycle model. Product and industry can be used interchangeably.

131. United States, "Implications of Multinational Firms for World Trade and Investment and for US Trade and Labour", Report to the Committee on Finance of the United States Senate and its Subcommittee on International Trade, Investigation No. 332-69, Under section 332 of the Tariff Act of 1930, US Government Printing Office, Washington, DC, 1973.

132. *Ibid.*, Table A-19, p. 709.

133. It has been assumed that if Canadian firms served that portion of the market now served by American subsidiaries they would utilize Canadian suppliers of equipment and components.

134. Despite the striking clarity of Canada's position businessmen are still not convinced. An interesting clash of views in recent issues of *Science Forum* brings this out. An editorial by Frank Maine, (*Science Forum*, vol. 52, October 1976) suggested foreign ownership is one of the main reasons for the poor state of R & D in Canada. This provoked several letters to the editor (*Science Forum* 10(1), February 1977). Maine was accused by one writer of being simplistic and misleading. Another accuses him of using "... the standard nationalist 'whipping boy' argument." The problem he was told in one letter is the lack of a national policy for either industry or technology in this country. Another letter argues that the real problem is the small size of the Canadian market. "... in almost any product (it) is too small to support the heavy burden of R & D costs involved in major technological successes." One can dispute the validity of such observations. But their relevance or validity is not the issue. These letters all reflect a failure to appreciate the enormity and pervasiveness of the foreign ownership problem.

135. For some recent statements on the condition of industry R & D in Canada, see M. J. Peacocke, "The State of R & D in Canada", *Canadian*

Research, Vol. 10, No. 11, January/February 1977, pp. 11-15; F. Maine, "Why is R & D in a Sorry State in Canada?", *Canadian Research*, Vol. 10, No. 1, January/February 1977, pp. 17-19.

136. Cordell, *op. cit.*, pp. 42-49.

137. *Ibid.*, pp. 42-43.

138. Peter Hanel, *The Relationship Existing Between the R & D Activity of Canadian Manufacturing Industries and Their Performance in the International Market*, Industry, Trade and Commerce, Technological Innovation Studies Program, Research Report, Information Canada, Ottawa, 1976.

139. *Ibid.*, pp. 100-101.

140. D. A. Ondrack, *Foreign Ownership and Technological Innovations in Canada: A Study of the Industrial Machinery Sector of Industry*, University Grant Program Research Report, Industry, Trade and Commerce, Office of Science and Technology, Ottawa, October 1975.

141. A. J. Cordell and J. M. Gilmour, *The Role and Function of Government Laboratories and the Transfer of Technology to the Manufacturing Sector*, Background Study No. 35, Science Council of Canada, Information Canada, Ottawa, 1976.

142. Association of Provincial Research Organizations, Brief on "The Role of the Provincial Research Organizations in Industrial Development" to Special Committee of the Senate on Science Policy – Proceedings of the Special Committee of the Senate on Science Policy, 16 March 1977, Issue No. 6, Sixth Proceedings on the Study of Canadian Government and Other Expenditures on Scientific Activities and Matters Related Thereto, GAI-6A80.

143. J. Wolner Sundelson, "US Automotive Investment Abroad", *The International Corporation*, C. P. Kindleberger, ed., MIT Press, Cambridge, Mass., 1970, p. 70.

144. Robert Gilpin, *Technology, Economic Growth and International Competitiveness*, Subcommittee on Economic Growth of the Joint Economic Committee, Congress of the United States, US Government Printing Office, Washington, DC, July 1975, p. 65.

VI. Canadian Technological Weakness and the Dynamics of Change

145. In 1969, when Canadian manufacturing seemed to be in relatively healthy condition, only Ireland among all the OECD countries had a smaller proportion of its labour force in manufacturing. See OECD, *Labour Force Statistics 1958-1969*, Paris, 1971.

146. Keith J. Pavitt, *The Multinational Firm and the Transfer of Technology*. Second draft, prepared for a Conference on the Multinational Enterprise, University of Reading, Berkshire, 1970.

147. Keith J. Pavitt, W. Walker, "Government Policies Towards Industrial Innovations: A Review", *Research Policy*, 5, 1976, pp. 11-97.

148. Pierre L. Bourgault, *Innovation and the Structure of Canadian Industry*, Science Council of Canada, Background Study No. 23, Information Canada, Ottawa, 1972.

149. Markets may be perceived first; in other cases products are developed and marketing strategies subsequently devised.

150. See also Economic Council of Canada, *Looking Outward*, *op. cit.*, pp. 23-24.

151. M. H. Carrère, Summary report presented to an IDRC seminar, October 1976. A book on Carrère's research and findings, entitled *Technological Strategies: An East-West, North-South Review* is in preparation.

152. C. Freeman, *The Economics of Industrial Innovation*, Penguin Books, Middlesex, England, 1974.

153. Freeman, *op. cit.*, p. 274.

154. H. Yoshihara, "The Japanese Multinational", *Long Range Planning*, Vol. 10, 1977, pp. 41-45.

155. David J. Fowler, *A Comparison of the Performance of Canadian and US Manufacturing and Mining Industries*, Unpublished PhD Thesis, Faculty of

Management Studies, University of Toronto, Toronto, 1976, pp. 234-275; and Bourgault, *op. cit.*, pp. 115-118.

156. Carrère, *op. cit.*

157. Junta del Acuerdo de Cartagena, *Technology Policy and Economic Development*, International Development Research Centre, Ottawa, 1976, pp. 15-21.

158. Junta del Acuerdo de Cartagena, *op. cit.*, pp. 22-29. For broadly based considerations of innovations in post-war Japanese industrialism, see Terutome Ozawa, *Japan's Technological Challenge to the West 1950-1974: Motivation and Accomplishment*, MIT Press, Cambridge, Mass., 1974; and H. Suzuki, "Industrial Technology of Japan", *Industria*, Vol. 1. No. 1, October 1971, pp. 1-9.

159. D. Scott, "It's All Happening", *Sweden Now*, 10 (4), 1976, pp. 21-23.

160. The literature on the problems of industrial development and on strategies and policies for growth, for both the developing and developed world is vast. For the developing world a most comprehensive and commendable review of problems and strategies is provided by R. B. Sutcliffe, *Industry and Underdevelopment*, Addison-Wesley, London, 1971. Much of the recent literature on the developed world addresses the issues of how to stimulate and sustain industrial innovation rates in order to avoid falling behind. For example, see K. Pavitt and W. Walker, "Government Policies Towards Industrial Innovations: A Review", *Research Policy*, Vol. 5, 1976, pp. 11-97. This paper reviews much recent literature from North America and Europe.

161. Some observers believe this is the inevitable fate of all developing countries if they attempt to industrialize using technology which is appropriate to the large markets and degree of specialization of the industrialized countries. See Meir Merhav, *Technological Dependence, Monopoly and Growth*, Pergamon Press, Oxford, 1969.

162. Herein lies one of the key ingredients of Japanese success. They succeeded in unbundling technological packages and buying only the core technologies.

163. This quality has been explored by Christian DeBresson, *Technology Transfer in Three Mediterranean Countries*, Working Paper No. 345, Faculty of Commerce and Business Administration, University of British Columbia, 1976.

164. For these characteristics we have relied heavily on Junta del Acuerdo de Cartagena, *op. cit.*

165. The problems arising from lost control have not gone unnoticed by the governments of host economies. Some have been seeking correctives and are attempting to redefine their relationships with transnational companies, e.g., seeking shares in the ownership of subsidiaries and the right to license new technologies directly from the companies. It is alleged that these pressures in association with other unrelated forces are promoting a withdrawal of many American companies from overseas activity. See Sanford Rose, "Why the Multinational Tide is Ebbing", *Fortune*, August 1977, pp. 111-120.

166. Government of Canada, *Foreign Direct Investment in Canada*, Information Canada, Ottawa, 1972; Bourgault, *op. cit.*; A. J. Cordell, *The Multinational Firm, Foreign Direct Investment and Canadian Science Policy*, Science Council of Canada, Background Study No. 22, Information Canada, Ottawa, 1971.

167. For example, S. Globerman, "Technological Diffusion in the Canadian Carpet Industry", *Research Policy*, Spring 1975, pp. 190-206; D. J. Daly, and S. Globerman, *Tariff and Science Policies: Applications of a Model of Nationalism*, Ontario Economic Research Studies, University of Toronto Press, Toronto, 1976.

168. Harold Crookell and Leonard Wrigley, "Canadian Response to Multinational Enterprise", *The Business Quarterly*, Spring 1975, pp. 58-66.

169. Scott, *op. cit.*

170. "The Challenge of Technology to Canadian Industry", an address by L. D. Clarke, Chairman, Spar Aerospace Products Ltd., at the company's Annual General Meeting, 27 May 1977.

171. While nowhere else among industrialized nations has this domestic-foreign dualism in the economy emerged to a comparable extent, there are similarities among industrializing countries of the Third World. The dualism in Brazil, Mexico, Argentina and the other Latin American countries derives from policies of import substitution which have been adopted to promote industrialization. Insufficient interconnections between the new foreign-owned sector and indigenous manufacturing is again the problem. See R. Weisskoff and E. Wolf, "Linkages and Leakages: Industrial Tracking in an Enclave Economy", *Economic Development and Cultural Change*, Vol. 25, No. 4, July 1977, pp. 607-628.

172. This is not just an expression of labour costs but among other factors it reflects productivity or efficiency with which production factors are used.

173. Sweden decided to leave its textile industries open to the full force of foreign competition. However, as the Swedish industry eroded, the importance of the interconnections between activities became apparent and led to questions about the wisdom of the policy. The Swedes realized they would have to import even their army uniforms and mail bags as well as most other items. This led to a reconsideration of policy and the provision of greater protection for industry. (Information obtained from a representative of the Canadian textile industry.)

174. Once again it should be noted we are not forgetting Canadair's Challenger, CANDU, etc., but merely placing them in perspective.

175. Gilpin, *op. cit.*, p. 10.

176. L. D. Clarke, *op. cit.*

177. In several of the export-oriented industrializing countries, foreign-owned manufacturing, like foreign-controlled plantation agriculture has very little contact with the local economy: "... foreign investment occupies an enclave, tightly bound to the home country, far away, but only loosely connected, except geographically, to the local scene." C. P. Kindleberger, *American Business Abroad*, Yale University Press, New Haven, Conn., 1969, p. 146. Foreign-controlled manufacturing in Canada has strong similarities, although the degree of separateness is much less pronounced; as always, Canada occupies the middle ground.

178. Gilpin, *op. cit.*, p. 50.

179. *II PBDCT, II Basic Plan for Scientific and Technological Development*, Brazil, Presidency of the Republic, Brazilia, 1976, p. 11.

180. *Ibid.*

181. *Ibid.*

182. *Ottawa Journal*, Saturday, 29 October 1977, p. 14.

183. "A single machine can insert components into a printed circuit board at a rate of 72 000 pieces per hour, compared with a hand rate of 300 pieces per hour. It would require 240 workers to achieve the 72 000 per hour insertion rate, yet automatic insertion machines can be operated by as few as 11 workers." *New Scientist*, 6 October 1977, p. 15.

184. In the fall of 1977, the largest home electronics firm in the US - Zenith - announced it could not fight the Japanese competition any longer. It was laying off its 5500 American workers and moving its TV production to Taiwan, *New Statesman*, 11 November 1977, p. 648.

185. "US Steel-makers are outdated" from *The Observer*, London, reprinted in the *Ottawa Journal*, 29 October 1977, p. 14.

186. Peter Evans, "Multinationals, State-owned Corporations and the Transformation of Imperialism: A Brazilian Case Study", *Economic Development and Cultural Change*, Vol. 26, No. 1, October 1977, p. 44.

187. "Germany's Engine Room Slows Down", *Economist*, pp. 7-71, 9 April 1977.

188. Yoshihara, *op. cit.*

189. S. S. Grimley, "Canadian Factors in the Generation and Evolution of New Product Ideas", *The Business Quarterly*, Summer, 1974.
190. While in theory Canada would be served well by a drop in costs below the level of the advanced industrial countries, the recent drop in the exchange rate which goes a long way toward achieving this, implies a reduction in the standard of living and unless substantial inflation is prevented this drop will not substantially improve Canada's competitiveness with respect to the developed or developing world.
191. See John W. Kendrick, "Productivity Trends and Prospects", *US Economic Growth from 1976 to 1986: Prospects, Problems and Patterns, Volume 1 - Productivity*. Studies prepared for the use of the Joint Economic Committee, Congress of the United States, US Government Printing Office, Washington, DC, October 1976, pp. 1-20.
192. For more detailed arguments along this line, see Nicholas Valéry, "The Future Isn't What it Used to Be", *New Scientist*, 13 January 1977, pp. 7-73; Arthur L. Robinson, "Impact of Electronics on Employment: Productivity and Displacement Effects", *Science*, Vol. 195, March 1977, pp. 1179-84; and "Technology, Productivity and Economic Growth", *Mosaic*, October 1976, pp. 1-7.
193. Gilpin, *op. cit.*, p. 50.
194. The notion of "technological plateau" is borrowed from Ieuan Maddock, "End of the Glamorous Adventure", *New Scientist*, 13 February 1975, pp. 375-377.
195. Canadian Manufacturers Association (CMA), *Agenda for Action*, Toronto, October 1977, p. 18.
196. *Ibid.*, p. 16.
197. John N. H. Britton, "Locational Perspectives on Free Trade for Canada", *Canadian Public Policy*, IV, 1978, pp. 1-19.
198. C. D. Howe Research Institute. *A Time of Difficult Transitions: Canada-US Relations in 1976*, Montreal: Canadian-American Committee, 1976.
199. John N. H. Britton, "Locational Perspectives on Free Trade", *op. cit.*, and "Prospects Under Free Trade", *Canadian Geographer*, XXI, 1977, pp. 351-371.
200. Robert Gilpin, "American Direct Investment and Canada's Two Nationalisms", in Richard A. Preston, *The Influence of the United States on Canadian Development*, Duke University, Commonwealth Studies Centre, 1972, p. 141.
201. Myron J. Gordon, "Canadian Manufacturing: A Strategy for Development", *The Business Quarterly*, 29, 1974.
202. John N. H. Britton, "Locational Perspectives on Free Trade", *op. cit.*, p. 17.
203. L. G. Clarke, *op. cit.*, p. 619.

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204. *Science and Technology Policy Implementation in Less-Developed Countries: Methodological Guidelines for the STPI Project*, International Development Research Centre, Ottawa, 1976. This is probably the most useful attempt so far made to examine the nature of technology policy.
205. *Ibid.*
206. *Ibid.*
207. Science Council of Canada, *Eleventh Annual Report, 1976-77*, Supply and Services Canada, Ottawa, p. 26.
208. Francisco R. Sagasti, "Guidelines for Technology Policies", *Science and Public Policy*, February 1977, pp. 2-15.
209. Science Council of Canada, *Towards a National Science Policy for Canada*, Report No. 4, Queen's Printer, Ottawa, October 1968.
210. *Ibid.*, p. 29.

211. For details on their activities see Arthur Cordell, *The Multinational Firm, Foreign Direct Investment and Canadian Science Policy*, Background Study No. 22, Science Council of Canada, Ottawa, 1971.

212. An important work supporting rationalization is A. Milton Moore, *How much price competition?*, McGill-Queen's University Press, Montreal and London, 1970.

213. Camco, involving Canadian General Electric and Canadian Westinghouse, is a form of rationalization of subsidiaries: it is also a take-over of General Steel Wares (GSW). Whether Canada gains from the rationalization or loses on balance because of the absorption of GSW will unfold over the next 5 years.

214. Probably in a majority of countries this discussion would occasion surprise and disbelief. Increasingly the host governments of developed and developing countries are insisting upon and getting a greater degree of host equity and management participation in foreign-owned subsidiaries. This is an effective way to reduce the obstacles to rationalization. See Jagdish C. Sachdev, "Dilution of Ownership in Multinational Concerns", *Long Range Planning*, Vol. 10, October 1977, pp. 33-39. Canada is not likely to make widespread use of this approach in solving its foreign ownership problems, even though some precedents have been set. There is still a very strong antipathy toward what is seen as government interference in the free enterprise system.

215. Norman Macrae, "The Coming Entrepreneurial Revolution: A Survey", *Economist*, 25 December 1976, pp. 41-44, 53, 58, 60-65.

216. *Financial Post*, 16 December 1977, p. 37. This article points out "that the sort of rationalization many US companies are thinking about is to pull out of Canada altogether. A recent survey by Memac showed that a 40 per cent tariff cut, as proposed under the multilateral trade negotiations, would mean some Canadian subsidiaries would be closed while others would cut lines that were only marginally profitable and switch production to the US."

217. A strong precedent for this line of thinking has been set by Japan. There, small businesses are regarded as providing the nucleus for regional economic development.

218. The subject of a recent Science Council report — *Canada as a Conserver Society: Resource Uncertainties and the Need for New Technologies*, Report No. 27, Science Council of Canada, Supply and Services Canada, Ottawa, 1977.

219. Rein Peterson, *Small Business: Building a Balanced Economy*, Press Porcépé Limited, Erin, Ontario, 1977, p. 179.

220. See Barry A. Stein, *Competitive Scale in Manufacturing, The Case of Consumer Goods*, Center for Community Economic Development, Cambridge, Mass., 1976; and *Size, Efficiency and Community Enterprise*, Center for Community Economic Development, Cambridge, Mass., 1974.

221. Peterson, *op. cit.*, p. 148.

222. *Ibid.*

223. From the text of the keynote address of Mr. Kiyotaka Kodama, Deputy Director-General of the Small and Medium Enterprise Agency, MITI, The Government of Japan, at the *Fourth International Symposium on Small Business*, Seoul, Korea, 1977. The discussion of Japan draws on this speech.

224. *Ibid.*

225. *Ibid.*

226. Norman Macrae, *op. cit.*, p. 52.

227. M. Shinohara, "MITI's Industrial Policy and Japanese Industrial Organization," *The Developing Economies*, XIV:4, 1976, pp. 372-373.

228. This section has benefitted greatly from discussion with personnel at IT&C.

229. Canada, Foreign Investment Review Agency, *Annual Report 1976-77*, Foreign Investment Review Act, Ottawa, Supply and Services Canada, 1977.

230. Foreign Investment Review Agency, News Release, Office of the Minister, Ottawa, 26 January 1978.

231. Selected Readings in Canadian Legislation Affecting Foreign Investment in Canada, Part 1 Federal Laws and Regulations as of October 1977. FIRA Papers, No. 2 December 1977, Foreign Investment Review Agency, Ottawa.

232. Speech by Alastair Gillespie, then Minister of Industry, Trade and Commerce, given to the House of Commons, 20 November 1973.

233. In this discussion remarks are confined to the relations between FIRA and manufacturing.

234. Foreign-owned businesses in Canada account for more than 70 per cent of the foreign investment in Canada each year. During the past twenty years, the net inflow of direct investment has been in decline relative to GNP.

235. The determination of whether a new business is related to an existing one is quite complicated. The FIRA guidelines give a remarkably wide scope to the definition of relatedness. A new business is related to an existing one if there is vertical integration (backward and forward) from an established business, if the product or service of the new business is a substitute for the product or service of the established business; if the product of the new business is produced by essentially the same technology and the same production processes as are used in the established business; if the product, service, or new production process on which the new business is based is a result of research and development carried out in Canada by or on behalf of the established business; if the industrial classification of the new business is the same as the industrial classification of the existing business. Also, a new business may be related to an established business on the basis of some other principle, "Quantitative tests are applied which may variously have the effect of propelling a related business into a state of unrelatedness or vice versa. . . . Even if the products or services are so different that the new activity is a new business, the new activity is not treated as a new business if its output is absorbed by the existing business." Dirk J. Vos, "Canada's Foreign Investment Review Act and Guidelines: Policy, Legislation, Practice", Paper delivered at an international seminar on *Multinational Corporations: Canadian and Scottish Perspectives*, University of Edinburgh, 6 and 7 March 1976, pp. 17-18.

236. Sagasti, *op. cit.*, p. 9.

237. *Ibid.*, p. 8.

238. *Ibid.*, p. 488.

239. D. Michael Ray, *Regional Aspects of Foreign Ownership of Manufacturing in Canada*, Mimeo, University of Waterloo, 1967, pp. 57-58.

240. *Economist*, "The Continental Challenge", 4 February 1978, pp. 78-9.

241. Especially due to the research of M. Boretsky. For example, see *US Technology: Trends and Policy Issues*, Monograph No. 17, George Washington University, Washington, DC, 1973; and "Trends in US Technology: A Political Economist's View", *American Scientist*, January 1975.

242. *Economist*, "The Continental Challenge", *op. cit.*, p. 79.

243. John L. Orr, *US Proposals for a "National Technology Policy" and Their Impact on Canada*, Report prepared for the Science Council of Canada, August 1977, p. 36.

244. *Ibid.*

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