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The Research and Development Policies of Large Companies in Canada

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The Research and Development Policies of Large Companies in Canada

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FOREWORD

Any examination of corporate policies for research and development, and technology transfer must, eventually, focus upon the actual decision-making process in this area within individual companies. In the present instance, a considerable amount of information of an unpublished or sensitive nature was provided to the Ministry by companies, on the understanding that it would not be disseminated.

Therefore, in order to permit a wider distribution of the findings, certain information of a confidential nature has been omitted from the text.

INTRODUCTION

The present study stems from a desire to examine the R&D policies and programs of large companies in Canada, identify their role in the technology transfer process both with affiliated and unrelated companies, and assess the implications of these findings for the development in Canada of indigenous industrial technology which is competitive internationally. An important aspect of this question is the nature of the parent/subsidiary working relationship, particularly the degree of autonomy exercised by a subsidiary in strategic decision-making regarding the nature and level of its own R&D program, and the scope of its product development and international marketing activities.

On January 28, 1977, the Minister of State for Science and Technology, the Hon. J. Hugh Faulkner wrote to the presidents of 51 large industrial companies which were understood to be doing R&D in Canada and which were wholly owned or controlled by foreign parents. Questions to which replies were sought included the company's corporate policy regarding R&D, the basis upon which decisions were made regarding the size of its R&D program, the balance between imported technology and that developed domestically, the corporate policy regarding technology transfers between both affiliated and unrelated companies, and the company's areas of R&D and market specialization. For purposes of comparison, the same letter was sent to 25 large Canadian firms doing R&D in Canada.

In order to determine the strategy of those firms which do not do R&D in Canada, a similar letter was sent to 25 foreign owned or controlled companies and 25 Canadian companies. (See Appendix A for a complete listing of the companies contacted.)

For the purposes of this study, "doing R&D in Canada" was taken to mean that the firm was conducting a continuing program of intramural R&D. It should be noted, however, that some companies which are classified as not doing R&D may be supporting extramural research, either in Canada or abroad. A number of such instances are mentioned in the report.

A total of 88 companies replied to the letters, for a response rate of 70 per cent. The responses caused some companies to be shifted from one category into another, with respect to whether they were doing a significant amount of intramural R&D or not. The replies in each category, in the final analysis, were as follows:

Foreign Subsidiaries Which do R&D	34 out of 49
Foreign Subsidiaries Which do Not do R&D	18 out of 27
Canadian Firms Which do R&D	15 out of 22
Canadian Firms Which do Not do R&D	21 out of 28

These companies had total revenues which were in excess of $72 billion in 1976. The sales of their manufacturing operations in Canada represented about 42 per cent of all manufacturing sales ($110.5 billion) in Canada in 1976.

It should be pointed out that while the responses cover a number of industrial sectors, the responding companies in a given sector are not any given proportion of all the companies in that sector. The focus on the largest companies in Canada and the limited number of companies contacted tended to leave some sectors under-represented. However, the reader will note that the R&D policies and practices of companies in some sectors are fairly similar in many aspects (e.g. forest products), and can, therefore, be judged to represent the sector adequately.

An examination of the non-respondents revealed that there is no significant difference in the response rate between those companies which are doing R&D and those which are not, or between the foreign subsidiaries and the Canadian companies. In addition, there is no reason to believe that a higher overall response rate would have negated the conclusions reached. However, additional replies in two specific areas - pharmaceuticals and food - would have permitted some comparisons which were not possible otherwise.

Except for a few instances which are identified, the report is based only upon the information provided by the companies in their responses, or that which was contained in their annual reports.

I - SIZE OF R&D EFFORT

A total of 88 companies provided information regarding their R&D and technology transfer policies and activities. Subsequent to the receipt of these replies, several companies were re-classified from the "doing R&D" category to the "not doing R&D" category and vice versa, based upon the information supplied. For the purposes of this analysis, the respondents were also classified by industry sector. The resulting matrix is presented in Table I.

The resources devoted to R&D by the 34 foreign subsidiaries and 15 Canadian companies respectively, which were considered to be performing in-house R&D were summarized. The annual sales of these 49 companies amounted to about $37 billion in 1976. The research intensity for a given company is calculated as the ratio of R&D expenses to sales, expressed as a percentage.

The foreign subsidiaries are concentrated in three sectors - chemicals, petroleum and electrical/electronics, while the Canadian companies are primarily in mining, ferrous and non-ferrous metals, and forest products.

Of the foreign subsidiaries, those in the petroleum sector spend the largest absolute amounts on R&D, followed by the chemical companies. However, if these expenditures are expressed as a percentage of sales, the situation is reversed, with the chemical companies having a higher research intensity than the oil companies (1.4 per cent vs 0.5 per cent).

The largest expenditures in the Canadian group are by Northern Telecom, Massey-Ferguson, Inco, Aluminium Co., and Bell Canada. Northern Telecom has the highest research

TABLE - CLASSIFICATION OF SPONSORING COMPANIES

Classification / Sector	Subsidiaries (of Foreign Parents) Doing R&D in Canada	Subsidiaries (of Foreign Parents) Not Doing R&D in Canada	Canadian Companies Doing R&D in Canada	Canadian Companies Not Doing R&D in Canada
Mining	Rio Algom Falconbridge Nickel Mines Sherritt Gordon Mines	Hudson Bay Mining & Smelting	INCO Cominco Denison Mines	
Non-Ferrous Metals			Aluminum Co. of Canada	
Iron & Steel			Dofasco Stelco	Sidbec-Dosco
Chemicals & Chemicals Products	Uniroyal Canada Union Carbide Canada Canadian Industries Ltd. Dow Chemical of Canada Du Pont of Canada Lever Brothers Proctor & Gamble Frank W. Horner	Goodyear		
Petroleum	Gulf Oil Canada Shell Canada Imperial Oil Dome Petroleum	Sun Oil Amoco Canada B.P. Canada Mobil Oil Canada Petrofina Canada Husky Oil		
Forest Products		Reed Paper	MacMillan Bloedel Abitibi Paper Co. Consolidated-Bathurst Domtar	Canadian Cellulose B.C. Forest Products ATCO Industries
Textiles				Dominion Textile
Agricultural Products	Imasco Rothmans of Pall Mall			
Electrical/ Electronics	Westinghouse Canada Aviation Electric Canadian General Electric Ferranti-Packard IBM Canada Litton Systems (Canada) Lenkurt Electric Raytheon Canada Honeywell		Northern Telecom	
Mach. & Transport Equipment	Lockheed Petroleum Services Pratt & Whitney Aircraft International Harvester	Chrysler Canada Ford Motor Co. Canadian Vickers General Motors	Bombardier Massey-Ferguson	
Food & Beverages	General Foods Canadian Canners	Carling O'Keefe	John Labatt	B.C. Sugar Refining Co. Burns Foods Hiram Walker-Gooderham House of Seagram Horne & Pitfield Foods
Non-metallic Mineral Products	Canada Cement Lafarge Fiberglas Canada St. Lawrence Cement			
Management		Genstar		Brascan Cdn. Corporate Mgmt. Jannock Molson Companies
Utilities/ Transportation		Westcoast Trans. B.C. Telephone	Bell Canada	Canadian Pacific Canada Steamship Line Consumers' Gas Trans Canada Pipelines Union Gas
Printing & Publishing				F-P Publications Southam Press
Import/Export etc.		Mitsubishi Canada		

intensity, while the pulp and paper companies have the lowest. The low research intensity in the forest products sector is in part a reflection of the fluctuating markets in the industry.

Direct comparisons between the foreign subsidiaries and the Canadian companies are possible in two areas - mining and agricultural machinery. In the mining sector, Inco is by far both the largest company and performer of R&D. It is interesting to note that although Sherritt Gordon is the smallest company in the foreign subsidiary group, its research intensity is the highest.

For a few companies, a significant portion of their total R&D expenditures was for work performed outside Canada - primarily by a subsidiary in the case of a Canadian multinational enterprise, or by a parent company in the case of a foreign subsidiary.

II - ORGANIZATION AND PLANNING OF R&D IN FOREIGN SUBSIDIARIES

A. Role of R&D Laboratory

Some indication of the extent to which a firm is innovative can be obtained by reference to the size of its R&D budget. However, such a single variable does have limitations as a means of assessing the relative benefits to Canada from R&D performed by foreign subsidiaries. For example, one subsidiary firm may have a significant budget for the modification of existing technology, while another may have a smaller R&D budget, but one which is devoted primarily to the development of new technology.

In order to analyze the potential impact of the R&D performed by the foreign subsidiaries, four R&D roles were constructed to categorize the responses. These are described below.

Technology Adaptation and Local Support

The laboratory acts primarily as a technical service centre to adapt products or production technology for the Canadian market, and to provide technical support for marketing operations.

Satellite Laboratory

Control of the R&D program is centred with the parent firm, which directs its international subsidiaries to perform R&D which can be integrated with that being performed in the central laboratories. A portion of the domestic R&D is usually devoted to problems and opportunities which are specific to the Canadian market.

Integration of Imported Technology and Domestic R&D

The company uses a high degree of technology imported from the parent. However, it conducts its own R&D to the extent necessary to innovate on the imported technology to meet market needs and/or opportunities. The subsidiary is also likely to be conducting R&D in other product areas which are unique to its operations.

Semi-Autonomous

The company has a product line or production process which does not duplicate that of the parent, and it conducts R&D in order to improve these products and processes and/or develop new ones. It may also be acquiring technology in specific areas from its parent, or through licensing arrangements with other companies.

A company was assigned to the category which most closely described the role of its laboratory as reported.

Fifty-six percent of the companies conduct their R&D along the lines of the "Integration" model - i.e. they tend to produce products which reflect technology acquired primarily from their parent companies and adapted through their own R&D. However, they are also involved, to varying degrees, in the type of innovation necessary for new product development. Twenty-nine percent of the companies operate their R&D program semi-autonomously. Twelve percent operate satellite laboratories, the output of which relates directly to the R&D being conducted by their parents, while 24 percent use their facilities to adapt imported technology to domestic needs.

It should be noted that the percentages total 121, as seven companies operate in two modes.

In summary, the R&D performed by about 70 percent of the companies is linked closely both to the R&D performed and the technology supplied by the parent organization. This is not surprising as the majority of their parent companies rank within the first 100 largest corporations inside the U.S. in the surveys which are published annually by Fortune magazine. The special relationship which exists between a Canadian subsidiary and the laboratory of its parent company, which is conducting R&D at a level of expenditure which is a multiple of its own, almost guarantees that there will be a significant dependence upon this foreign know-how and technology. However, this reliance upon imported technology is counter-balanced to some extent by the fact that the majority of the technology-dependent firms also conduct some R&D to support products or processes which are unique to their Canadian operations.

The last category of subsidiaries conduct their R&D operations primarily in a "semi-autonomous" mode, because they produce products or require processes which are distinct from those of their parents.

A more detailed examination of the parent/subsidiary relationship in the area of technology transfer is contained in Section II-B. This is followed in Section II-C by an analysis of the extent to which R&D specialization by the subsidiaries, which was referred to above, is related to responsibility for international marketing.

B. Technology Transfer

An analysis of the responses regarding the policies for technology transfer between foreign subsidiaries, their parents/affiliates, and unrelated companies reveals that while the policies for technology transfer are similar, a wide variety of arrangements are in existence.

Within a corporate group, three mechanisms for both technology acquisition and outflow can be discerned. Generally speaking, these are:

(a) Formal case-by-case license agreements with payment(s), or cross-licensing arrangements which involve no direct payments;

(b) exchanges of know-how, technology, and/or R&D results, which may be informal with no direct payment, or under the umbrella of an overall corporate cooperation agreement involving payment; and

(c) shared cost R&D programs, both within and outside Canada.

Table II presents a summary on a sector basis of the more common technology transfer practices and arrangements reported. As some subsidiaries did not provide complete information with respect to their relationship with their parent and affiliated companies, the figures should be interpreted as representing the minimum number of companies engaging in a particular practice.

It is immediately evident from Table II that the most common arrangement which characterizes the parent/subsidiary relationship is access by the subsidiary to the entire technical know-how of the parent, including the experience and knowledge of other affiliates.

TABLE II

TECHNOLOGY TRANSFER PRACTICES OF FOREIGN SUBSIDIARIES DOING R&D IN CANADA

Sector	No. of companies in sector	No of Companies Reporting Practice						
		Subsidiary has complete access to R&D and technology of parent & vice versa	Overall Agreement governs technology exchanges with parent	Technology transfer arranged on case by case basis	Technology acquired from parent involves direct payment	Technology acquired from parent involves no direct payment	Subsidiary contributes to and/or engages in shared cost R&D with parent or affiliates	Technology acquisition is primarily from parent
Mining	3	-	-	-	-	-	-	-
Chemicals/ Chemical Products	8	7	1	2	3	3	2	4
Petroleum	4	3	-	2	-	2	2	2
Agricultural Products	2	2	-	1	1	1	-	-
Electrical/ Electronics	9	9	1	4	4	3	-	6
Machinery and Trans. Equipment	3	1	-	1	2	-	-	1
Food and Beverages	2	2	-	-	-	-	-	2
Non-Metallic Mineral Prod.	3	2	-	-	-	-	-	-
TOTAL	34	26	2	10	10	9	4	15

Twenty-six of the 34 subsidiaries operate in this manner. Such arrangements usually include reciprocal access to any R&D performed and technology developed by the subsidiary in Canada. For at least 15 of the 34 subsidiaries, the parent company is the primary (and in some instances the only) source of technology acquired from outside. In other words they only infrequently obtain licenses from unaffiliated third parties. These characteristics apply in particular to subsidiaries in the chemicals, petroleum, electrical/electronics, and food sectors. For example, one chemical company considered that the development of new technology both domestically and by the corporation was essential in order to maintain its competitive edge, and therefore it purchased no technology from unrelated companies. Two companies in the electrical/electronics sector stated that 80 percent and 66 percent respectively of their sales were based on imported technology. In contrast, the mining companies, which operate rather semi-autonomously, meet most of their need through their own R&D.

Nine of the 34 subsidiaries stated or implied that technology acquired from their parents did not involve direct payments. However, 10 subsidiaries indicated that technology transferred from their parents did involve some payment in some form. For some of these companies, there is sufficient information available to estimate the dollar value of R&D transferred to a subsidiary from its parent and vice-versa.

Typically, technology transfers between related companies have greater depth and scope than those which would be negotiated at arm's length between unrelated companies. Over a period of time, the parent/subsidiary exchanges may include such elements as know-how or patents for product design, manufacturing technology, product testing, and plant design and construction. To this list should be added the valuable information which is exchanged frequently through plant visits, training seminars and personal contacts. In practice, it may be very difficult for the parent company to determine the value of these transfers. It is

probably this difficulty which contributes in part to the variation in arrangements between subsidiaries regarding payments for technology received from the parent. For example, some subsidiaries pay an annual fee to their parents which covers all transfers, while others pay only a fee for major transfers on a case by case basis.

A more precise assessment of the costs and benefits of this imported technology is beyond the scope of this report. It is apparent from the replies, however, that when technology alone is considered, most subsidiaries have access to far more technology from their parent companies than they make available in return. This does not take account of the broader parent/subsidiary relationship which might involve payments for technology through indirect means such as dividends on equity, interest on loans, and the sale or purchase of products between affiliated firms.

It is apparent from the replies received that some firms devote a significant part of their R&D program to the evaluation of the mass of R&D results being generated by their affiliated companies. On the whole, the continuing reliance on the parent companies for technology would appear to have the effect of reducing the overall level of R&D which needs to be done in Canada by foreign subsidiaries. This conclusion is supported by statistics (outside the scope of this study) which show that in general, the research intensity of the subsidiaries is less than that of their respective parent companies in the U.S. There is no reason, however, that the research intensity of subsidiaries must be significantly lower than that of their foreign parent companies. Research specialization and/or autonomy to develop unique products by a

subsidiary, depending upon their extent, may result in a research intensity which is equal to or greater than that of its parent. There are a few such cases. Having made these points, one must recognize that imported technology originally created new production facilities and jobs in Canada and continues to do so. Nevertheless, these technology links do have an impact on the development of indigenous technology in Canada.

It is interesting to note that while most companies expressed satisfaction (or at least no dissatisfaction) with the technology sharing arrangements obtained through their parents, one electronics company expressed some reservations, stating that "as to the balance between imported and self-generated R&D, and reviewing our total business activity, one clearly sees an excessive reliance upon imported technology. It must be emphasized that product lines, whether derived from a corporate affiliate or an independent company, which have been established by technology transfer, usually bear severe market constraints. It is for this reason that autonomous product development is preferred despite the higher risk and higher cost."

As indicated previously, those subsidiaries which operate their R&D program in a "semi-autonomous" manner tend to generate in-house a good deal of the technology they require. In addition, when technology is acquired, it tends to be from unrelated companies. Part of the explanation probably lies in the fact that the technology for the products they manufacture or the processes they require are generally not available from their parents.

Five subsidiaries indicated that they made a practice of selling technologies which they had developed themselves to unrelated firms.

C. R&D Specialization & Markets

Companies were asked whether they had any areas of specialization with respect to R&D, along with international marketing responsibility for those areas.

Two important points emerge from the analysis. The first, and rather obvious one, is that the international marketing activities of some companies are a function primarily of the nature of the product rather than R&D specialization. For example, refined petroleum products tend to be consumed domestically, while non-ferrous metals are marketed internationally.

The second, and more important point, emerges from an examination of the extent to which the manufacturing companies export their output. It is apparent that for over one-half of these companies, exports represent 15 per cent or less of sales. Those companies which are export oriented do not fit neatly into any particular sector. Rather, it would appear that the export-intensive subsidiaries tend to be those which were described earlier as conducting their R&D program in a "semi-autonomous" manner. In other words, they tend to export products which do not duplicate those of their parent companies. It would seem, therefore, that R&D specialization per se does not necessarily result in a high ratio of exports to total sales. Rather, it is a relatively autonomous new product research and development role which generally carries with it a responsibility for marketing on an international level. Nevertheless, it should be noted that even a low proportion of sales to international markets may represent a high absolute level of exports.

This analysis also suggests that for some companies, doing more R&D may not lead necessarily to increased export sales. Apart from the fact that a number of the subsidiaries serve the Canadian market primarily, it would appear from some letters that a part of the R&D being performed by some companies is oriented towards the needs of their parent companies. Another facet of this subject is that without access to international markets, the expected return on investment may be insufficient to justify the R&D to launch new product development.

D. R&D Planning

The criteria used by foreign subsidiaries in setting the level of their current R&D expenditures are of particular interest, given the relatively low level of overall expenditures for industrial R&D in Canada in recent years.

The various responses are summarized in Table III. Thirteen of the companies did not mention the criteria used in specific terms which could be categorized. For example, one company in a typical response, stated that "the size of our effort, like that of any industrial concern, is a judgmental process governed by the opportunities of the enterprise". Table III, therefore, represents the comments of the twenty-one subsidiaries which did provide some indication as to their decision-making process.

For the most part, the companies reported that their level of R&D depended primarily upon the need to remain competitive through new products, the need to improve existing products or processes, and/or technical demands generated by customers. Eight of the 15 companies which cited the need for new products as a criterion also mentioned the need to improve existing products or processes. These factors are of the "demand-pull" type as opposed to "research-push". There was no significant correlation between the specific factors cited and the sectors represented.

Three companies mentioned the economic climate in Canada as affecting their R&D funding decisions. A large chemical company stated that the climate for manufacturing was "sufficiently poor and uncertain" to compel it to emphasize the support of existing businesses rather than diversification.

TABLE III

FACTORS MENTIONED BY FOREIGN SUBSIDIARIES AS DETERMINING THEIR LEVEL OF R&D EXPENDITURES

	New Technology or Product Development Opportunities	Need to Improve Existing Products/ Processes	Need for Technical Support of Existing Markets	Economic Climate	Sales	Profits	Diversification Opportunities
No. of companies reporting factor (a)	15	11	6	3	3	3	2

(a) of 21 companies

An electronics company referred to the importance of an economic environment attractive to the expansion of R&D, in suggesting that the government use its purchasing power to support companies doing R&D in Canada. More specifically, the company pointed out that it was not in a good position to compete through products based upon indigenous R&D in situations where a Canadian competitor could purchase technology abroad which had already been developed with the support of another government. The third company, also in the electronics area, indicated that the high cost of doing business in Canada was forcing a reduction of "expendable costs such as R&D."

The reference to expendable R&D costs raises the question of whether R&D is a residual activity which depends upon the profitability of the company - i.e. whether it is the fruit or the root of their prosperity. Five companies mentioned factors which were related to sales or profits as affecting their decisions. In this regard, one electronics company pointed out that its sales would probably drop in 1978 due to a slower growth in the capital expenditures of its customers, and as a result, it expected severe pressure from its parent to reduce R&D costs.

The tentative conclusion is that insofar as large (and for the most part mature) foreign subsidiaries are concerned, no one theory can adequately explain the motivations of a particular company in doing R&D. Furthermore, because of the structure and role of many of these laboratories in relation to their parent companies, neither the "root" or "fruit" theories apply with any precision in actual practice. One can say, however, that for mature companies:

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(i) the predominant factors which affect the level of R&D are of the demand-pull type; and

(ii) R&D expenditures as a percentage of sales revenue is more often considered a statistic rather than a criterion.

It should be noted that the decision of a company to do R&D in the first place is not usually governed by these factors. Therefore, the "fruit theory", seems to be more applicable in the earlier stages of a company's development.

Ten companies provided some information as to the duration of their projects. Four companies indicated that they were of a "long-term" duration, while one mentioned "short-term". Three companies specified a maximum duration of about five years, while two others mentioned three years as a typical duration.

III - R&D POLICIES OF CANADIAN FIRMS

Sixteen of the 25 Canadian firms which were thought to be doing R&D responded to the letter. One of these was subsequently re-classified as not doing R&D. Nine of the remaining 15 firms are concentrated in three sectors - mining, forest products and steel. The other six firms are spread among five sectors.

The replies of the Canadian companies, have been examined for their policies and activities in respect of:

- their rationale for conducting R&D
- the types of R&D being performed
- the extent to which R&D has been decentralized by the Canadian MNE
- policies regarding technology acquisition and sale
- R&D funding criteria
- the role of R&D in diversification

The mining sector is one in which direct comparisons are possible between the Canadian companies and the foreign subsidiaries. To a significant extent, they follow similar practices in the conduct of their R&D. They rely upon their own R&D for most of the metals technology they need, and it is conducted primarily in Canada-particularly process R&D, which must be related to the ore being mined. To a considerable extent, therefore, the foreign operations of these mining companies are supported by R&D conducted in Canada.

All four companies in the forest products sector share two characteristics in particular. Their intramural R&D budgets and priorities are affected by the variations in demand for their products, and they satisfy some of their common R&D needs through the extramural research which is conducted by the industry associations such as the Pulp and Paper Research Institute of Canada, and the Forest Engineering Research Institute of Canada.

Imported technology alone cannot meet the needs of this sector, due to the particular Canadian problems arising from climatic conditions, wood species, terrain, etc. The approach of the industry therefore has been to satisfy its needs through a mix of imported technology, intramural R&D, and joint extramural R&D on common problems of a longer term nature.

Annual variations of profits in the industry are not necessarily reflected in smaller R&D budgets. For example, one company maintains a stable budget but emphasizes projects having an earlier pay-back (i.e. less risk) when markets are poor, in order to avoid fluctuations in R&D staff.

In addition to the development of new products an important focus of the R&D performed is to obtain improvements in productivity. Two of the companies stated that their present R&D programs were directed towards incremental improvements of costs and quality rather than the identification and development of new products and processes.

The steel industry generally tends to have international informal exchanges of technology between unaffiliated companies. This is a sharing of knowledge which involves no payment.

Some conclusions can be drawn in comparing the R&D policies and activities of the foreign subsidiaries with those of the Canadian companies.

In general, it is apparent that:

(a) The multinational firms based in Canada have tended to concentrate the major portion of their R&D and/or the development of their strategic technologies in this country, much the same as the U.S. multinational firms have done in relation to their foreign subsidiaries;

(b) As is the usual practice between the foreign subsidiaries in Canada and their parent companies, the Canadian companies generally share technology with their Canadian and foreign subsidiaries, under various cost-sharing arrangements; and

(c) While the Canadian companies do import technology to augment their own R&D, this source does not usually represent a major portion of the technologies used, as is the case with most of the foreign subsidiaries.

Although the subject of diversification was not within the scope of the study as conceived originally, the extent to which some Canadian companies have diversified raises the question as to whether their R&D has assisted them to broaden the scope of their activities. A related question is whether diversification takes place in Canada. Some useful information was obtained as a by-product of the analysis. It is apparent that when large research-intensive Canadian companies expand, it is usually into related areas of technology, but not necessarily in Canada.

IV - DEGREE OF COMMITMENT IN CANADA

Companies were asked whether they foresaw a long or short-term involvement in the local Canadian community and whether they made use of Canadian inputs in conducting their R&D. The intent behind these questions was to judge whether the companies, especially the foreign subsidiaries conducting R&D in Canada, considered themselves as having a permanent involvement in R&D in Canada.

Of the 34 companies, 19 stated or implied that they had a long-term involvement in the local community. Eleven of the remaining 15 companies made no comment on this subject. One other company stated that it had no long-term involvements while another pointed out that a part of its business could be moved easily to another country.

In general, it was the larger companies in the group which indicated that they had a long-term involvement in the local community. These larger subsidiaries are mature companies which have had production facilities in Canada for a number of years. As such, they see themselves as having a stable and permanent Canadian operation. Some of the companies which did not respond have operations in Canada which could be moved with relative ease, (e.g. electronics companies).

Comments by Canadian companies doing R&D were also considered. Of the fifteen companies in this group, eleven made no comment regarding their involvement in the local community. Three other companies indicated that they had both long and short-term involvements, and one company considered that it has long-term involvements in the

communities where its research facilities are located. Given the long-standing ties which many of these companies have had in Canada (e.g. in the resource sectors), it may be that they saw no need to comment on the nature of their involvement in the local community.

The responses of the companies doing R&D, with respect to their use of Canadian supplies and services, are summarized in Table IV. Both the foreign subsidiaries and the Canadian companies make frequent use of Canadian supplies and professional services. Perhaps more important, there is a low use of universities and industry associations by companies. It is apparent that large companies doing R&D do not regard universities as a source of technology or know-how. The low use of industry associations can be explained by the fact that Canada does not have a well developed system of industry associations which perform R&D.

To a considerable extent, the foreign subsidiaries and Canadian companies offered similar comments regarding the use of Canadian inputs. For example, many of the companies which use Candian supplies and professional services qualified their statements by pointing out that they used these sources when they were available and competitive, and that they often had to import specific types of equipment, and hire specialists from abroad.

TABLE IV

USE OF CANADIAN SUPPLIES AND SERVICES BY COMPANIES DOING R&D IN CANADA

Number of Companies reporting use of input

	Supplies	Professional Services	Universities	Industry Associations	Government Services	No Comment
Foreign Subsidiaries (total = 34)	15	21	4	3	5	7
Canadian Companies (total = 15)	6	6	3	4	2	6

V - ROLE OF GOVERNMENT

Companies were invited to comment on the special needs and problems of research in the Canadian economy. Two areas are considered in this section-whether companies had made use of government incentive programs, and whether they had any suggestions or comments regarding the role of government in promoting R&D.

About fifty percent of the companies doing R&D, (both foreign subsidiaries and Canadian companies), mentioned that they had received financial incentives through government programs such as PAIT, IRDIA, DIP, and IRAP. The actual proportion is much higher, as it is known that other companies in the sample also made use of one or more of these programs - particularly IRDIA. In addition, three of the 21 Canadian companies classified as not doing R&D stated that they had benefited from incentive programs.

There was both criticism of, and praise for the programs. One company indicated that the incentive programs were too narrow and specific. Another felt that they were variable, uncertain and often counter-productive. There were general complaints about the bureaucratic procedures and paper work involved in applying for grants. Two Canadian companies classified as non-performers of R&D said that incentive programs were oriented heavily towards sophisticated research and tended to ignore practical, applied research. On the other hand, another company stated that the programs had been useful because they had helped fund longer term, high risk projects which could not have been undertaken otherwise. Another felt they were conducive to encouraging more R&D in Canada and lessening the dependence on foreign sources for technology. One of the subsidiaries commented that PAIT funding of two projects had enabled it

to move from a complete dependence on U.S. designs in 1960 to a 50 per cent dependence by 1975.

Thirty-three of the 88 companies provided views on what the role of the government ought to be in the promotion of R&D in Canada. The response rate in each category was as follows:

	Subsidiaries		Canadian companies	
	doing R&D	not doing R&D	doing R&D	not doing R&D
number of companies commenting	14	1	11	7
number of companies in group	34	18	15	21

Canadian companies commented on the role of government more frequently than the foreign subsidiaries (50 vs 29 per cent) and also offered a wider range of comments and suggestions. In addition, companies which were doing R&D commented with greater frequency than those which were not (51 vs 21 per cent).

Canadian companies and foreign subsidiaries share many of the same concerns and suggestions. The most frequent suggestion received was for tax incentives. Seven of the subsidiaries and six Canadian companies doing R&D felt that this would be the most efficient way in which the government could promote profitable R&D. One of the subsidiaries suggested that the present tax credit be increased from five to fifteen per cent, while a Canadian company suggested a tax credit of 25 per cent of current and capital expenses for qualified R&D expenditures. Three subsidiaries and one Canadian company doing R&D stated that there was a need for a general improvement in the economic climate, as

a pre-requisite for increased spending on R&D in industry. Three other subsidiaries specifically noted the need for productivity improvements. One Canadian company and two subsidiaries were pleased with the contracting-out policy and suggested that it be expanded and strengthened. Two companies (one Canadian and one subsidiary), mentioned that strong patent protection was necessary in order to promote R&D.

Other comments received from subsidiaries doing R&D were that the government should use its purchasing power to reward companies doing R&D in Canada (two companies mentioned this); that R&D should be considered in each industry sector as one element of the overall framework, along with trade policy, taxation and industrial assistance, in an effort to develop comprehensive strategies on a sector by sector basis (one company); that more money should be spent on key problem areas such as exports and energy (one company); and that economic rewards should be given for actual results, instead of across the board (one company). One other subsidiary remarked that Canada had a dearth of institutions providing applied technology services, especially in the area of food research.

Canadian companies voiced some concerns and made suggestions which were not shared by the subsidiaries. Two companies doing R&D stressed the need for better technology transfer between government, universities and industry. However, another expressed satisfaction that efficient technology transfer had contributed to its success. One company suggested that too much of Canada's R&D dollar was being spent on basic research. Two companies thought that more assistance should be given in the early stages of research projects. One company doing R&D and another

not doing R&D stated that support should be concentrated on designated industries rather than across the board. Another company maintained that across the board programs were neither effective nor necessary and that incentive schemes should promote technology based on national goals. One company said that there was a need to develop a range of incentives for research, innovation and industrial entrepreneurship and another suggested that general grants-in-aid to industrial R&D establishments should be used to supplement specific grants.

One of the Canadian companies classified as not doing R&D maintained that research was more efficient when left to private industry and the universities and that government should be funding research without being involved directly. Another felt that the government dominated the national R&D effort, and that it would be better if industry played the dominant role.

In conclusion, then, the dominant suggestion by industry was that the government encourage R&D through the use of tax incentives. Thirteen of the 49 companies (Canadian and foreign subsidiaries) doing R&D proposed tax credits using various formulae. Two factors probably helped to stimulate this suggestion - (a) the termination of the IRDIA Program; and (b) publicity given to the proposal for a tax incentive put forward by Mr. Scrivener of Northern Telecom Limited.

VI - SUCCESS WITHOUT IN-HOUSE R&D

The demarcation between those companies which are conducting R&D and those which are not is a somewhat difficult line to draw. The fact that 39 of the responding companies have been classified as not having a continuing program of intramural R&D for the purposes of this study does not mean necessarily that they never have an involvement with research. Some of these companies may engage in specific R&D projects from time to time. This is complicated somewhat by some instances where it is not clear whether a company is doing the research itself, having it done elsewhere, sharing the work with other companies, or primarily purchasing the technology developed by others. However, it is the main thrust of a company's R&D and/or technology transfer policies and activities which are of primary importance here.

A company which is not doing R&D itself may, nevertheless, be in a business which is R&D intensive. This implies that it has to obtain its technology from sources outside the company. Basically, a subsidiary may:

(a) rely on its parent's R&D facilities;
(b) obtain technology from third parties such as by licensing or in conjunction with equipment purchases; and/or
(c) support extramural R&D, such as would be undertaken by industry associations or universities.

The oil and automobile companies constitute fifty percent of those subsidiaries not doing R&D which responded to the letter. Their primary source of technology is from their parent companies.

A number of interesting points emerge from an analysis of the Canadian companies which do not do R&D. As is the case with foreign subsidiaries, some of these companies, particularly those in manufacturing or resource processing industries, do acquire technology from others and/or support extramural research. However, in contrast to the foreign subsidiaries which are concentrated in the automobile and petroleum sectors, the majority of the Canadian companies are in the sectors of food/beverages, management, and utilities/transportation, and as such, are not in businesses which require a continuing intramural R&D effort to remain competitive.

For the most part, the companies in the food and beverage sector are not research intensive. Sugar cane refining and beet sugar manufacturing are reasonably mature industries.

On the whole, the food and beverages industry is not a heavy performer of R&D. For example, the average research intensity in the Canadian food and beverages industry was 0.3 percent in 1973, and about 0.5 percent for the U.S.

The distillers are concerned more with quality control than with research.

Five companies are characterized by their management of diversified companies whose products are generally unrelated. The majority of products and services produced by the subsidiaries of these companies are not research intensive.

VII - CONCLUSIONS

The purpose of the study was to examine the R&D strategies of large companies in Canada, with particular emphasis on the role of foreign subsidiaries in the development of indigenous technology. The interest in large companies derived from the fact that the majority of industrial R&D in Canada is performed by a relatively small number of such companies. In the present instance, the 49 foreign subsidiaries and Canadian companies analyzed, which represent only about 6 percent of the companies doing R&D in Canada, accounted for about 55 percent of the total intramural R&D expenditures in 1976.

The questions which were asked of companies focussed primarily upon the means used to acquire the technology embodied in their products, and the scope of their related marketing activities. The question which must be answered ultimately is whether the companies should (and could) be more technologically innovative, based upon R&D performed in Canada. It will be obvious from the conclusions which follow that no one answer is universally applicable to the range of companies analyzed In effect, the foreign subsidiaries and Canadian companies (both those which are doing R&D and those which are not), constitute four different populations, each having its own characteristics.

Companies Doing R&D

It should be stated that there is no modus operandi which describes adequately the relationships between foreign subsidiaries doing R&D in Canada and their parent companies, in respect of such parameters as exchanges of R&D, technology transfer, management autonomy, etc. Specifically, the major differences between subsidiaries relate to: (i) the balance

and interaction between imported and domestically generated technology; and (ii) the terms under which technology is transferred between parent and subsidiary companies. In this context, the major conclusions are that:

(i) The majority of the foreign subsidiaries doing R&D in Canada depend, to varying degrees, on the R&D performed and the technology supplied by their parent companies;

(ii) The dependence upon this imported technology is counterbalanced, to some extent, by the fact that a number of the subsidiaries have progressed beyond the technology adaptation stage, and are conducting some R&D to further innovate on the imported technology and support products or processes which are unique to their Canadian operations;

(iii) Subsidiaries generally have access to the complete range of R&D and technology of the parent company, at a direct cost which usually does not reflect the full value of the technology transferred. However, the continuing reliance on the parent companies for technology would appear to have the effect of reducing the overall level of R&D which needs to be done in Canada by foreign subsidiaries. It is interesting to note, however, that in some instances the research intensity of the foreign subsidiary was higher than that of the parent;

(iv) If exports are used as the criterion to measure the success of the subsidiaries in terms of economic benefits to Canada, they have, on the whole, not been very successful. R&D specialization by a subsidiary is not related necessarily to the export of its products. About 50 percent of the subsidiaries doing R&D sell their products primarily in Canada. Their exports amount to less than 15 percent of sales. The implication is that a significant portion of the R&D being performed is in support of domestic market needs;

(v) It is those subsidiaries which have what could be termed a semi-autonomous product development role which tend to be export intensive. Companies in this category manufacture products which either do not duplicate those of the parent or require process technology which is not available from the parent. There is no one type or size of company which fits this category. For example, the products include electronics, gas turbines, and farm machinery;

(vi) It would be desirable for the foreign subsidiaries in Canada to have greater freedom to develop their own products. However, the encouragement of subsidiaries to develop indigenous technology which can satisfy international markets must recognize the difficulty which exists because of the complex relationship which links the

subsidiary to the technology of its foreign parent. An approach might be to encourage subsidiaries to diversify into unrelated areas of technology; and

(vii) Variations in R&D between subsidiaries, while interesting, may be less relevant than the end use to which the R&D is devoted. This is to underline the point that it may not be simply the amount being spent on R&D which is important to Canada, but the extent to which the R&D, because of its characteristics, contributes to the development of the economy.

In contrast to the foreign subsidiaries, which are concentrated in the chemicals and petroleum sectors, the Canadian companies doing R&D are to be found primarily in the mining and forest products sectors. Although this makes direct comparisons inappropriate, some general conclusions can be drawn in comparing the R&D policies and activities of the foreign subsidiaries with those of the Canadian companies.

In general, it is apparent that:

(a) The multinational firms based in Canada have tended to concentrate the major portion of their R&D and/or the development of their strategic technologies in this country, much the same as the U.S. multinational firms have done in relation to their foreign subsidiaries;

(b) as is the usual practice between the foreign subsidiaries in Canada and their parent companies, the Candian companies generally share technology with their Canadian and foreign subsidiaries, frequently free of

charge or under terms and conditions more favourable than those accorded to unrelated companies; and

(c) while the Canadian companies do import technology to augment their own R&D, this source does not usually represent a major portion of the technologies used, as is the case with the majority of the foreign subsidiaries.

Companies Not Doing R&D

A company which is not doing R&D itself may, nevertheless, be in a business which is R&D intensive. This implies that it has to obtain its technology from outside sources.

The foreign subsidiaries in this category are concentrated in the petroleum and automotive areas, and as such, rely primarily on their parent companies for technology. Given the structure of these industries, there would not appear to be much scope for changing these parent/subsidiary relationships to encourage the performance of more R&D in Canada. The automotive R&D has been centralized in the U.S. by the "Big Four" manufacturers, and the Canadian plants have become primarily assembly opperations. It should be noted, however, that while companies such as BP Canada, Amoco, and Sun Oil do not have R&D facilities on the scale of those of Shell Oil, Imperial Oil and Gulf, they are involved in R&D projects such as the tar sands and the extraction of heavy oil.

In contrast to the foreign subsidiaries, the majority of the Canadian companies not doing R&D are in the sectors of food/beverages, management, and utilities/transportation. As such, they are not in businesses which

require a continuing intramural R&D effort to remain competitive. The food and beverages industry has an overall research intensity which is rather low (0.3 per cent of sales in 1973). However, the industry has apparently remained competitive with this level of research effort. In this context, it is interesting to note that the average research intensity of the large food and beverages companies in the U.S. is not much higher (0.5 per cent in 1976).

The five Canadian management companies, for the most part, are not in businesses which are research intensive. There may be some potential here for encouraging the entry into businesses which are more technology intensive.

Role of Government

Of the 34 foreign subsidiaries which are performing R&D, fourteen indicated that they had used government programs of one type or another for technology development. Eleven identified specific programs other than IRDIA. The remaining companies made no mention of having received any financial assistance. In fact, the actual proportions are much higher, as it is known that a number of other companies have benefited from these programs.

Among the subsidiaries which identified specific programs, only two provided any criticism (positive or negative) as to their value. One company was pleased that the Program For The Advancement of Industrial Technology (PAIT) had allowed it to become much less dependent on the technology of its parent and affiliated companies. Another company stated it had been assisted greatly by NRC's IRAP grants in building a viable multidisciplinary research organization. However, four of the subsidiaries did propose that the government encourage R&D through a tax incentive.

One of the subsidiaries which made no mention of having received government assistance; one felt that the programs were too narrow and specific and suggested a tax credit supplemented by specific programs in priority areas; another suggested that R&D support by the government had been inadequate and uncertain; and two others simply recommended a tax incentive as an effective means of encouraging R&D.

It was primarily the smaller foreign subsidiaries which identified specific programs they had utilized. When considered together with the fact that the majority of the foreign subsidiaries doing R&D did not refer to government programs in their replies, this would suggest that the programs have been of significant value primarily to the smaller companies in the sample. This may be because the new technology developed represented an important increase in the total stock of technology held by the company.

Within the group of fifteen Canadian companies which are doing R&D, seven mentioned that they had used government incentive programs. Only one of these companies, which is in the forest products sector, suggested that broad R&D incentive programs were not effective. However, four of the companies recommended the re-instatement of a tax-based incentive program.

General Conclusions

1. In practice the predominant factors which affect the level of R&D performed by a company are the need to improve existing products and processes, or develop new ones to remain competitive.

2. Some foreign subsidiaries doing R&D are restricted by corporate policy from securing technology from sources other than their parents or affiliated companies. However, it would appear that in most of the other cases it is the scope and competence of the parent company's R&D and the favourable technology transmission process which attracts the subsidiary. The transfer of technology from a parent to a subsidiary will usually encompass more cooperation than would be the case with technology purchased from unrelated companies and may include such elements as product technology, process technology, quality control system, market research results and management training. In addition, the subsidiary can benefit over time from product improvements which are generated by the parent. Technology imported in this manner is not detrimental per se to Canada. In fact, it has created new investment and jobs. Rather, it is the balance between this imported technology and that which is generated domestically which is important. A foreign subsidiary which increases its development of indigenous technology through diversification would not be competing directly with its parent company and therefore should be in a position to amortize its R&D investment on the basis of international markets. The fact that this latter strategy has been implemented recently by a large chemical company suggests that the autonomous in-house R&D capacity which would be necessary to support such ventures can be developed successfully. This may present a model for encouraging other foreign subsidiaries to diversify.

3. Some of the responses of the Canadian companies suggest that while licenses are a useful way to obtain technology, their contractual and other limitations make it desirable for the licensee to either innovate further using the technology acquired as a base, or eventually sever the ties with the licensor and develop an indigenous R&D facility. To some extent, the Canadian company has the same problem as the foreign subsidiary which wants to diversify its products - it must develop its own R&D capacity. As with the foreign subsidiary mentioned above, some examples provided by the Canadian companies suggest that this transition can be achieved successfully. This type of innovative activity would also seem to merit encouragement.

4. Some responses from Canadian companies suggested the "core industries" concept. One recommended a designation and concentration by government of support behind certain target industries, and another suggested that government should provide a favourable climate for the encouragement of R&D in selected industries.

5. Most of the companies which responded consider that the government should have some role in encouraging industrial innovation. Companies seem to value government financial assistance on a project basis in the earlier stages of their growth, when sufficient funds for R&D may not be generated internally. //The more mature companies need a different type of assistance - that which is related to the creation of an environment which will enhance market opportunities. This could be viewed, for example, in terms of improving industry/university linkages, transfer of technology from government to industry and the maintenance of an economic climate which makes R&D investments desirable.

APPENDIX A

LIST OF COMPANIES SURVEYED

A. Foreign Subsidiaries which do R&D

		Sales ($millions)	
		1975	1976
1.	Aviation Electric Ltd.	$35.6	
2.	British Columbia Telephone	360.7	
3.	*Budd Automotive Co. of Canada	114.8	
4.	*B.F. Goodrich Canada Ltd.	151.2	
5.	*Bristol Myers Canada Ltd.	123.8	
6.	Canadian General Electric	822.1	879.4
7.	Canadian Industries Limited	594.9	613.9
8.	Canada Cement Lafarge	398.9	384.8
9.	*Collins Radio Company (Canada) Ltd.	56.7	
10.	Canadian Canners	106.7	113.0
11.	*Ciba-Geigy Canada Limited	86.7	
12.	Canadian Vickers Limited	52.9	48.1
13.	Dow Chemical of Canada	336.7	388.9
14.	Du Pont of Canada	410.2	458.1
15.	Dome Petroleum	234.7	385.5
16.	Falconbridge Nickel Mines	429.5	483.5
17.	Fiberglas Canada Limited	116.4	140.2
18.	Frank W. Horner Limited	19.3	
19.	Ferranti-Packard		
20.	Gulf Oil Canada	1,701.2	1,924.0
21.	General Foods	316.9	345.5
22.	G.T.E. Lenkurt Electric Canada Ltd.	51.9	
23.	*GTE Automatic Electric Canada Ltd.	124.9	
24.	Husky Oil	454.4	522.4
25.	Honeywell	115.2	133.2
26.	*Hudson's Bay Oil and Gas	228.6	
27.	Hudson Bay Mining and Smelting Co. Ltd.	259.6	343.6
28.	Imperial Oil	4,110.0	4,304.0
29.	IBM Canada	719.3	837.1
30.	Imasco	941.2	1,031.6
31.	*I.T.T. Canada Limited	184.8	
32.	*Kraft Foods	320.7	
33.	Lever Brothers Limited	266.5	269.9
34.	Lockheed Petroleum Services Ltd.	not available	
35.	Litton Systems (Canada) Limited	51.7	
36.	*Maple Leaf Mills	520.6	
37.	*Merck, Sharp and Dohme Canada Ltd.	27.8	
38.	*N.C.R. Canada	151.4	
39.	Proctor & Gamble Co. of Canada	313.7	359.4
40.	Pratt & Whitney Aircraft of Canada	271.9	267.1
41.	*Philips Electronics Canada	132.5	
42.	*Quebec Iron and Titanium Corporation	not available	

* Denotes company which did not respond

		Sales ($millions)	
		1975	1976
43.	Rio Algom Mines Limited	367.4	401.6
44.	Raytheon Canada Limited	12.1	
45.	Shell Canada	1,868.4	2,111.0
46.	Sherritt Gordon Mines	191.5	179.4
47.	St. Lawrence Cement	178.5	
48.	*Sherwin-Williams Company of Canada	60.5	
49.	Union Carbide Canada	378.2	393.7
50.	Uniroyal Limited	212.4	214.2
51.	Westinghouse Canada	451.6	454.6

* Denotes company which did not respond

B. Foreign Subsidiaries which do not do R&D

	Sales ($millions)	
	1975	1976
1. *Anglo-Canadian Telephone	445.0	
2. *Agro Company of Canada	522.2	
3. Amoco Canada Petroleum	379.8	
4. B.P. Canada	550.5	626.0
5. Chrysler Canada	2,473.5	2,941.1
6. *Canadian Hydrocarbons	301.2	
7. Carling O'Keefe	317.0	580.7
8. Ford Motor Company of Canada	4,437.9	4,768.9
9. General Motors of Canada	4,335.2	5,189.8
10. Genstar	720.1	888.3
11. Goodyear Canada	329.2	366.3
12. *Golden Eagle	303.0	
13. *Hawker Siddeley Canada	365.2	
14. *Iron Ore Company of Canada	472.8	
15. International Harvester Canada	735.1	715.0
16. Mitsubishi Canada	667.3	
17. *Mitsui and Company (Canada)	604.5	
18. Mobil Oil Canada	467.2	
19. *Marubeni Canada	326.3	
20. Petrofina Canada	396.5	495.2
21. Reed Paper	369.1	429.1
22. Rothmans of Pall Mall Canada	810.6	897.5
23. Sun Oil Company Limited	315.0	400.8
24. *Texaco Canada	864.5	
25. Westcoast Transmission	416.7	

* Denotes company which did not respond

C. Canadian Firms which do R&D

	Sales ($millions)	
	1975	1976
1. Aluminum Company	$2,229.8	2,585.4
2. Abitibi Paper	764.4	880.4
3. *Algoma Steel	541.5	
4. Bell Canada	2,988.1	3,159.0
5. B.C. Forest Products	273.4	392.1
6. Bombardier	138.6	160.6
7. *Canada Packers	1,635.2	
8. Cominco	746.2	725.0
9. *Canron	365.9	
10. Consumers' Gas	381.0	498.0
11. Consolidated Bathurst	643.7	745.2
12. Domtar	815.2	886.8
13. Dominion Foundries & Steel	738.1	903.9
14. *Dominion Bridge	459.3	
15. Denison Mines	139.9	160.1
16. International Nickel	1,694.8	2,040.3
17. John Labatt	727.5	837.2
18. Massey-Ferguson	2,513.3	2,771.7
19. MacMillan-Bloedel	1,296.7	1,520.2
20. *Moore Corporation	1,005.6	
21. *Noranda Mines	1,159.3	
22. Northern Telecom	1,018.3	1,112.0
23. Steel Company of Canada	1,201.8	1,359.8
24. *Space Research Corporation		
25. Trans Canada Pipelines	920.4	1,499.1

* Denotes company which did not respond

D. Canadian Firms which do not do R&D

		Sales ($millions)	
		1975	1976
1.	Atco Industries	$180.1	205.6
2.	Brascan	1,157.5	
3.	B.C. Sugar Refinery	162.0	124.3
4.	Burns Foods	622.1	
5.	Canadian Pacific	3,655.5	
6.	Canadian Cellulose Company	156.0	
7.	Canadian Corporate Management	261.2	
8.	Canada Steamship Lines	283.5	
9.	Dominion Textile	273.4	475.4
10.	F-P Publications Limited	176.5	
11.	*Hugh Russel Limited	199.3	
12.	Horne & Pitfield Foods	340.6	367.2
13.	Jannock Corporation	226.9	174.5
14.	*Norcen Energy Resources	479.1	
15.	*Neonex International	250.9	
16.	Seagram	1,930.8	2,049.0
17.	Sidbec	180.8	
18.	Southam Press	257.4	293.0
19.	*Silverwood Industries	261.3	
20.	*Schneider Corporation	217.0	
21.	The Molson Companies	800.0	889.0
22.	*Thomson Newspapers	199.3	
23.	Union Gas	327.6	489.5
24.	Walker-Gooderham & Worts	864.1	875.0
25.	*Westburne International Industries	357.5	

* Denotes company which did not respond