

BRIEF
ON
"THE ROLE OF THE PROVINCIAL
RESEARCH ORGANIZATIONS IN
INDUSTRIAL DEVELOPMENT"
BY
THE ASSOCIATION OF PROVINCIAL
RESEARCH ORGANIZATIONS

JANUARY 1977

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SUMMARY

The Provincial Research Organizations which have been established in all of the Canadian Provinces (except Newfoundland and Prince Edward Island) represent an important scientific resource comprising some 425 scientists and engineers and \$40 million worth of laboratory facilities. Collectively, they have the capability for making a major contribution to the technological needs of Canadian industry, government and society. Unfortunately, the full potential of this resource is far from being fully utilized under present circumstances. It is this concern which has motivated the preparation of this Brief which identifies the urgent needs of the industrial sector and highlights the role which the Provincial Research Organizations might play in satisfying these needs on a national as well as a regional scale.

At the outset, it would seem that the technological limitations of Canadian manufacturing industry are not fully appreciated by various federal and provincial government agencies concerned with Science and Technology policies. The primary limitation arises from the extreme fragmentation of manufacturing firms in Canada, viz: the median firm size is 11 employees and 50% of all employment is in firms having fewer than 270 employees. The technological limitation is reflected in the fact that fewer than 3% of manufacturing firms currently maintain any intramural R & D activity. Moreover, the median size of Industrial Research unit consists of only 2 Qualified Scientists or Engineers and a unit of such small size is only marginally viable.

There is also a serious limitation in the lack of any "technological infrastructure" outside of the major urban centres. This lack severely handicaps technological innovation, especially for the smaller firms in the less-industrialized regions.

Based on the analysis presented, it is shown that the existing Federal Government incentive and assistance programs for industrial R & D are probably applicable to only 5% of all manufacturing firms. Therefore it is concluded that a major requirement exists to serve the technological needs of the remaining 95% of Canadian manufacturing firms so as to upgrade their productivity and competitiveness. These firms are too small to maintain their own intramural R & D facilities. Accordingly, it is our contention that the several Provincial Research Organizations are particularly well-suited to fill this gap by providing technical support services for the small and medium industrial firms in their respective regions.

A particular problem arises in this connection with the recent Federal "Make-or-Buy" policy for contracting out mission-oriented R & D, whereby the Provincial Research Institutes are discriminated against as eligible contractors under the existing Guidelines. It is suggested that the Provincial Research Organizations could play a major role in the transfer of technology to small and medium firms who do not have the capacity to support intramural R & D by themselves. Accordingly, we would urge that the Make-or-Buy Policy guidelines should be amended to facilitate this function.

Finally, it seems evident that existing Federal government Science policies and programs have failed to take account of the very real skills and capabilities which the Provincial Research Organizations could bring to bear on the solution of national problems, especially in satisfying the technological requirements of Canadian industry. To this end, the Association of Provincial Research Organizations wishes to submit for consideration the following specific policy recommendations:

1. Both the Federal and Provincial governments should substantially expand the level of their support for industrially-oriented R & D and for this purpose should make much greater use of the capabilities of the Provincial Research Organizations as agencies for the transfer of technology to Canadian industry.
2. To this end, the guidelines for the Federal "Make-or-Buy" policy for mission-oriented R & D should include explicit provision for participation by Provincial Research Organizations as eligible contractors and should accord them a preference second only to manufacturing firms.
3. In order to increase the effectiveness of the "Make-or-Buy" policy, wherever appropriate, a significant share of the R & D Budgets of all government agencies should be specifically allocated for extramural contracts with industry or industry-oriented research institutions.
4. The Federal government should initiate on an urgent basis, new policies and programs designed to strengthen the technological capability of small and medium-size industrial firms and should utilize the resources of the Provincial Research Organizations as the vehicle for transferring technology to regional industries.
5. In view of the declining level of industrial R & D in Canada, a general R & D incentive to replace the support formerly provided by IRDIA should be introduced at the earliest opportunity as one means of offsetting the current deterioration of technological innovation and productivity in Canadian industry.

THE ROLE OF THE PROVINCIAL RESEARCH ORGANIZATIONS
IN INDUSTRIAL DEVELOPMENT

INTRODUCTION

In June 1969, during the initial hearings of the Special Senate Committee on Science Policy, four Provincial Research Councils presented briefs outlining their roles and advocating greater employment of their capabilities in the national science effort. Although these representations were favourably commented upon in Volume I of the Committee's Report, (Ref. 1), it is regrettable that no explicit recommendation was made regarding more effective utilization of the latent scientific resources embodied in the Provincial Research Councils.

Subsequently, in 1971, the Science Council of Canada published its background study on "Research Councils in the Provinces" (Ref. 2) which identified their importance in providing technical support to regional industry and strongly endorsed greater utilization of their capabilities by the Federal government in the pursuit of national goals for science and technology.

Nevertheless, in the intervening period there does not appear to have been any significant change in either the policy or operating practices of Federal government agencies in this regard. Indeed, it appears that the Provincial Research Organizations may be discriminated against under the so-called "Make or Buy" Policy for contracting-out Federal mission-oriented Research and Development activities.

Accordingly, the Association of Provincial Research Organizations desires to avail itself of this opportunity to clarify the place and functions of the Provincial Research Institutes in the overall national science effort, and more particularly, to establish the importance of their contribution to upgrading the technological capability and productivity of Canadian industry. At the same time, it is desired to correct some apparent misconceptions regarding the role and capabilities of Provincial Research Organizations in relation to the development of regional industry.

TECHNOLOGY AND INDUSTRIAL DEVELOPMENT IN THE CANADIAN CONTEXT

"No amount of improvement in education and quality of labour force, no greater efforts by the mass media, no economies of scale or structural changes, no improvements in management or in government administration could in themselves ultimately transcend the technical limitations of candle-power as a means of illumination, of wind as a source of energy, or iron as an engineering material, or of horses as a means of transport. Without technological innovation, economic progress would cease in the long run and in this sense we are justified in regarding it as primary, although operating in close association with other factors".

- Christopher Freeman (Ref. 3)

The essential basis of manufacturing industry is the systematic application of science and technology, and as Prof. Freeman so aptly puts it in the foregoing quotation, technology is the key to industrial progress and as a result, to competitive survival. Moreover, while it is frequently assumed that the need for technological input terminates at the product design stage, in reality, there is a continuing need throughout the life of most products for technical effort to improve performance, reduce costs and meet competitive threats.

Furthermore, in the increasingly competitive world trading environment, it is axiomatic that, apart from the inherent excellence of the product, the decisive factor in attaining commercial success is the productivity of its manufacturer. Although productivity is the resultant of a multiplicity of factors, it is generally acknowledged that the dominant factor is technology, which authoritative economists (e.g. Solow, Denison and Mansfield) credit for as much as 2/3 of the growth in per capita incomes in the U.S.A. over the period 1929 to 1969. The contribution of technology to

productivity lies in increasing the efficiency of the production process through the use of improved machinery, increasing the output of labour, and reducing the cost of material and energy inputs.

From the foregoing, it will be instructive to examine the technological capability of Canadian industry and the potential for further improvement in its performance.

The Technological Limitations of Canadian Manufacturing Industry

The salient feature of Canadian manufacturing industry is the preponderance of small production units as shown in Figure 1 and Table I. In 1973, the median size of manufacturing establishments was only 11 employees and manufacturing establishments employing fewer than 270 persons accounted for 50% of the total employment in manufacturing industry.

Arising from the size factor, the research capability of Canadian manufacturing industry is similarly limited. In 1973, only 831 or 2.7% of manufacturing firms maintained any intramural R & D activity. In fact, the industrial R & D effort is highly concentrated at the upper end of the size scale so that over 50% of the total expenditure is confined to some 25 of the larger firms (i.e. firms having over 5,000 employees) as illustrated in Figure 2 and Table II.

At the same time the median size of research unit was only 2 qualified scientists/engineers (QSE's) as shown in Figures 3 and Table III. Most research managers consider an R & D unit of only 2 qualified scientist/engineers to be only marginally viable.

In addition to the general weakness and fragmentation of the industrial R & D effort, there are also serious regional disparities as shown in Table IV. Thus, out of a total of 7,928 QSE's engaged in industrial R & D, 91% are concentrated

in Ontario and Quebec, with only 44 QSE's (or 0.6%) in the Atlantic Provinces, 360 (or 4.6%) in the Prairie Provinces and 282 (or 3.6%) in British Columbia.

Another way of viewing this problem is to examine the ability of Canadian manufacturing companies to support research activity based on a representative "Research Intensity" of 1%. (i.e. an R & D expenditure equal to 1% of sales). Thus, it is estimated that a sales volume of approximately \$10 millions per annum would be needed to support an R & D expenditure of \$100,000 which corresponds to a minimal R & D unit of 2 Qualified Scientist/Engineers. In other words, firms employing fewer than 250 persons (representing almost 50% of total manufacturing employment - see Figure 1) would experience very real difficulty in maintaining any viable R & D effort on a continuing basis.

Based on this method of analysis, Canadian manufacturing companies may be divided into 3 categories according to their financial ability to support R & D as follows:

<u>CATEGORY</u>	<u>DEFINITION</u>	<u>ANNUAL SALES</u>	<u>EMPLOYMENT</u>	<u>ESTIMATED NO. OF FIRM</u>
I	Capable of supporting Intra-mural R & D on continuing basis.	over \$10 million	over 250	1550 - (5%)
II	Individually capable of sponsoring Extramural R & D.	\$2 million to \$10 million	50 to 250	5000 - (16%)
III	Remainder not included in categories I or II.	Below \$2 million	Below 50	24600 - (79%)

From the foregoing analysis, the conclusion seems inescapable that only 5% of Canadian manufacturing firms are capable of supporting intramural R & D and that the remaining 95% of firms in Categories II and III are more or less totally dependent on external sources for whatever technological support they may require in the conduct of their business. Thus, it is the small and medium size manufacturing companies (where Canadian ownership intends to be concentrated) which have the greatest need for technical assistance in order to remain competitive.

The Need for Contract Research Establishments

In 1973, Canadian manufacturing industry expended \$107.8 million for extramural R & D out of a total research expenditure of \$514.9 million. Almost 2/3 of this extramural R & D expenditure went to foreign performers, the bulk of whom were either parents or affiliates of the sponsoring firm. It is interesting to note also that while \$11.2 million went to non-affiliated Canadian performers, an almost equal amount went to non-affiliated performers in foreign countries. On this evidence, it may be concluded that there is a demonstrable shortage of contract R & D performers in Canada.

In the United States extramural contracts comprise a major share of the R & D expenditures by both government and industry, and Private Non-Profit Institutes account for some 3.5% of the Gross Expenditure on Research and Development (G.E.R.D.). In Canada however, only some \$12 million (or barely 1% of our Gross Expenditure on Research and Development) was performed by domestic non-profit research organizations in 1973. Potentially such organizations could make much greater contribution in serving the technological needs of the Category II firms mentioned above (i.e. firms unable to support an intramural R & D unit but capable of sponsoring extramural research).

However, in 1973, out of a total of 926 companies reporting R & D expenditures, only 95 relied solely on extramural R & D performers. Thus, it seems apparent that there is a substantial undeveloped market for providing contract R & D services to the 5000 Category II manufacturing firms. (i.e. firms having annual sales volumes between \$2 million and \$10 million).

The Need for Regional Technology Centres

The remaining 24,600 smaller firms in Category III of the manufacturing sector could undoubtedly benefit greatly from technical advice and services providing these could be made readily available to them at nominal cost. These firms do not usually require sophisticated technology but do need access to the best existing technology and facilities for applying such technology to their particular products and manufacturing operations. However, the provision of technical services to the Category III group is seriously hampered by their widespread geographical dispersion. While there is a high concentration of R & D resources in the two central provinces, there is a serious lack of "technological infrastructure" outside of the major urban centres across Canada, which seriously handicaps manufacturing as well as innovation activities.

Ideally, the technical requirements of the vast majority of smaller firms could best be met by some form of regional technology centres capable of providing a broad range of technical skills in response to the particular and varied problems of the industries which they serve. Furthermore, since the most effective means of transferring technology is through direct personal contact, it is essential that

such services should be locally-based so as to provide ready accessibility to the users on a day-to-day basis. Obviously this is a function which the Provincial Research Organizations are ideally suited to provide.

The following section will discuss the suitability and competence of the Provincial Research Organizations to serve the technological needs of regional industries, especially those in Categories II and III.

THE PROVINCIAL RESEARCH ORGANIZATIONS: AN UNTAPPED RESOURCE

"These institutes have played a significant role in the transfer of technology from laboratory to industry, acting as an interface between science and business. The role of these organizations in assisting small industrial firms to progress technologically has an importance far greater than expenditures would indicate."

- Statistics Canada (Ref. 4)

The Provincial Research Organizations are a uniquely Canadian institution designed to serve the needs of regional industry and government and geared to the realities of the Canadian geography and economy. Although originally patterned on the National Research Council, in reality they are much more concerned with the practical applications of science and technology to the specific problems and immediate needs of their regions. Essentially, they complement rather than duplicate the functions of NRC or other Federal or Provincial government agencies.

There are now provincially-sponsored research organizations in all provinces except Newfoundland and Prince Edward Island, and all operate laboratory facilities except Manitoba. The oldest of these is the Research Council of Alberta which was established in 1921 and the most recent is the Centre de Recherche Industrielle du Quebec which was established in 1969. The largest, the Ontario Research Foundation, was established in 1928 with direct financial support from Ontario industry and business.

While varying widely in structure, facilities and funding, all have the common objective of providing scientific and technical support for the development of natural resources.

and industry. And although their activities are focused principally on regional needs, in many cases, they also service the needs of industry in other parts of Canada, (and even foreign countries to a limited extent).

The manpower and physical assets of the Provincial Research Organizations are summarized in Table V from which it will be seen that collectively they represent a significant scientific resource (viz. 425 Qualified Scientists and Engineers and \$40.4 million worth of laboratory facilities for 1974). Their sources of funding are summarized in Table VI from which it will be seen that they depend on government for only 54% of their income. More importantly, they earn 44% of their operating expenses through contract activities, of which almost half is on behalf of industry. Indeed, if the special cases of MRC and CRIQ are excluded, the share of contract income becomes almost 50% of their total outlay. It is also interesting to note that B.C. Research attained the highest level of contract income, viz. 67%.

Looking at the various functions performed by the Provincial Research Organizations as summarized in Table VII, while R & D activities constitute the largest element, technical services of various kinds represent 45% of the total. It is also of interest to note that technology transfer activities (i.e. technical information together with industrial engineering services) account for some 13% of the total. Considering the field of application of their efforts, it will be seen from Table VIII that some 57% is oriented toward the various industrial sectors, with secondary manufacturing accounting for the largest part (40% of the total).

Given the peculiar structure and technological limitations of Canadian industry, it is indeed surprising that greater use has not been made of the resources of the Provincial Research Organizations. This may be attributable in part to their identification as agencies of the provincial governments, coupled with an apparent reluctance of the Federal government to include them in the implementation of national science policies and programs. Whatever the reasons for this under-utilization, it seems abundantly clear that there is a large unfulfilled need for technological support for small and medium industrial firms throughout Canada.

One of the most serious handicaps to technical progress in the industrial sector of the Canadian economy is the lack of a viable "technological infrastructure", especially in the Atlantic and Prairie Provinces. This technological infrastructure consists of applied research groups, testing laboratories, engineering consultants and equipment suppliers, all of whom contribute to the diffusion of technology and the process of technological innovation. While Canadian governments in 1973 spent over \$700 million on Research and Development either in intramural laboratories or universities, (mostly on highly sophisticated science), the amount dedicated to the generation and delivery of the more mundane technology required by small and medium firms was almost infinitesimal by comparison.

It is generally acknowledged that the process of technology transfer depends predominantly on direct contact between the user and the supplier of technical information and services. In the Canadian situation, this condition dictates that such services be made available on a local or regional basis.

On the foregoing basis, since upgrading the technological capability of Canadian industry is stated to be one of the basic objectives of the Federal government's industrial policy, and since this was also a primary "raison d'etre" for the establishment of the several Provincial Research Organizations, it is suggested that they are in the best position to fulfil the indisputable need for a major expansion of technical support services for small and medium industry on a national scale.

GOVERNMENT SUPPORT FOR PROVINCIAL RESEARCH ORGANIZATIONS:
THE UNRESOLVED DILEMMA

"Sponsored Research Institutes provide know-how and research capacity in the fields where industrial firms have neither the need nor the time to build up a permanent competence of their own. Thus they increase the flexibility of a country's capacity for industrial research."

- Organization for Economic Cooperation and Development, (Ref. 5)

Under present circumstances the Provincial Research Organizations appear to be caught between the 'Scylla' of the Provincial governments and the 'Charybdis' of the Federal Government. Thus, the Federal government tends to view them as "arms" of the Provincial governments and is therefore reluctant to provide financial support. Conversely, many Provincial governments tend to view them as independent agencies established primarily to serve the private sector and therefore expect them to recover a substantial part of their operating costs from their industrial clientele. While there is a wide variation in relationships, the Provincial Research Organizations do not act primarily as instruments of their respective provincial governments. In reality, all are autonomous corporate bodies and four of them obtain at least 50% of their income from contract earnings.

Despite the fact that the Provincial Research Organizations represent some of the largest R & D performers outside of the government and industry sectors, both federal and provincial governments (with the exception of Alberta and Quebec) on the whole appear unwilling either to utilize their resources or to finance any expansion of their existing operations.

Moreover, there appears to be a growing tendency to exclude them from direct participation in the various federal government programs designed to promote industrial research and development. The Federal government, as the principal funder of research in Canada, (amounting to \$621 million or 53% of GERD in 1973) obviously exerts a major influence on the activities of contract research organizations in both the public and private sectors. For example, in 1973 a total of some \$226 millions was spent extramurally, being divided about equally between industry and universities with only a miniscule share allocated to non-profit Research Institutes.

With specific regard to the Provincial Research Organizations, the Federal government provided a total of \$2.55 million in 1974 (almost entirely in the form of contracts). Moreover, the federal share of their income has been dropping steadily from 14% in 1971 to 10% in 1974.

This situation has been further aggravated by the termination of the IRDIA incentive program, and the DIR assistance program, together with the curtailment of PAIT funds, all of which will in due course have a severely detrimental effect on the level of R & D sponsored by industry at Provincial Research Institutes.

It is not generally appreciated that the existing Federal Industrial R & D incentive and assistance programs are aimed at the less than 3% of firms in the manufacturing sector which either perform or sponsor R & D. With the exception of the NRC Technical Information Program, there is almost a total lack of any concerted effort on the

part of the Federal government to improve the technological support for the remaining 30,000 firms in the manufacturing sector.

The key problem for the vast majority of the smaller firms is to upgrade their technological competence by enabling them to make better use of existing technology. The solution thus appears to lie in devising better mechanisms for diffusing technology to such firms and actively assisting them in its application.

Obviously, this is a role which the Provincial Research Councils have played effectively in the past, and which should be greatly expanded for the future. Insofar as the promotion of industrial development is a jointly-shared responsibility between the federal and provincial governments, there would seem to be compelling reasons for the provision of strong federal government encouragement and support for the use of the Provincial Research Organizations for this purpose.

THE "MAKE-OR-BUY" POLICY ISSUE:
PARTICIPATION BY PROVINCIAL RESEARCH ORGANIZATIONS

"We strongly recommend that mission-oriented federal departments and agencies - and the corresponding provincial departments examine their procedures to make sure that they remove those barriers and impediments that now prevent these (Provincial) Research Councils from obtaining contracts or from participating in cost-sharing arrangements".

- Science Council of Canada (Ref. 2)

"It appears that non-profit research institutes (including Provincial Research establishments) have tended to regard Federal research contracts simply as an immediate source of income. That - by itself - is not in keeping with the objectives of the contracting-out policy and accordingly, such institutes have not been major beneficiaries.

- Ministry of State for Science and Technology (Ref.6)

Early in 1973, the Federal government instituted its so-called "Make-or-Buy" policy for the contracting-out of mission-oriented R & D to industry. The underlying purpose was to facilitate the transfer of technology from government laboratories to industry and thereby enhance industry's technological capability and expedite the application of new research. The results of the initial three year's experience with the policy have been the subject of a preliminary review by the Ministry of State for Science and Technology which was summarized in a report issued in July 1976 (Ref. 6).

Although it is claimed that the policy has been successful, in reality, while R & D contracts with industry increased

by \$20 Million over the period 1973-1975, as shown in Table IX intramural R & D expenditures grew by some \$57 Million, (or nearly 3 times as much!). At the same time, the industry share of the Federal R & D Budget fell from 24% to 21.6%. Indeed, on the evidence it would have to be concluded that the major impact of the policy was directly attributable to the "Unsolicited Proposals Fund" established in 1974 which provided an additional \$10 Million specifically earmarked for contract R & D in Fiscal Year 1975/76.

Unfortunately, the "Make-or-Buy" policy appears to have had a seriously adverse effect on Federal government support for the Provincial Research Institutes, for between 1973 and 1974, there was a reduction of some \$600,000 in federal contracts. This would appear to be the result of a policy of deliberate discrimination against non-profit research organizations as indicated in the above abstract from the MOSST Report.

The contradiction between the views of the Science Council and MOSST on the subject of Federal government utilization of the resources of the Provincial Research Organizations is reflected in their respective statements quoted at the beginning of this section.

The MOSST report (Ref. 6) also makes the following inaccurate observations regarding the function of the Provincial Research Institutes:

"In those provinces where the research councils must derive most of their income from contract research, they tend to compete with the very industry they are meant to serve. Given the present state of Canada's economic development, the role of these research councils is becoming increasingly unclear."

These views betray a regrettable lack of understanding of the unique role and contribution of the Provincial Research Organizations as outlined in the previous sections of this Brief.

To place this issue in its proper perspective, it should be pointed out that the "Make-or-Buy" policy is probably only applicable to some 270 firms with established research teams of a viable size (i.e. more than 5 QSE's) which represents less than 1% of the total manufacturing establishments in Canada. Thus, the "Make-or-Buy" Policy has little relevance for the remaining 99% of manufacturing establishments which is the sector principally served by the Provincial Research Institutes.

In this context, it is also worth noting that contract placements by the D.S.S. Science Procurement Centre currently comprise approximately 40% to the Service Sector and 14% to Universities in terms of dollar value. Indeed, the Service Sector accounts for almost half of Federal science contracts placed with private industry. Since the Service Industry continues to be a major beneficiary under the "Make-or-Buy" policy, it would appear inconsistent and even counter-productive to discriminate against Provincial Research Institutes which provide similar essential scientific and technical services to primary and secondary industry.

Moreover, because of their broad interface with manufacturing industry, it might be expected that, in many cases, Provincial Research Institutes would be in a better position to effect the transfer of technology to the smaller firms. Therefore,

in terms of the ultimate objective of the "Make-or-Buy" policy, it would seem reasonable to suggest that the Provincial Research Organizations should be accorded at least the same priority as the Service Industry with respect to eligibility for Federal R & D contracts.

Similarly, the charge that the Provincial Research Organizations compete with the very industry they are meant to serve demonstrates ignorance of their real function as "agents of technology transfer". In point of fact, most of the firms they serve do not have any research capability. However, by acting as their R & D arm, the Provincial Research Organizations are able to make advanced technology available to the smaller firms which they would not otherwise readily be able to acquire. Moreover, any technology acquired by the Provincial Research Institutes can be transferred to a number of firms whenever and wherever the need or opportunity arises. Strong support for this point of view is provided in the following statements from a recent letter addressed to the Minister of State for Science & Technology by the R & D Committee of the Canadian Manufacturers Association. (attached as Appendix A)

"In our experience, these organizations are an integral part of the industrial research process in Canada, and should be recognized as such by the Federal Government".

"As suppliers of R & D, testing, and analytical services to thousands of Canadian companies, these institutes are in an ideal position to exploit government - funded technology in the industrial sector. That, in our opinion, is entirely in keeping with objectives of "Make-or-Buy".

It is our firm conviction that if the objective of the "Make or-Buy" Policy is to diffuse technology rapidly and widely to the maximum number of firms across Canada, the Provincial Research Organizations probably constitute one of the most effective instruments available for this purpose. Therefore, rather than discriminating against them as R & D contractors to the Federal government, the correct procedure would seem to be to encourage their greater participation under the "Make-or-Buy" policy and to strengthen their role as regional centres for industrial technology.

RECOMMENDATIONS

Based on the foregoing analysis of the critical need of Canadian manufacturing industry for technological support, the Association of Provincial Research Organizations wish to submit the following recommendations concerning future government policies and programs in this regard:

1. Both the Federal and Provincial governments should substantially expand the level of their support for industrially-oriented R & D and for this purpose should make much greater use of the capabilities of the Provincial Research Organizations as agencies for the transfer of technology to Canadian industry.
2. To this end, the guidelines for the Federal "Make-or-Buy" policy for mission-oriented R & D should include explicit provision for participation by Provincial Research Organizations as eligible contractors and should accord them a preference second only to manufacturing firms.
3. In order to increase the effectiveness of the "Make-or-Buy" policy, wherever appropriate, a significant share of the R & D budgets of all government agencies should be specifically allocated for extramural contracts with industry or industry-oriented research institutions.
4. The Federal government should initiate on an urgent basis, new policies and programs designed to strengthen the technological capability of small and medium-size industrial firms and should utilize the resources of the Provincial Research Organizations as the vehicle for transferring technology to regional industries.
5. In view of the declining level of industrial R & D in Canada, a general R & D incentive to replace the support formerly provided by IRDIA should be introduced at the earliest opportunity as one means of offsetting the current deterioration of technological innovation and productivity in Canadian industry.



THE CANADIAN MANUFACTURERS' ASSOCIATION
L'ASSOCIATION DES MANUFACTURIERS CANADIENS

Appendix A

ONE YONGE STREET, TORONTO, ONTARIO M5E 1J9
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September 30, 1976

Hon. J. H. Faulkner
Minister of State for
Science and Technology
Martel Building
270 Albert Street
Ottawa, Ontario
K1A 1A1

Dear Mr. Faulkner:

As Chairman of the Canadian Manufacturers' Association Research and Development Committee, I have been asked to write to you on behalf of the Committee, disagreeing with the position adopted by the Industry Branch of MOSST, concerning the role and status of non-profit institutions under "Make or Buy".

In its recently published review entitled "The Make or Buy 1973 - 1975", MOSST stated on page 31 and 32 that:

- a) non-profit institutes tend to compete with the very industry they are meant to support
- b) their role is becoming increasingly unclear
- c) their orientation has not been in keeping with the objectives of the contracting-out policy, and accordingly they have not been major beneficiaries of government contracts

The experience of our members, on the contrary, has been that the Ontario Research Foundation and similar non-profit industrial research institutes have a very clear role in providing an up-to-date and relevant technological resource to supplement the needs of larger companies and to act as the R & D lab for small companies whose needs are too sporadic to justify the establishment of an on-going in-house R & D facility. In our experience, these organizations are an integral part of the industrial research process in Canada, and should be recognized as such by the Federal Government.

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As suppliers of R & D testing, and analytical services to thousands of canadian companies, these institutes are in an ideal position to exploit government-funded technology in the industrial sector. That, in our opinion, is entirely in keeping with the objectives of "Make or Buy".

Yours very truly,



G. A. Chapman
Chairman Research & Development
Committee
Canadian Manufacturers' Association

GAC:LSH

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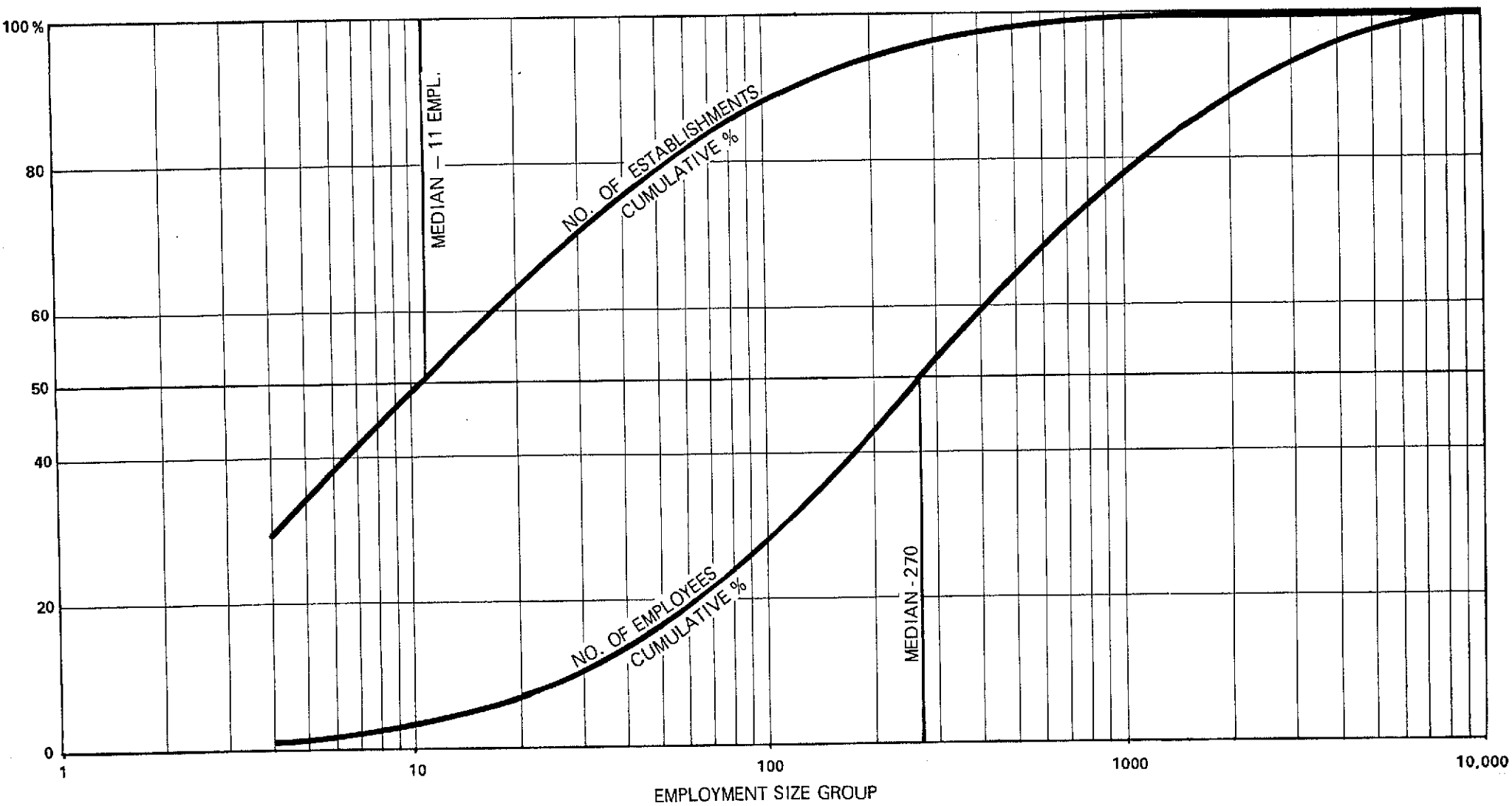


FIG. 1 STRUCTURE OF CANADIAN MANUFACTURING INDUSTRY 1973

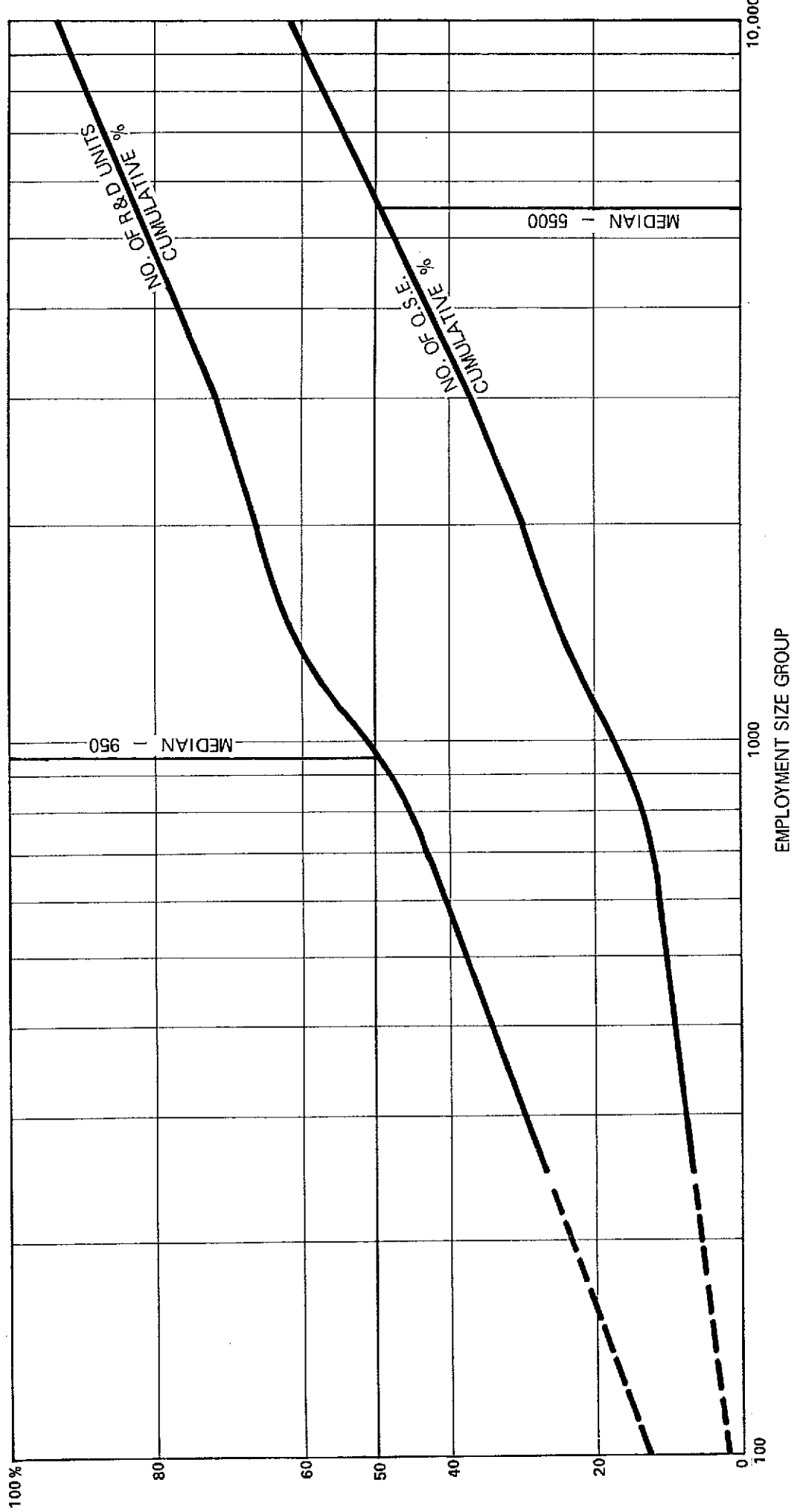


FIG. 2 INDUSTRIAL R & D EFFORT VS. COMPANY SIZE 1973

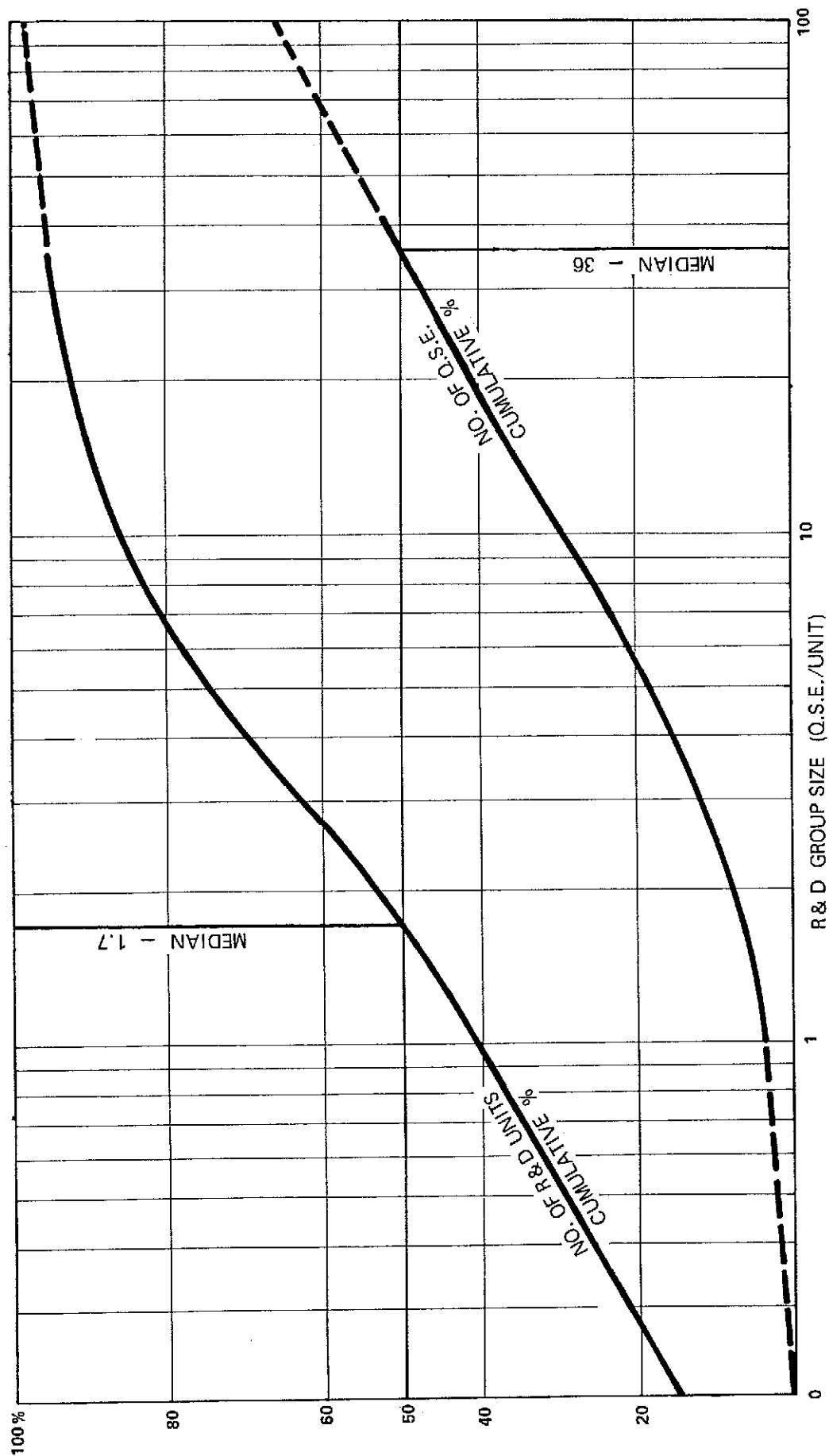


FIG. 3 SIZE DISTRIBUTION OF INDUSTRIAL R & D UNITS 1973

TABLE I
FIRM SIZE & EMPLOYMENT DISTRIBUTION
IN CANADIAN MANUFACTURING INDUSTRY - 1973

EMPLOYMENT SIZE GROUP	NO. OF ESTABLISHMENTS	% EST'S IN GROUP	CUMULATIVE %	TOTAL NUMBER OF EMPLOYEES	% EMPLOYEES IN GROUP*	CUMULATIVE %*
0 - 4	9214	29.6%	29.6%	13,779	1.1%	1.1%
5 - 9	5131	16.5%	46.1%	32,840	2.0%	3.1%
10 - 19	4967	15.9%	62.0%	68,442	3.9%	7.0%
20 - 49	5347	17.2%	79.2%	168,276	9.6%	16.6%
50 - 99	2800	9.0%	88.2%	195,521	11.2%	27.8%
100 - 199	1923	6.1%	94.3%	270,842	15.4%	43.2%
200 - 499	1275	4.1%	98.4%	386,014	21.9%	65.1%
500 - 1000	343	1.1%	99.5%	234,654	13.3%	78.1%
Over 1000	145	0.5%	100.0%	304,273	17.3%	95.4%
TOTAL	31,145			1,751,066	* Excludes Headquarters and Sales Offices	

SOURCE: STATISTICS CANADA CATALOGUE #31-210

TABLE II
DISTRIBUTION OF INDUSTRIAL R & D UNITS AND
Q.S.E. EMPLOYMENT BY COMPANY SIZE 1973

EMPLOYMENT SIZE GROUP	NO. IN GROUP	%	CUMULATIVE %	QUALIFIED SCIENTISTS & ENGINEERS (QSE)			INDUSTRIAL R & D EXPENDITURE	
				NO. IN GROUP	% IN GROUP	CUMULATIVE %	\$ MILLIONS	% IN GROUP
1 - 249	274	26.6%	26.6%	515	6.7%	6.7%	\$ 25.9	6.1%
250 - 749	178	17.3%	43.9%	421	5.5%	12.2%	21.3%	4.9%
750 - 1499	197	19.1%	63.0%	1047	13.6%	25.8%	54.0%	12.7%
1500 - 2999	92	8.9%	71.9%	872	11.4%	37.2%	40.6%	9.5%
3000 - 4999	92	8.9%	80.8%	779	10.2%	47.4%	57.9%	13.6%
Over 5000	198	19.2%	100	4040	52.6%	100.	226.9%	53.2%
TOTAL	1031			7674			\$426.6	

SOURCE: STATISTICS CANADA CATALOGUE #13-203 &
 SUPPLEMENTARY DATA

TABLE III

R & D UNIT SIZE AND MANPOWER DISTRIBUTIONIN CANADIAN INDUSTRY - 1973

<u>R & D UNIT SIZE NO. Q.S.E.</u>	<u>NO. OF R&D UNITS</u>	<u>% UNITS IN GROUP</u>	<u>CUMULATIVE %</u>	<u>NO. OF QUALIFIED SCI & ENGINEERS (Q.S.E.)</u>	<u>% ENGINEERS</u>	<u>CUMULATIVE %</u>
0	155	14.5%	14.5%	0	0%	0%
1	278	26.0%	40.5%	278	3.5%	3.5%
2	130	12.2%	52.7%	260	3.3%	6.8%
3-5	240	22.4%	75.1%	891	11.2%	18.0%
6-10	117	10.9%	86.0%	866	10.9%	28.9%
11-15	47	4.4%	90.4%	588	7.4%	36.3%
16-20	20	1.9%	92.3%	341	4.3%	40.6%
21-25	15	1.4%	93.7%	326	4.1%	44.7%
26-30	9	0.8%	94.5%	225	2.8%	47.5%
Over 30	59	5.5%	100 %	4153	52.4%	100. %
TOTAL	1070			7928		

SOURCE: STATISTICS
CANADA
(CORRESPONDENCE)

TABLE V

RESOURCES OF PROVINCIAL RESEARCH ORGANIZATIONS

1974

INSTITUTE	STAFF		TOTAL EXPENDITURE ON SCIENTIFIC ACTIVITIES \$M	LABORATORY FACILITIES		
	No. Q.S.E.	Total		Floor Area Sq. Ft.	Value of Buildings \$ Million	Value of Equipment \$ Millions
Nova Scotia Research Fdn.	31	86	\$1.47 M	49,800 Sq. Ft.	\$ 1.8 M	\$ 1.0 M
N. B. Research & Productivity Council	30	61	1.52	79,774	1.3	1.9
Quebec Centre de Recherche Industrielle	47	169	5.79	106,850	4.1	2.7
Ontario Research Fdn.	78	283	6.68	221,000	7.7	5.3
Manitoba Research Council	4	7	0.31	1,000	-	-
Saskatchewan Research Council	42	120	2.75	30,400	0.8	0.9
Alberta Research Council	119	279	7.78	176,000	4.6	2.7
B. C. Research Council	74	151	3.50	147,000	4.1	1.5
TOTAL	425	1,156	\$29.8 M	811,824 Sq. Ft.	\$24.3 M	\$16.1 M

SOURCE : STATS CAN #13-209

TABLE VI
PROVINCIAL RESEARCH ORGANIZATIONS
SOURCES OF FUNDS FOR ALL SCIENTIFIC ACTIVITIES - 1974

INSTITUTE	CONTRACTS \$ THOUSANDS					GRANTS & SUBSIDIES \$ THOUSANDS		OTHER CDN SOURCES	FOREIGN SOURCES	TOTAL \$ THOUSANDS
	INDUSTRY	PROV GOVT	FED GOVT	TOTAL	% (ACROSS)	PROV GOVT	FED GOVT			
N.S.R.F.	\$ 251	\$ 60	\$418	\$ 729	49.5	\$ 700	-	\$ 43	-	\$ 1,472
N.B. R.P.C.	259	326	247	832	54.7	600	-	41	\$ 49	1,522
CRIQ	81	25	38	144	2.5	5,500	-	145	-	5,789
ORF	3,090	375	522	3,987	59.7	2,192	-	315	185	6,679
MRC	-	-	-	-	0	307	-	-	-	307
SRC	405	418	193	1,016	36.9	1,600	\$ 98	37	-	2,751
ARC	543	1,887	289	2,719	35.0	4,940	114	2	-	7,775
B.C. RESEARCH	1,117	593	633	2,343	67.0	320	-	599	237	3,499
TOTAL	\$5,746	\$3,684	\$2,340	\$11,770	39.5 %	\$16,159	\$212	\$1,182	\$471	\$29,794
LESS CRIQ & MRC				\$11,626	49.1 %					\$23,698

TABLE VII
SCIENTIFIC ACTIVITIES OF
PROVINCIAL RESEARCH ORGANIZATIONS

1974

ACTIVITY	CURRENT EXPENDITURES \$ Million	%
Research & Development	\$14.7M	55%
Analysis & Testing	2.6M	10%
Resource Surveys	3.1M	12%
Feasibility Studies	1.0M	4%
Technical Information including library services	1.5M	6%
Industrial Engineering	2.0M	7%
Other incl. Industrial Innovation	1.9M	7%
TOTAL	\$26.8M	100%

SOURCE: Stats Can #13-209

TABLE VIII
FIELD OF APPLICATION
OF PROVINCIAL RESEARCH ORGANIZATION
ACTIVITIES
1974

FIELD OF APPLICATION	CURRENT EXPENDITURES \$ million	%
Primary Industry	\$ 3.3M	12%
Secondary Industry	\$10.8M	40%
Construction Industry	\$ 0.5M	2%
Service Industry	\$ 0.7M	3%
Industry Total	\$15.3M	57%
Public Utilities	\$ 1.6M	6%
Natural Resources	\$ 3.7M	14%
Environmental Problems	\$ 4.7M	18%
Developing Countries	\$ 0.4M	1%
Other	\$ 1.1M	4%
Total	\$26.8M	100%

SOURCE: Stats Can #13-209

TABLE IX

FEDERAL GOVERNMENT SCIENCE EXPENDITURES

RELATIVE TO THE "MAKE-OR-BUY" POLICY

	FY 1973-74	FY 1974-75	FY1975-76	2 YEAR CHANGE	REMARKS
A. Total Payments to Industry for R & D	\$172.7 M	\$181.9 M	\$189.2 M	+\$ 16.5 M	
Industrial R & D Grants	122.1	126.9	125.8	+3.7	Sharp Decline in Grants for FY 1976-77 due to cancellation of IRDIA & DIR
B. Industry Contracts (excluding AECL)	29.4	34.4	49.1	+19.7	
Unsolicited Proposal Fund	-	1.8	9.3	+ 9.3	Unsolicited Proposals have been dominant factor
Net Make/Buy Contracts	29.4	32.6	49.1	+10.4	Limited Progress
C. Current Intramural R & D Expenditures (excluding AECL)	292.1	321.8	349.3	+57.2	N.B.3 times industry contract increment (Line B)
D. Total Government Expenditure on R & D	718.9	788.7	877.1	+158.2	Growth Rate 11% per annum
Ratio Industry Payments to Total R & D Expenditure (Line A/Line B)	24.0%	23.1%	21.6%	- 2.4%	N.B.Industry Share declining

SOURCES: STATISTICS CANADA CAT. NO. 13 - 202
MOSST REPORT - "THE MAKE-OR-BUY" POLICY
1973-1975".