

Q  
180  
.C2A52  
no.3

# MOSST Background Paper

**3**

Importation of Invisible  
Research and Development,  
1974-1976

July 1978



*Canada*

Ministry of State  
Science and Technology  
Canada

Ministère d'État  
Sciences et Technologie  
Canada

DEPARTMENT OF IN  
TRADE & COMMERCE  
LIBRARY  
DEC 14 1978  
BIBLIOTHÈQUE  
MINISTÈRE DE L'INDUSTRIE  
ET DU COMMERCE

TABLE OF CONTENTS

	<u>Page</u>	
i	INTRODUCTION	1
ii	INVISIBLE TECHNOLOGICAL IN-FLOWS	1
iii	METHODOLOGY	2
iv	ASSUMPTIONS OF THE MODEL	3
v	GENERAL FINDINGS	4
vi	INTERNATIONAL COMPARISONS	5
vii	CONCLUSIONS	8
viii	NOTES TO STATISTICAL TABLES	20

**3**

Importation of Invisible  
Research and Development,  
1974-1976

July 1978

TABLE OF CONTENTS

	<u>Page</u>
I INTRODUCTION	1
II INVISIBLE TECHNOLOGICAL IN-FLOWS	1
III METHODOLOGY	2
IV ASSUMPTIONS OF THE MODEL	3
V GENERAL FINDINGS	4
VI INTERNATIONAL COMPARISONS	6
VII CONCLUSIONS	8
VIII NOTES TO STATISTICAL TABLES	20

LIST OF TABLES

	<u>Page</u>
1. General Findings - Invisible R&D	5
2. International Comparison of Gross Expenditures on R&D as a Percentage of Gross Domestic Product	9
3. International Comparison of Industrial R&D Expenditures as a Proportion of Gross Domestic Product - 1973	10
4. Calculation of Invisible R&D - 1976	11-13
5. Calculation of Invisible R&D - 1975	14-16
6. Calculation of Invisible R&D - 1974	17-19
7. Calculation of Multiplier to Universe	25-26
8. 1975 Payments to Non-Residents for Technology	29
9. 1974 Payments to Non-Residents for Technology	30

## I INTRODUCTION

It has often been noted that Canada's R&D performance is low in comparison with that of other industrialized nations. At the same time it is commonly acknowledged that Canada's domestically-conducted R&D does not begin to approximate its total source of new technology, inasmuch as, being largely foreign-owned, Canadian industry has ready access to R&D imported from foreign parent companies. Significantly, much of this imported R&D enters the country without being financially recorded, or it may be lumped together with other services under a rubric such as "management fees". This study was undertaken with a view to estimating these imports in an effort to make at least a partial reconciliation in the anomaly between Canada's low R&D expenditures and the potentially large benefits from unrecorded R&D.

An estimate of unrecorded R&D in-flows should prove helpful in the Ministry's work of planning policies and programs for the future, by making it possible to judge more accurately the aggregate level of R&D which is currently supporting Canadian industry. Until now, only financially visible R&D has been used in estimating the total base. Also, such an estimate should assist in formulating an informed reaction to changes in foreign (especially U.S.) technology-related policies or programs, such as the recent tax regulation requiring U.S. multinational companies to apportion R&D expenses to their foreign subsidiaries.

## II INVISIBLE TECHNOLOGICAL IN-FLOWS

The purpose of this study is to estimate the value of technology entering Canada without being shown explicitly in accounts which identify its technical nature, and therefore without being included as technology in statistical surveys. One must resort to indirect measurement by estimating the entire R&D base made available to companies by foreign parents and deducting the visible payments. What remains is "invisible R&D."

The estimation process used reasons that technology employed by Canadian subsidiaries is similar to that used by their parents which produce similar products. R&D not performed in Canada to sustain sales in the face of competition must be imported and, of this, that which is not separately identified is invisible.

In mathematical terms, the model assumes the level of R&D needed to support the subsidiary's sales is proportional to the R&D needed to support the parent's sales. This is termed "notional R&D", abbreviated  $R_{not}$ , where:

$$R_{not} = \frac{\text{annual R\&D of parent}}{\text{annual sales of parent}} \times \frac{\text{annual sales of subsidiary}}{\text{annual sales of parent}}$$

From this quantity are subtracted the invisible sources of R&D, namely:

$$R_{cdn} = \text{actual R\&D performed or bought in Canada by the subsidiary annually}$$

$$R_{pay} = \text{annual payments from a subsidiary to non-residents (including its parent) for technology or R\&D results acquired.}$$

Thus is obtained invisible R&D:

$$R_{inv} = R_{not} - R_{cdn} - R_{pay}$$

### III METHODOLOGY

From the companies questioned about R&D policies by the Minister's letter of January 1977, and from other data readily available, were taken those foreign-owned companies for whose parents information could be gathered on sales and annual R&D expenditures. Companies with U.S. parents were the most important source of information because of the disclosure policy of the U.S. Securities and Exchange Commission, with which American companies file a "10K Report" specifying R&D expenditures. However, information was available for several non-American parents, although not with the same regularity, and these were also included.

The resulting companies were arranged according to SIC major groups, with exceptions explained in the notes accompanying Tables 4-6. Not all major groups in Canadian industry are represented because some comprise fewer foreign subsidiaries.  $R_{not}$  was calculated for each company, and a total  $R_{not}$  summed for all companies in each group. This was extrapolated to the "universe" of foreign-controlled Canadian companies in that group by the ratio of annual sales of the universe

to total annual sales of the sample companies. (This ratio is termed the "Multiplier to Universe", denoted as "K". See pages 24-26.) From this resulted an estimate of total notional R&D in each of the industry groups.

Deducted from total group  $R_{not}$  was total Canadian-performed R&D in the same industry groups, as supplied by the Science Statistics Centre of Statistics Canada (see page 27). Also deducted were the total payments to non-residents for technology ( $R_{pay}$ ) in the same industry groups, as supplied by Business Finance of Statistics Canada, using CALURA data (see pages 28-29). The remaining amounts represent total invisible R&D in the major industry groups.

These calculations were performed for the years 1974, 1975 and 1976. Although the companies comprising each group are, in most cases, included in all three of the years studied, it should be noted that the group compositions for the Mining, and Food, Beverage, and Tobacco sectors change somewhat from one year to the next. This inconsistency is the result of information unavailability for some companies in certain years. The group composition is outlined in the accompanying "Notes to Statistical Tables", under "Sample Canadian Companies", on page 21.

#### IV ASSUMPTIONS OF THE MODEL

The model assumes that both parent and subsidiary produce similar products using similar processes, and that R&D performed by the parent is applicable to, and tends to flow to, the subsidiary. In some cases the assumption is not valid. This, then, results in an overestimate of the in-flow of invisible R&D.

The sample in this study is based mainly on U.S.-controlled firms because of the scarcity of data for other foreign parents. Insofar as U.S. firms may perform larger amounts of R&D than other parent companies, this may also result in an overestimate of the in-flow of invisible R&D.

To the extent that technology's value is not truly apportionable on the basis of sales, the model understates the invisible R&D. That is, a case can be made that the value of technology received by subsidiaries is not dependent on their sales; its value is the full amount of what the parent spent to develop it.

In executing the model, it has been impossible on occasion to obtain all data for the same year. Corporate sales in 1976, for example, are predominantly 1976 but with some 1975 figures. Parents' R&D expenditures are predominantly for the year specified. Total Canadian R&D ( $R_{\text{cdn}}$ ) is also for the year specified. Canadian payments to non-residents ( $R_{\text{pay}}$ ) are 1974 and 1975. (Consideration was given to projecting the 1975 CALURA data to 1976, but this was discarded because of the inaccuracy that would result from projecting all sectors equally with a single aggregate growth rate, and because of the unavailability of growth rates for each individual sector.) The result is to overestimate the value of invisible R&D.

The performance of the model may also be affected by the number or nature of the sample companies used. In some sectors, the sample is a dominating portion of the sector and the extrapolation factor is small. This is true in Petroleum where the sample constitutes 80% of the industry group. However, in Mining in 1976, for instance, the sample constitutes only 26% of the industry group.

It should be noted especially that the model does not imply that parent companies are conducting a "correct" amount of R&D, nor that subsidiaries are receiving a "correct" amount. One should also note that, because corporations experience time lags in generating sales from completed R&D, the model would take several years to detect a serious change in the flow of technology between a parent and its subsidiary.

## V GENERAL FINDINGS

The general findings and conclusions are shown in Table 1 following. Located after the conclusions are Tables 4-6, which summarize the collected data and the computations. They are accompanied by explanatory notes and lists of the sources used in compiling the information.



TABLE 1

GENERAL FINDINGS  
INVISIBLE R&D

(\$ millions Cdn.)

	Industry Group	Total R not	—	Total R cdn	—	Total R pay	=	Total R inv
1976	Mining	99.6		29.8		12.7		57.1
	Petroleum	55.6		47.0		17.2		(8.6)
	Food, Beverages, Tobacco	49.7		12.0		11.7		26.0
	Machinery, Transportation Equipment	521.9		28.7		71.9		421.3
	Electrical Products, Utilities, Transportation	195.1		85.2		22.4		87.5
	Rubber, Plastics, Chemicals	177.2		65.2		53.6		58.4
	Metal Fabricating	45.6		3.9		12.6		29.1
	Paper & Allied	34.2		9.3		7.7		17.2
			<u>1,178.9</u>		<u>281.1</u>		<u>209.8</u>	
1975	Mining	96.4		37.1		12.7		46.6
	Petroleum	57.4		49.0		17.2		(8.8)
	Food, Beverages Tobacco	43.0		10.3		11.7		21.0
	Machinery, Transportation Equipment	484.9		17.4		71.9		395.6
	Electrical Products, Utilities, Transportation	178.1		86.9		22.4		68.8
	Rubber, Plastics, Chemicals	167.9		58.4		53.6		55.9
	Metal Fabricating	38.5		3.8		12.6		22.1
	Paper & Allied	28.6		10.9		7.7		10.0
			<u>1,094.8</u>		<u>273.8</u>		<u>209.8</u>	
1974	Mining	80.3		29.7		11.7		38.9
	Petroleum	48.8		45.4		11.9		(8.5)
	Food, Beverages, Tobacco	37.8		8.5		8.2		21.1
	Machinery, Transportation Equipment	496.3		22.7		56.3		417.3
	Electrical Products, Utilities, Transportation	171.4		65.6		26.9		78.9
	Rubber, Plastics, Chemicals	156.3		49.6		49.6		57.1
	Metal Fabricating	34.8		3.4		10.7		20.7
	Paper & Allied	27.8		7.1		9.7		11.0
			<u>1,053.5</u>		<u>232.0</u>		<u>185.0</u>	

The trend of Invisible R&D over three years is unsteady growth from \$636.5 million to \$688.0 million, with a drop in the middle year to \$611.2 million. Notional R&D has grown steadily at a compound annual rate of 5.8 per cent, although the growth between 1974 and 1975 was not as great as between 1975 and 1976. In any case it is interesting to note that Invisible R&D is more than double the actual Canadian R&D, although on account of Canadian R&D increasing at a compound annual rate of 10.1 per cent this ratio appears to be decreasing. That is, Invisible R&D is 2.74 times greater than Canadian R&D in 1974, but in 1976 this drops to 2.45, implying that the proportion of Canada's industrial technology requirements being supplied without visible payment is decreasing.

## VI INTERNATIONAL COMPARISONS

International comparisons of R&D activity normally are based on actually-expended funds, and hence tend to ignore technology flows that occur without explicit payment, but which contribute to a country's technological base nevertheless. Of course the omission holds true for all countries, but for Canada the invisible flows are probably of particular significance. This is because the unusually high degree of foreign ownership of Canadian industry contributes significantly to making Canada highly dependent on imported technology.

The technology in-flows which occur are often not subject to visible payment and, therefore, reduce the effectiveness of international comparisons in indicating the true picture of Canada's relative technology base.

Accordingly, in an attempt to set Canada in a more appropriate international context, Table 2 on page 9 shows a comparison of Canada's R&D picture with that of other industrialized countries, both exclusive and inclusive of Canadian Invisible R&D.

When viewed in the context of domestic and invisible R&D combined, Canada's technology resources fit into a world-wide industrial picture at a level somewhat more commensurate with its other economic indicators than if one considers Canada's domestic R&D alone. For example, the inclusion of invisible R&D raises Canada's GERD as a percentage of GDP to 1.37 per cent, which is

above that of Australia (1.30 per cent) or the combined Scandinavian countries (1.33 per cent), regions that may be likened to Canada for their similarity of industrial beginnings and/or the similarity of their populations, terrain or climate.

It has been noted in other studies that manufacturing industries in Canada constitute a smaller proportion of national GDP than is the case in other industrialized countries. To remove the effect of this when discussing relative R&D performance, it is more appropriate to compare countries' industrial R&D to the GDP of their manufacturing industries. Table 3 on page 10 makes this comparison, both including and excluding Canada's invisible R&D (which has been estimated only for the manufacturing sector).

If one subtracts out the effect of Canada's relatively smaller industrial sector, and compares internationally the R&D resources of the business enterprise sector as a proportion of the sector's own GDP, Canada's position among industrialized nations improves significantly when invisible R&D is included. With it, Canadian business enterprises have access to R&D equivalent to 4.28 per cent of their GDP, while for Australia the figure is 2.29 per cent and for the combined Scandinavian countries the figure is 2.92 per cent. In fact, only the U.K. (4.66 per cent) and the U.S.A. (6.45 per cent) exceed the Canadian figure.

However, it is obvious that an even better comparison would be one which included invisible R&D for each of the countries concerned. We are now endeavouring to obtain data which would permit these estimations to be made.

In to-day's world every nation uses the results of science and technology performed elsewhere. However, the magnitude of the invisible in-flows of technology, as estimated in this study, indicates that Canada's dependence on the importation of technology is quite substantial and probably greater than for most industrialized nations. Imported R&D cannot fully substitute for indigenous R&D and Canada's great dependence on such imports creates a serious problem.

We have had rather easy access to the accessories of modern life through the use of these technological in-flows but there are also invisible costs. Imported technology does not generally make Canadian industry internationally competitive. It increases our vulnerability to foreign decision-making, and it limits the opportunities for highly-trained Canadians. There are undoubtedly other costs.

In the current paper an attempt has been made to quantify the invisible flow of technology. Clearly, the next step will be to explore more fully the invisible costs.

TABLE 2

INTERNATIONAL COMPARISON OF GROSS EXPENDITURE ON R&D  
AS A PERCENTAGE OF GROSS DOMESTIC PRODUCT

COUNTRY	GERD as % of GDP	1
Canada: Excluding Invisible R&D	1.00	
Including Invisible R&D	1.37 <sup>2</sup>	
Australia	1.30 <sup>3</sup>	
Denmark	1.00 <sup>3</sup>	
Finland	0.95 <sup>3</sup>	
Norway	1.11 <sup>3</sup>	
Sweden	1.73 <sup>3</sup>	
Total Scandinavia	1.33	
France	1.86	
Germany	2.16	
Japan	2.00 <sup>4</sup>	
USA	2.35	

(1) Source: OECD/DSTI Science Resources Newsletter, No. 2, Spring 1977. Data is 1975, except as otherwise indicated.

(2) Derivation is as follows:

(\$ millions Cdn.)

1975 Canadian GERD <sup>(i)</sup>	=	1,650
e.1975 Canadian invisible R&D	=	611.2
1975 Canadian GDP <sup>(ii)</sup>	=	165,000
GERD as % of GDP	=	$\frac{1,650+611.2}{165,000} \times 100\% = 1.37\%$

(i) Canadian GERD 1975 is from OECD/DSTI Science Resources Newsletters No. 1, Table 1, Page 6; and No. 2, Graph 1, Page 2.

(ii) Canadian GDP is from OECD/DSTI Science Resources Newsletter, No. 2, Table "GERD as a percentage of GDP", Page 1.

(3) GERD figures are 1973, from OECD International Statistical Year 1973, Vol. 5, publication DSTI/SPR/76.29, Page 34. Currency is U.S. dollars.

GDP figures are 1973, from U.N. Yearbook of National Accounts Statistics, Vol. III, 1974, International Tables, given in national currency. Conversion to U.S. currency is according to exchange rates given in OECD/DSTI Science Resources Newsletter, Vol.1, September 1976, Table 1, page 6. Exchange rates are 1973, except Norway (1972).

(4) Data is 1974

TABLE 3  
INTERNATIONAL COMPARISON OF INDUSTRIAL R&D EXPENDITURES  
AS A PROPORTION OF GROSS DOMESTIC PRODUCT  
1973

	Total R&D Expenditures Performed by the Business Enterprise Sector <sup>(1)</sup> (\$U.S. Millions)	R&D Expenditures As a Percent of Total GDP <sup>(2)</sup> %	Ratio of Manufacturing Industries' GDP to Total GDP <sup>(3)</sup> %	R&D Spending as a proportion of Manufacturing Industries' GDP %
Canada Excluding Invisible R&D	487	0.40	20	2.00
Canada Including Invisible R&D	1,042 <sup>4</sup>	0.84	20	4.28
<i>Australia</i>	361	0.48	21	2.29
Denmark	123	0.47	26	1.81
Finland	87	0.51	27	1.89
Norway	82	0.43	22	1.95
Sweden	551	1.15	27	4.26
<i>Total Scandinavia</i>	843	0.76	26	2.92
France	2,586	1.09	35 <sup>5</sup>	3.14
Germany	4,400	1.28	40	3.19
Japan	4,757	1.20	38	3.16
U.K.	2,063	1.26	27	4.66
U.S.A.	20,921	1.61	25	6.45

- (1) Source: OECD International Statistical Year 1973, Vol. 5, publication DSTI/SPR/76.29, Page 40. Data is 1973.
- (2) GDP figures are from U.N. Yearbook of National Accounts Statistics, Vol. III, International Tables, 1974. Data is 1973, except Australia, which is 1972. Exchange rates provided by U.N. Yearbook of Labour Statistics, 1975, Table 28.
- (3) Source: U.N. Yearbook of National Accounts Statistics, Vol. III, International Tables, 1974. Data is 1973, except Australia which is 1972.
- (4) Base expenditure is 1973. Added to this is 1974 Invisible R&D, which has been adjusted to approximate 1973 figure. The adjusting factor is  $0.87 = 114.6/131.7$ , namely the ratio of 1973 to 1974 Implicit Price Indexes of GNE, as given by the Bank of Canada Review, July 1977, Table 54. The resulting sum is converted to U.S. dollars at the 1973 exchange rate (from OECD/DSTI Science Resources Newsletter, No. 1, Table 1, page 6).
- (5) Estimated from trend between 1960-69.

TABLE 4

## CALCULATION OF INVISIBLE R&amp;D 1976

All Dollar Figures are (\$M Cdn.) All Data is 1976 Unless Otherwise Noted

INDUSTRY SECTOR	CANADIAN COMPANY		PARENT COMPANY				CALCULATION OF INVISIBLE R&D						
	NAME	SALES (\$M Cdn.)	NAME & NATIONALITY	SALES (\$M U.S.)	R&D (\$M U.S.)	INTENSITY $\bar{z}$	CANADIAN NATIONAL R&D OF SAMPLE	MULTIPLIER TO UNIVERSE	TOTAL CDN. NATIONAL R&D OF SECTOR	ACTUAL CANADIAN R&D	IMPORTED R&D (\$M Cdn.)	PAYMENTS TO NON-RESIDENTS	INVISIBLE R&D (\$M Cdn.)
		$S_c^1$		$S_p^2$	$R_p^2$	$I = R_p/S_p$	$R_{not} = I \times S_c$	K	$R_{not} = K \times R_{not}$	$R_{cdn}^3$	$R_{imp} = R_{not} - R_{cdn}$	$R_{pay}^4$	$R_{inv} = R_{imp} - R_{pay}$
Mining	Asbestos Corp.	151	General Dynamics (US)	2,553	24.0	0.94	1.42						
	Cdn. Johns-Manville	260	Johns-Manville (US)	1,309	11.5	0.88	2.28						
	Falconbridge Nickel	483	Superior Oil (US)	441 <sup>6</sup>	3.1 <sup>7</sup>	0.70	4.23						
	McIntyre Mines	119		7,958	23.7	0.30	1.22						
	Hudson Bay Oil & Gas	409	Continental Oil (US)	7,958	23.7	0.30	1.22						
	Quebec Iron & Titanium	200 <sup>8</sup>	Kennecott Copper (US) <sup>9</sup>	956	16.2	1.69	3.38						
	Rio Algon Mines	402		Rio Tinto Zinc (UK) <sup>10</sup>	2,843 <sup>6</sup>	22.5 <sup>6,11</sup>	0.79	4.44					
	Indal	159	Newmont Mining (US)	602 <sup>6</sup>	14.7 <sup>6,12</sup>	2.44	6.42						
	Sherritt-Gordon	183		602 <sup>6</sup>	14.7 <sup>6,12</sup>	2.44	6.42						
	Cassiar Asbestos	60					23.39	4.26	99.6	29.8	69.8	12.7	57.1
		2,446											
Petroleum	BP Canada	626 <sup>13</sup>	British Petroleum (UK) <sup>10</sup>	17,988 <sup>6</sup>	43.0 <sup>6</sup>	0.24	1.49						
	Gulf Oil Canada	1,924 <sup>13</sup>	Gulf Oil (US)	16,451	64.0	0.39	7.48						
	Imperial Oil	4,303 <sup>13</sup>	Exxon (US)	48,631	202.0	0.42	17.87						
	Shell Canada	2,111	Shell Oil (US) <sup>14</sup>	9,230	65.1	0.71	14.89						
	Sun Oil Canada	401	Sun Oil (US)	5,387	24.9	0.46	1.85						
	Texaco Canada	989	Texaco (US)	26,452	52.0	0.20	1.98						
			9,365				45.56	1.22	55.6	47.0	8.6	17.2	(8.6)
Food, Beverages, Tobacco	Borden Co.	132	Borden Inc. (US)	3,381	14.8	0.44	0.58						
	Campbell Soup	115	Campbell Soup (US)	1,635	13.8	0.84	0.97						
	Canadian Cannery	113	Del Monte (US)	1,430	9.9	6.69	0.78						
	Christie, Brown & Co	137	Nabisco (US)	2,027	10.1	0.50	3.68						
	Consolidated Food	219	Consolidated Food (US)	2,755	5.9	0.21	0.47						
	General Foods	346	General Foods (US)	3,978	37.8	0.95	3.29						
	General Mills	95	General Mills (US)	2,645	25.7	0.97	0.92						
	H.J. Heinz	135	H.J. Heinz (US)	1,882	9.6	0.51	0.69						
	Kellogg-Salada	125	Kellogg Co. (US)	1,385	7.5	0.54	0.68						
	Kraft	369	Kraftco (US)	4,977	13.0	0.26	0.96						
	Quaker Oats	81	Quaker Oats (US)	1,473	19.0	1.29	1.04						
	Ralston-Purina	166	Ralston-Purina (US)	3,394	16.4	0.48	0.80						
	Standard Brands	315	Standard Brands (US)	1,810	6.0	0.33	1.04						
			2,348				12.90	3.85	49.7	12.0	37.7	11.7	26.0
Machinery, Transportation Equipment	Chrysler Canada	2,941	Chrysler Corp. (US)	15,538	280.4	1.80	52.93						
	Ford Motor	4,769	Ford Motor (US)	28,840	924.9	3.21	152.94						
	General Motors	5,190	General Motors (US)	47,181	1,257.3	2.66	139.30						
	Int. Harvester	715	Int. Harvester (US)	5,488	140.0	2.55	18.24						
	Pratt & Whitney	267	United Technologies (US)	5,166	358.4	6.94	18.52						
		13,882				380.93	1.37	521.9	28.7	493.2	71.9	421.3	
Electrical, Utilities, Transportation	Aviation Electric	36 <sup>6</sup>	Bendix Corp. (US)	2,947	100.5	3.41	1.23						
	Anglo-Canadian Tel	532											
	B.C. Telephone	436	GTE (US)	6,751	105.6	1.56	15.91						
	GTE Lenkurt	52 <sup>6</sup>											
	GCE	879	General Electric (US)	15,697	411.5	2.62	23.04						
	Honeywell	133		Honeywell (US)	2,495	125.6	5.03	6.69					
	IBM Canada	837	IBM (US)	16,304	1,012.0	6.21	51.95						
	Raytheon	12 <sup>6</sup>	Raytheon (US)	2,463	46.9	1.90	0.23						
	Westinghouse	455	Westinghouse (US)	6,145	41.0	2.29	10.44						
	Westcoast Trans.	562	Phillips Petroleum (US)	5,698	40.2	0.71	3.96						
		3,934				113.45	1.72	195.1	85.2	109.9	22.4	87.5	

TABLE 4 cont'd

All dollar figures are (\$M Cdn.) All data is 1976 unless otherwise noted.

INDUSTRY SECTOR	CANADIAN COMPANY		PARENT COMPANY				CALCULATION OF INVISIBLE R&D						
	NAME	SALES (\$M Cdn.)	NAME & NATIONALITY	SALES (\$M U.S.)	R&D (\$M U.S.)	INTENSITY %	CANADIAN NATIONAL R&D OF SAMPLE	MULTIPLIER TO UNIVERSE	TOTAL CDN. NATIONAL R&D OF SECTOR	ACTUAL CANADIAN R&D	IMPORTED R&D	PAYMENTS TO NON-RESIDENTS	INVISIBLE R&D (\$M Cdn.)
		$S_c^1$		$S_p^2$	$R_p^2$	$I = R_p/S_p$	$R_{not} = I \times S_c$	$K$	$R_{not} = K \times R_{not}$	$R_{cdn}^3$	$R_{imp} = R_{not} - R_{cdn}$	$R_{pay}^4$	$R_{inv} = R_{imp} - R_{pay}$
Rubber, Plastics, Chemicals	Bristol-Myers	124 <sup>6</sup>	Bristol-Myers (US)	1,986	60.0	3.02	3.75						
	CIL	614	ICI (UK) <sup>10</sup>	7,029 <sup>6</sup>	232.9 <sup>6</sup>	3.31	20.34						
	Dow Chemical	389	Dow Chemical (US)	5,652	187.5	3.32	12.87						
	du Pont	459 <sup>5</sup>	du Pont (US)	8,361	352.5	4.22	19.35						
	F.W. Horner	19 <sup>7</sup>	Carter-Wallace (US)	165	9.1	5.52	1.05						
	B.F. Goodrich	183	B.F. Goodrich (US)	1,996	41.9	2.10	3.44						
	Goodyear	366	Goodyear (US)	5,792	113.6	1.96	7.17						
	Lever Bros.	270 <sup>5</sup>	Unilever (UK) <sup>10</sup>	14,842 <sup>6</sup>	185.3 <sup>6</sup>	1.25	7.37						
	Merck, Sharpe, Dohme	28 <sup>5</sup>	Merck (US)	1,662	135.4	8.15	2.28						
	Monsanto Canada	186	Monsanto (US)	4,270	111.2	2.60	4.84						
	Proctor & Gamble	359	Proctor & Gamble (US)	6,513	136.6	2.10	7.53						
	Sherwin-Williams	60	Sherwin-Williams (US)	952	9.6	1.01	0.60						
	Union Carbide	394	Union Carbide (US)	6,346	142.4	2.24	8.84						
	Uniroyal	214	Uniroyal (US)	2,315	59.0	2.55	5.45						
			3,665				104.88	1.69	177.2	65.2	112.0	53.6	58.4
	Metal Fabricating	American Can	255 <sup>15</sup>	American Can (US)	3,143	40.3	1.28	3.26					
Babcock & Wilcox		130	Babcock & Wilcox (US)	1,692	27.4	1.62	2.11						
Black & Decker		69	Black & Decker (US)	748	14.3	1.91	1.32						
Combustion Engineering-Superheater		102 <sup>16</sup>	Combustion Engineering (US)	1,831	29.4	1.61	1.64						
Continental Group Canada		311	Continental Group (US)	3,458	40.3	1.17	3.62						
Gillette Canada		45 <sup>17</sup>	Gillette (US)	1,492	34.6	2.32	1.04						
Horton CBI		68 <sup>18</sup>	Chicago Bridge & Iron (US)	577	3.7	0.64	0.44						
Koppers Int.		20 <sup>18</sup>	Koppers Co. (US)	1,189	10.6	0.89	0.18						
Litton Systems		52	Litton Industries (US)	3,351	56.7	1.69	0.88						
							14.49	3.15	45.6	3.9	41.7	12.6	29.1
Paper & Allied	Addressograph-Multigraph Canada	35.8 <sup>17</sup>	Addressograph-Multigraph (US)	573	15.8	2.76	0.99						
	Canadian Int'l. Paper	750	International Paper (US)	3,541	20.1	0.57	4.26						
	Crown Zellerbach	394 <sup>19</sup>	Crown Zellerbach (US)	2,136	9.3 <sup>21</sup>	0.43	1.72						
	Masonite Canada	57 <sup>16</sup>	Masonite (US)	386	1.8	0.47	0.26						
	Rayonier Canada	145	ITT (US)	11,764	246.3	2.09	3.04						
	Scott Paper	99	Scott Paper (US)	1,374	24.4	1.78	1.76						
	Spruce Falls Paper & Paper	100 <sup>16</sup>	Kimberly-Clark (US)	1,585	21.8	1.38	1.38						
	Weyerhaeuser	157 <sup>20</sup>	Weyerhaeuser (US)	2,668	30.3	1.14	1.78						
							15.19	2.25	34.2	9.3	24.9	7.7	17.2



TABLE 4 cont'd

GENERAL NOTES AND SOURCES OF DATA

- (1) "2+2", Canadian Business, July 1977.
- (2) "What 600 Companies Spend for Research," Business Week, 27 June 1977.
- (3) Statistics Canada, unpublished Science Statistics Centre data. (See details in "Notes to Statistical Tables," attached).
- (4) Statistics Canada, unpublished CALURA listing. (See derivation in "Notes to Statistical Tables", attached) Data is 1974.
- (5) Summary sheet of companies receiving R&D letter, prepared by MOSST. Data is 1974.
- (6) The Financial Post Information Service. Data is 1975
- (7) Corporate 10-K Report, filed with U.S. Securities & Exchange Commission. Data is 1975.
- (8) The Blue Book of Canadian Business, Canadian Newspaper Services International Ltd., Toronto, 1976
- (9) Part owners of Quebec Iron & Titanium are Kennecott Copper, USA (2/3), and New Jersey Zinc, USA (1/3). Financial statements of New Jersey Zinc are consolidated with its parent, Gulf & Western (USA), for which no separate R&D figure is available.
- (10) Financial data based on exchange rate of \$1.70 (Can.) = £ 1.00 (UK).
- (11) Includes exploration and environmental expense.
- (12) Includes exploration.
- (13) Sales are net of non-operating revenue.
- (14) R&D not available for parent (Royal Dutch/Shell Group). American affiliate taken as approximation.
- (15) American Can Company of Canada.
- (16) The Blue Book of Canadian Business, Canadian Newspaper Services International Ltd., Toronto, 1977.
- (17) The Financial Post Survey of Industrials, 1977.
- (18) Consumer and Corporate Affairs, Bureau of Corporate Affairs Bulletin, August 1977.
- (19) "The Top 200 Industries", The Financial Post 300, Summer 1977.
- (20) Weyerhaeuser Canada Limited.
- (21) Estimated from trend between 1974 and 1975.

TABLE 5

## CALCULATION OF INVISIBLE R&amp;D 1975

All dollar figures are (\$M Cdn.) All data is 1975 unless otherwise noted.

INDUSTRY SECTOR	CANADIAN COMPANY		PARENT COMPANY				CALCULATION OF INVISIBLE R&D						
	NAME	SALES (\$M Cdn.)	NAME & NATIONALITY	SALES (\$M U.S.)	R&D (\$M U.S.)	INTENSITY $\frac{R}{S}$	CANADIAN NATIONAL R&D OF SAMPLE	MULTIPLIER TO UNIVERSE	TOTAL CDN. NATIONAL R&D OF SECTOR	ACTUAL CANADIAN R&D	IMPORTED R&D	PAYMENTS TO NON-RESIDENTS	INVISIBLE R&D (\$M Cdn.)
	$S_c^1$		$S_p^2$	$R_p^2$	$I = R_p/S_p$	$R_{not} = I \times S_c$	K	$R_{not} = K \times R_{not}$	$R_{edn}^3$	$R_{imp} = R_{not} - R_{edn}$	$R_{pay}^4$	$R_{inv} = R_{imp} - R_{pay}$	
Mining	Asbestos Corp.	85	General Dynamics (US)	2,160	20.9	0.97	0.82						
	Cdn. Johns-Manville	223	Johns-Manville (US)	1,107	24.4	2.20	4.92						
	Falconbridge Nickel	429	Superior Oil (US)	382 <sup>7</sup>	3.1 <sup>10</sup>	0.81	4.28						
	McIntyre Mines	98	Continental Oil (US)	7,254	37.8	0.52	1.19						
	Hudson Bay Oil & Gas	229	Int'l. Minerals & Chemical (US)	1,303	10.7	0.82	1.11						
	Quebec Iron & Titanium	200 <sup>12</sup>	Kenecott Copper (US)	769	12.3	1.60	3.20						
	Pio Algon Mines	367	Rio Tinto Zinc (UK)	2,630 <sup>6</sup>	11.8 <sup>5,11</sup>	0.45	2.63						
	Indal	219	Newmont Mining (US)	517 <sup>7</sup>	11.2 <sup>10,14</sup>	2.17	5.94						
	Sherritt-Gordon	191					24.09	4.00	96.4	37.1	59.3	12.7	46.6
	Cassiar Asbestos	81											
	2,239												
Petroleum	PP Canada	550	British Petroleum (UK)	17,286 <sup>6</sup>	50.0 <sup>5</sup>	0.29	1.59						
	Gulf Oil Canada	1,701	Gulf Oil (US)	14,268	62.0	0.43	7.39						
	Imperial Oil	4,110	Exxon (US) <sup>14</sup>	44,865	187.0	0.42	17.13						
	Shell Canada	1,868	Shell Oil (US)	8,143	76.2	0.94	17.48						
	Sun Oil Canada	315	Sun Oil (US)	4,389	23.5	0.54	1.69						
	Texaco Canada	865	Texaco (US)	24,508	50.0	0.20	1.76						
		9,409					47.06	1.22	57.4	49.0	8.4	17.2	(8.8)
Food, Beverages, Tobacco	Borden Co.	150	Borden Inc. (US)	3,367	13.6	0.40	0.61						
	Campbell Soup	113	Campbell Soup (US)	1,546	12.7	0.82	0.93						
	Canadian Cannery	107	Del Monte (US)	1,297	9.0	0.70	0.75						
	Carnation	71	Carnation (US)	2,075	6.6	0.32	0.23						
	Christie, Brown & Co.	132	Nabisco (US)	1,971	9.3	0.47	0.62						
	Consolidated Food	202 <sup>8</sup>	Consolidated Food (US)	2,443	5.1	0.21	0.42						
	General Foods	317	General Foods (US)	3,675	31.3	0.85	2.70						
	General Mills	88	General Mills (US)	2,309	22.9	0.99	0.87						
	H.J. Heinz	119	H.J. Heinz (US)	1,663	8.2	0.49	0.59						
	Kellogg-Canada	78	Kellogg Co (US)	1,214	5.2	0.43	0.33						
	Kraft	321	Kraftco (US)	4,857	10.9	0.22	0.72						
	Quaker Oats	70	Quaker Oats (US)	1,389	16.9	1.22	0.85						
	Ralston-Purina	166	Ralston-Purina (US)	3,149	11.3	0.36	0.60						
	Standard Brands	280	Standard Brands (US)	1,945	9.0	0.46	1.30						
		2,214					11.52	3.73	43.0	10.3	32.7	11.7	21.0
Machinery, Transportation Equipment	Chrysler Canada	2,474	Chrysler Corp. (US)	11,598	199.0	1.72	42.44						
	Ford Motor	4,348	Ford Motor (US)	24,009	747.6	3.11	135.38						
	General Motors	4,335	General Motors (US)	35,725	1,113.9	3.12	135.16						
	Int. Harvester	735	Int. Harvester (US)	5,246	130.5	2.49	18.28						
	Pratt & Whitney	272	United Technologies (US)	3,878	323.7	8.35	22.70						
	12,164					353.96	1.37	484.9	17.4	467.5	71.9	395.6	
Electrical, Utilities, Transportation	Aviation Electric	36 <sup>5</sup>	Bendix Corp. (US)	2,590	83.9	3.24	1.17						
	Anglo-Canadian Tel	445											
	B.C. Telephone	361 <sup>5</sup>	GTE (US)	5,948	93.7	1.58	13.52						
	GTE Lenkurt	52											
	CGF	822	General Electric (US)	13,399	357.1	2.67	21.91						
	Honeywell	115	Honeywell (US)	2,760	164.2	5.95	6.84						
	IBM Canada	719 <sup>5</sup>	IRM (US)	14,437	946.0	6.55	47.11						
	Raytheon	12	Raytheon (US)	2,245	42.3	1.88	0.23						
	Westinghouse	452	Westinghouse (US)	5,863	130.0	2.22	10.02						
	Westcoast Trans.	417	Phillips Petroleum (US)	5,134	33.7	0.66	2.74						
	3,431					103.54	1.72	178.1	86.9	91.2	22.4	68.8	

TABLE 5 cont'd

All dollar figures are (\$M Cdn.) All data is 1975 unless otherwise noted.

INDUSTRY SECTOR	CANADIAN COMPANY		PARENT COMPANY				CALCULATION OF INVISIBLE R&D						
	NAME	SALES (\$M Cdn.)	NAME & NATIONALITY	SALES (\$M U.S.)	R&D (\$M U.S.)	INTENSITY $\frac{R}{S}$	CANADIAN	MULTIPLIER	TOTAL CDN.	ACTUAL	IMPORTED	PAYMENTS	INVISIBLE R&D
							NOTIONAL R&D OF SAMPLE	TO UNIVERSE	NGTIONAL R&D OF SECTOR	CANADIAN R&D	R&D	TO NON-RESIDENTS	(\$M Cdn.)
$S_c^1$	$S_p^2$	$R_p^2$	$I = R_p/S_p$	$R_{not} = I \times S_c$	K	$R_{not} = K \times R_{not}$	$R_{cdn}^3$	$R_{imp} = R_{not} - R_{cdn}$	$R_{pay}^4$	$R_{inv} = R_{imp} - R_{pay}$			
Rubber, Plastics, Chemicals	Bristol-Myers	124 <sup>5</sup>	Bristol-Myers (US)	1,828 <sup>6</sup>	63.0	3.45	4.27						
	CIL	595	ICI (UK)	6,884 <sup>6</sup>	250.9 <sup>5,11</sup>	3.64	21.69						
	Dow Chemical	337	Dow Chemical (US)	4,888	167.4	3.92	11.54						
	Du Pont	410 <sup>9</sup>	Du Pont (US)	7,222 <sup>10</sup>	335.7 <sup>10</sup>	4.65	19.06						
	F.W. Horner	19 <sup>9</sup>	Carter-Wallace (US)	182 <sup>10</sup>	7.2 <sup>10</sup>	3.96	0.75						
	B.F. Goodrich	151	B.F. Goodrich (US)	1,901	41.8	2.20	3.32						
	Goodyear	329	Goodyear (US)	5,452 <sup>6</sup>	117.7 <sup>5,11</sup>	2.16	7.10						
	Lever Bros.	266	Unilever (UK)	15,016 <sup>6</sup>	176.3 <sup>5,11</sup>	1.17	3.12						
	Merck, Sharpe, Dohme	28 <sup>5</sup>	Merck (US)	1,490	124.5	8.36	2.33						
	Monsanto	145	Monsanto (US)	3,625	115.7	3.19	4.63						
	Proctor & Gamble	314 <sup>5</sup>	Proctor & Gamble (US)	6,082	123.4	2.02	6.37						
	Sherwin-Williams	56 <sup>5</sup>	Sherwin-Williams (US)	867	25.2	2.91	1.63						
	Union Carbide	378	Union Carbide (US)	5,665	120.2	2.12	8.02						
	Uniroyal	212	Uniroyal (US)	2,188	57.0	2.61	5.52						
		3,364					99.35	1.69	167.9	58.4	109.5	53.6	55.9
Metal Fabricating	American Can	230 <sup>15</sup>	American Can (US)	2,870	33.9	1.18	2.72						
	Babcock & Wilcox	103	Babcock & Wilcox (US)	1,565	23.9	1.53	1.57						
	Black & Decker	54	Black & Decker (US)	645 <sup>18</sup>	13.1 <sup>18</sup>	2.03	1.10						
	Combustion Engineering-Superheater	82 <sup>16</sup>	Combustion Engineering (US)	1,711 <sup>18</sup>	29.1 <sup>18</sup>	1.70	1.39						
	Continental Group Canada	264	Continental Group (US)	3,101 <sup>18</sup>	40.5 <sup>18</sup>	1.31	3.45						
	Foster Wheeler	47 <sup>16</sup>	Foster Wheeler (US)	1,021	5.1	0.50	0.23						
	Gillette Canada	42 <sup>16</sup>	Gillette (US)	1,407	31.6	2.24	0.94						
	Horton CBI	22 <sup>16</sup>	Chicago Bridge & Iron (US)	564	3.3	0.59	0.13						
	Koppers Int.	24 <sup>16</sup>	Koppers Co. (US)	1,075	8.6	0.80	0.19						
	Litton Systems	52 <sup>16</sup>	Litton Industries (US)	3,430	53.9	1.57	0.82						
	Research-Cottrell Canada	22	Research-Cottrell (US)	224	1.9	0.85	0.19						
	Stanley Works	21 <sup>16</sup>	The Stanley Works (US)	465	3.5	0.75	0.16						
						12.69	2.99	38.5	3.8	34.7	12.6	22.1	
Paper & Allied	Addressograph-Multigraph Canada	33 <sup>16</sup>	Addressograph-Multigraph (US)	584	18.4	3.15	1.04						
	Canadian International Paper	735 <sup>8</sup>	Canadian International Paper (US)	3,081	16.5	0.54	3.93						
	Crown Zellerbach	296 <sup>16</sup>	Crown Zellerbach (US)	1,767	8.0	0.45	1.34						
	Dennison Mfg. Canada	16 <sup>16</sup>	Dennison Mfg. (US)	245	4.5	1.84	0.29						
	Masonite Canada	45 <sup>16</sup>	Masonite (US)	288	1.6	0.56	0.25						
	Rayonier Canada	105	ITT (US)	11,368	219.0	1.93	2.02						
	Scott Paper	85 <sup>12</sup>	Scott Paper (US)	1,192	24.2	2.03	1.73						
	Spruce Falls Paper & Paper	80 <sup>12</sup>	Kimberly-Clark (US)	1,484	19.6	1.32	1.06						
	Weyerhaeuser Canada	123 <sup>17</sup>	Weyerhaeuser (US)	2,421	22.9	0.95	1.16						
						12.62	2.23	28.6	10.9	17.7	7.7	10.0	

TABLE 5 cont'd

GENERAL NOTES AND SOURCES OF DATA

- (1) "2+2", Canadian Business, July 1976.
- (2) "Where Private Industry Puts its Research Money," Business Week, 28 June 1976.
- (3) Statistics Canada, unpublished Science Statistics Centre data. (See details in "Notes to Statistical Tables", attached.)
- (4) Statistics Canada, unpublished CALURA listing. (See derivation in "Notes to Statistical Tables", attached. Data is 1974.
- (5) The Financial Post Information Service.
- (6) "Directory of the 500 Largest Industrial Corporations Outside the US," Fortune, August 1976.
- (7) "Directory of the 500 Largest U.S. Industrial Corporations," Fortune, May 1976.
- (8) Estimate. Based on mean of 1974 and 1976 sales.
- (9) Summary sheet of companies receiving R&D letter, prepared by MOSST. Data is 1974.
- (10) Corporate 10K Report filed with U.S. Securities & Exchange Commission.
- (11) Based on exchange rate for 1975 of \$2.26 (Cdn.) = £ 1 (UK). Source: Bank of Canada.
- (12) The Blue Book of Canadian Business, Canadian Newspaper Services International Ltd., Toronto, 1976.
- (13) R&D for parent (Royal Dutch/Shell Group) not available. U.S. affiliate taken as approximation.
- (14) Includes exploration
- (15) American Can Company of Canada.
- (16) The Financial Post Survey of Industrials, 1977.
- (17) Weyerhaeuser Canada Limited.
- (18) "What 600 Companies Spend for Research", Business Week, 27 June 1977. Figures are derived from 1976 figures and percentage change over 1975.

TABLE 6

## CALCULATION OF INVISIBLE R&amp;D 1974

All dollar figures are (\$M Cdn.) All data is 1974 unless otherwise noted.

INDUSTRY SECTOR	CANADIAN COMPANY		PARENT COMPANY				CALCULATION OF INVISIBLE R&D						
	NAME	SALES (\$M Cdn.)	NAME & NATIONALITY	SALES (\$M U.S.)	R&D (\$M U.S.)	INTENSITY = $\frac{R}{S}$	CANADIAN NOTIONAL R&D OF SAMPLE	MULTIPLIER TO UNIVERSE	TOTAL CDN. NOTIONAL R&D OF SECTOR	ACTUAL CANADIAN R&D	IMPORTED R&D	PAYMENTS TO NON-RESIDENTS	INVISIBLE R&D (\$M Cdn.)
		$S_c$		$S_p$	$R_p$	$I = R_p/S_p$	$R_{not} = I \times S_c$	K	$R_{not} = K \times R_{not}$	$R_{cdn}$	$R_{imp} = R_{not} - R_{cdn}$	$R_{pay}$	$R_{inv} = R_{not} - R_{pay}$
Mining	Asbestos Corp.	108	General Dynamics (US)	1,969	20.6	1.04	1.13						
	Cdn. Johns-Manville	192	Johns-Manville (US)	1,105	18.8	1.70	3.27						
	Falconbridge Nickel	458 <sub>5</sub>	Superior Oil (US)	332 <sup>10</sup>	3.5 <sup>9</sup>	1.05	5.40						
	McIntyre Mines	54											
	Hudson Bay Oil & Gas	183	Continental Oil (US)	7,043	35.3	0.50	0.92						
	Int. Minerals & Chemical	72 <sup>5</sup>	Int. Minerals & Chemical (US)	853	3.7	0.43	0.21						
	Quebec Iron & Titanium	200 <sup>12</sup>	Kennecott Copper (US)	1,134	10.5	0.93	1.85						
	Pio Algon Mines	391											
	Indal	188	Rio Tinto Zinc (UK)	2,724 <sup>7</sup>	9.4 <sup>6,11</sup>	0.35	2.00						
	Sherritt-Gordon	193	Newmont Mining (US)	548 <sup>10</sup>	15.0 <sup>9,14</sup>	2.74	6.76						
Cassiar Asbestos	54						21.64	3.71	804.3	29.7	50.6	11.7	38.9
		2,093											
Petroleum	BP Canada	446	British Petroleum (UK)	18,269 <sup>7</sup>	43.5 <sup>6,11,13</sup>	0.24	1.06						
	Gulf Oil Canada	1,477	Gulf Oil (US)	16,457	54.0	0.33	4.85						
	Imperial Oil	3,713	Exxon (US)	42,245	174.0	0.41	15.29						
	Shell Canada	1,602	Shell Oil (US) <sup>15</sup>	7,632	77.7	1.02	16.31						
	Sun Oil Canada	269	Sun Oil (US)	3,800	22.2	0.58	1.57						
	Texaco Canada	754	Texaco (US)	23,430	39.0	0.17	1.25						
			8,261				40.33	1.21	48.8	45.4	3.4	11.9	(8.5)
Food, Beverages, Tobacco	Forden Co.	144 <sup>5</sup>	Forden Inc. (US)	3,266	11.8	0.36	0.52						
	Campbell Soup	100 <sub>5</sub>	Campbell Soup (US)	1,468	12.7	0.87	0.87						
	Canadian Cannery	86 <sub>5</sub>	Del Monte (US)	1,042	7.5	0.72	0.62						
	Carnation	56 <sub>5</sub>	Carnation (US)	1,886	5.6	0.30	0.17						
	Christie, Brown & Co.	109	Nabisco (US)	1,793	7.3	0.41	0.44						
	Consolidated Food	186	Consolidated Food (US)	2,281	3.8	0.17	0.31						
	General Foods	248 <sub>5</sub>	General Foods (US)	2,788	27.8	1.00	2.47						
	General Mills	74 <sub>5</sub>	General Mills (US)	2,000	21.6	1.08	0.80						
	H.J. Heinz	95	H.J. Heinz (US)	1,439	7.5	0.52	0.50						
	Kellogg-Salada	67	Kellogg Co. (US)	1,010	4.8	0.48	0.32						
	Kraft	281	Kraftco (US)	4,472	9.9	0.22	0.62						
	Quaker Oats	59	Quaker Oats (US)	1,227	15.4	0.13	0.74						
	Ralston-Purina	156	Ralston-Purina (US)	3,072	11.0	0.36	0.56						
	Standard Brands	252	Standard Brands (US)	1,776	7.6	0.43	1.08						
			1,913				10.02	3.77	37.8	8.5	29.3	8.2	21.1
Machinery, Transportation Equipment	Chrysler Canada	1,929	Chrysler Corp. (US)	10,859	238.9	2.20	42.43						
	Ford Motor	4,259	Ford Motor (US)	23,631	825.2	3.49	148.73						
	General Motors	3,614	General Motors (US)	31,559	125.2	3.57	128.85						
	Int. Harvester	566	Int. Harvester (US)	4,968	119.7	2.41	13.64						
	United Aircraft	150	United Technologies (US)	3,328	298.3	8.96	13.44						
		10,518				347.09	1.43	496.3	22.7	473.6	56.3	417.3	
Electrical, Utilities, Transportation	Aviation Electric	29 <sup>6</sup>	Bendix Corp. (US)	2,464	76.3	3.10	0.90						
	Anglo-Canadian Tel.	374											
	B.C. Telephone	303 <sub>6</sub>	GTE (US)	5,659	96.7	1.71	12.20						
	GTE Lenkurt	37											
	CGE	710	General Electric (US)	13,412	351.8	2.62	18.62						
	Poneywell	101	Poneywell (US)	2,626	170.2	6.48	6.55						
	IBM Canada	668 <sub>6</sub>	IBM (US)	12,675	889.9	7.02	46.90						
	Raytheon	9	Raytheon (US)	1,928	41.6	2.15	0.19						
	Westinghouse	403	Westinghouse (US)	5,799	137.0	2.36	9.52						
	Westcoast Trans.	257	Phillips Petroleum (US)	4,980	25.8	0.54	1.44						
		2,901				96.32	1.78	171.4	65.6	105.8	26.9	78.9	

TABLE 6 cont'd

All dollar figures are (\$M Cdn.) All data is 1974 unless otherwise noted.

INDUSTRY SECTOR	CANADIAN COMPANY		PARENT COMPANY				CALCULATION OF INVISIBLE R&D							
	NAME	SALES (\$M Cdn.)	NAME & NATIONALITY	SALES (\$M U.S.)	R&D (\$M U.S.)	INTENSITY =	CANADIAN NOTIONAL R&D OF SAMPLE	MULTIPLIER TO UNIVERSE	TOTAL CDN. NOTIONAL R&D OF SECTOR	ACTUAL CANADIAN R&D	IMPORTED R&D	PAYMENTS TO NON-RESIDENTS	INVISIBLE R&D (\$M Cdn.)	
														$S_c$
Rubber, Plastics, Chemicals	Bristol-Myers	106 <sup>6</sup>	Bristol-Myers (US)	1,591	55.0	3.46	3.66							
	CIL	518	ICI (UK)	6,912	199.2 <sup>6,11</sup>	2.88	14.93							
	Dow Chemical	314	Dow Chemical (US)	4,937	148.7	3.01	9.45							
	Du Pont	368	Du Pont (US)	6,911	334.0 <sup>9</sup>	4.83	17.77							
	F.W. Horner	19 <sup>8</sup>	Carter-Wallace (US)	169	8.5 <sup>9</sup>	5.62	1.07							
	B.F. Goodrich	164	B.F. Goodrich (US)	1,966	39.6	2.02	3.31							
	Goodyear	281	Goodyear (US)	5,257	114.9	2.19	6.15							
	Lever Bros.	233	Unilever (UK)	13,667	144.3 <sup>6,11</sup>	1.06	2.46							
	Merck, Sharpe, Dohme	24 <sup>6</sup>	Merck (US)	1,330	103.4	7.77	1.86							
	Monsanto	134	Monsanto (US)	3,499	87.2	2.49	3.34							
	Proctor & Gamble	216 <sup>6</sup>	Proctor & Gamble (US)	4,913	109.2	2.22	4.79							
	Sherwin-Williams	50 <sup>6</sup>	Sherwin-Williams (US)	802	23.0	2.87	1.44							
	Union Carbide	341	Union Carbide (US)	5,319	94.2	1.77	6.04							
	Uniroyal	203	Uniroyal (US)	2,301	58.0	2.52	5.12							
			2,971				81.39	1.92	156.3	49.6	106.7	49.6	57.1	
	Metal Fabricating	American Can	213 <sup>16</sup>	American Can (US)	2,657	34.3	1.29	2.75						
		Eabcock & Wilcox	64 <sup>17</sup>	Eabcock & Wilcox (US)	1,278	21.8	1.71	1.09						
Black & Decker		45 <sup>18</sup>	Black & Decker (US)	642	12.5	1.95	0.88							
Foster Wheeler		40 <sup>17</sup>	Foster Wheeler (US)	876	3.3	0.38	0.15							
Gillette Canada		32 <sup>17</sup>	Gillette (US)	1,246	29.2	2.34	0.75							
Horton CSI		29 <sup>18</sup>	Chicago Bridge & Iron (US)	466	3.7	0.79	0.23							
Koppers Int.		24 <sup>18</sup>	Koppers Co. (US)	914	6.7	0.73	0.18							
Litton Systems		41 <sup>17</sup>	Litton Industries (US)	3,956	46.7	1.18	0.52							
Research-Cottrell		7 <sup>18</sup>	Research-Cottrell (US)	165	1.6	0.97	0.07							
Lansda							0.13							
Stanley Works		19 <sup>18</sup>	The Stanley Works (US)	487	3.4	0.70	6.75	5.15	34.8	3.4	31.4	10.7	20.7	
Paper & Allied	Addressograph-Multigraph Canada	29 <sup>12</sup>	Addressograph-Multigraph (US)	541	20.0	3.70	1.07							
	Canadian International Paper	720 <sup>19</sup>	International Paper (US)	3,041	15.7	0.52	3.72							
	Crown Zellerbach	343 <sup>18</sup>	Crown Zellerbach (US)	1,770	6.7	0.39	1.34							
	Masonite Canada	40	Masonite (US)	356	2.4	0.67	0.27							
	Rayonier Canada	142	ITT (US)	11,156	195.0	1.75	2.48							
	Scott Paper	74 <sup>20</sup>	Scott Paper (US)	1,110	23.0	2.09	1.53							
	Weyerhaeuser Canada	146 <sup>20</sup>	Weyerhaeuser (US)	2,529	21.8	0.86	1.26	2.38	27.8	7.1	20.7	9.7	11.0	
						11.67								

TABLE 6 cont'd

GENERAL NOTES AND SOURCES OF DATA

- (1) "The Top 200", Canadian Business, July 1975.
- (2) "Where Private Industry Puts its Research Money," Business Week, 28 June 1976. Figures are derived from 1975 amounts and percentage change over 1974.
- (3) Statistics Canada, unpublished Science Statistics Centre data. (See details in "Notes to Statistical Tables", attached.)
- (4) Statistica Canada, unpublished CALURA listing. (See derivation in "Notes to Statistical Tables", attached.)
- (5) "2+2", Canadian Business, July 1976. Figure derived from 1975 amounts and percentage change over 1974.
- (6) The Financial Post Information Service.
- (7) "Directory of the 300 Largest Industrial Corporations Outside the U.S.," Fortune, August 1975.
- (8) Summary sheet of companies receiving R&D letter, prepared by MOSST.
- (9) Corporate 10K Report, filed with U.S. Securities & Exchange Commission.
- (10) "Directory of the 500 Largest Industrial Corporations," Fortune, May 1975.
- (11) Based on exchange rate for 1974 of \$2.29 (Cdn.) = £ 1 (UK).
- (12) The Blue Book of Canadian Business, Canadian Newspaper Services International Ltd., Toronto, 1976.
- (13) R&D reported for 1974 in 1974 Annual Report is \$47 million, while in 1975 Annual Report the 1974 R&D is stated to have been \$40 million. The mean of these figures is used.
- (14) Includes exploration.
- (15) R&D figures for parent (Royal Dutch/Shell) not available. U.S. affiliate taken as approximation.
- (16) American Can Company of Canada.
- (17) Consumer and Corporate Affairs, Bureau of Corporate Affairs Bulletin, February 1976.
- (18) The Financial Post Survey of Industrials 1977.
- (19) International Paper Company, 1974 Annual Report.
- (20) Weyerhaeuser Canada Limited.

## VIII

NOTES TO STATISTICAL TABLES

The following notes are arranged in the order in which they appear in the columns of the main tables on pages 11-19.

<u>Page</u>	<u>Description of Notes</u>
21-23	Sample Canadian Companies
24	Calculation of Multipliers to Universe
27	Calculation of Actual Canadian R&D
28	Calculation of Payments to Non-Residents
31	Correlation Between Statistical Aggregation Methods



SAMPLE CANADIAN COMPANIES

<u>Canadian Company</u>	<u>Parent</u>	<u>% Ownership</u> <sup>1</sup>
<u>Mining</u>		
Abestos Corp.	General Dynamics (US)	N/A
Canadian Johns-Manville	Johns-Manville (US)	100.0
Falconbridge Nickel Mines	Superior Oil (US)	15.0
McIntyre Mines	Superior Oil (US)	40.5 <sup>2</sup>
Hudson Bay Oil & Gas	Continental Oil (US)	N/A
Quebec Iron & Titanium	Kennecott Copper (US)	66.7 <sup>3</sup>
Rio Algom Mines	Rio Tinto Zinc (UK)	51.3
Indal	Rio Tinto Zinc (UK)	59.0
Sherritt-Gordon Mines	Newmont Mining (US)	39.7
Cassiar Asbestos	Newmont Mining (US)	N/A
<u>Petroleum</u>		
BP Canada	British Petroleum (UK)	65.5
Gulf Oil Canada	Gulf Oil (US)	68.3
Imperial Oil	Exxon (US)	69.6
Shell Canada	Royal Dutch/Shell Group (UK/Neth)	71.0
Sun Oil Canada	Sun Co. (US)	100.0
Texaco Canada	Texaco (US)	68.2
<u>Food, Beverages, Tobacco</u>		
Borden Co.	Borden Inc. (US)	100.0
Campbell Soup	Campbell Soup (US)	100.0
Canadian Cannery	Del Monte (US)	99.2
Carnation	Carnation (US)	N/A
Christie, Brown, & Co.	Nabisco (US)	100.0
Consolidated Foods	Consolidated Foods (US)	100.0
General Foods	General Foods (US)	100.0
General Mills	General Mills (US)	100.0
H.J. Heinz	H.J. Heinz (US)	100.0
Kellogg-Salada	Kellogg Co. (US)	100.0
Quaker Oats	Quaker Oats (US)	N/A
Ralston-Purina	Ralston-Purina (US)	100.0
Standard Brands	Standard Brands (US)	100.0
<u>Machinery Transportation Equipment</u>		
Chrysler	Chrysler (US)	100.0
Food Motor	Food Motor (US)	88.1
General Motors	General Motors (US)	100.0
International Harvester	International Harvester (US)	100.0
Pratt & Whitney	United Technologies (US)	100.0

### Electrical, Utilities, Transportation

Aviation Electric	Bendix Corp. (US)	N/A
Anglo-Canadian Telephone	GTE (US)	86.4
B.C. Telephone	GTE (US)	N/A
GTE Lenkurt	GTE (US)	N/A
CGE	General Electric (US)	91.9
Honeywell	Honeywell (US)	N/A
IBM Canada	IBM (US)	100.0
Raytheon	Raytheon (US)	N/A
Westinghouse	Westinghouse (US)	93.3
Westcoast Transmission	Philip Petroleum (US)	16.5

### Rubber, Plastics, Chemicals

Bristol-Myers	Bristol-Myers (US)	100.0
CIL	ICI (UK)	73.4
Dow Chemical	Dow Chemical (US)	100.0
du Pont	du Pont (US)	74.9
B.F. Goodrich	B.F. Goodrich (US)	100.0
Goodyear	Goodyear (US)	88.0
Lever Brothers	Unilever (UK)	100.0
Merck, Sharpe, Dohme	Merck (US)	N/A
Proctor & Gamble	Proctor & Gamble (US)	100.0
Sherwin-Williams	Sherwin-Williams (US)	74.0 <sup>3</sup>
Union Carbide	Union Carbide (US)	75.0
Uniroyal	Uniroyal (US)	100.0

### Metal Fabricating

American Can	American Can (US)	98.0 <sup>4</sup>
Babcock & Wilcox	Babcock & Wilcox (US)	100.0 <sup>4</sup>
Black & Decker	Black & Decker Mfg. (US)	99.8 <sup>4</sup>
Combustion Engineering - Superheater	Combustion Engineering (US)	100.0 <sup>4</sup>
Continental Group Canada	Continental Group (US)	100.0 <sup>4</sup>
Foster Wheeler	Foster Wheeler (US)	100.0 <sup>4</sup>
Gillette Canada	Gillette (US)	97.5 <sup>4</sup>
Horton CBI	Chicago Bridge & Iron (US)	99.9 <sup>4</sup>
Koppers International	Koppers Co., Inc. (US)	99.9 <sup>4</sup>
Litton Systems Canada	Litton Industries (US)	100.0 <sup>4</sup>
Research Cottrell Canada	Research-Cottrell (US)	100.0 <sup>4</sup>
Stanley Works	The Stanley Works (US)	100.0 <sup>4</sup>

### Paper & Allied

Addressograph -	Addressograph -	
Multigraph Canada	Multigraph (US)	100.0 <sup>4</sup>
Canadian International Paper	International Paper (US)	100.0
Crown Zellerbach	Crown Zellerbach (US)	88.0
Dennison Mfg. Canada	Dennison Mfg. (US)	99.7 <sup>4</sup>
Masonite Canada	Masonite (US)	N/A
Rayonier Canada	ITT (US)	99.9
Scott Paper	Scott Paper (US)	54.6 <sup>4</sup>
Spruce Falls Power & Paper	Kimberly-Clark (US)	54.1 <sup>4</sup>
Weyerhaeuser Canada	Weyerhaeuser (US)	100.0 <sup>4</sup>

### Sources of Data

- (1) "The Top 200 Industries, "The Financial Post 300, Summer, 1977.
- (2) Corporate 10-k Report filed with U.S. Securities & Exchange Commission
- (3) The Blue Book of Canadian Business, Canadian Newspaper Services International Ltd., Toronto, 1976
- (4) Inter-Corporate Ownership 1975, Statistics Canada, Cat. No. 61-517 Occasional.

### Notes on Composition of Industry Groups

Hudson Bay Oil & Gas is included in "Mining" to reflect the company's concentration in petroleum exploration and extraction, not in refining and marketing. Business Finance (CALURA) and the Science Statistics Centre, both of Statistics Canada, include gas and oil wells with mining.

Utilities and Transportation are included with Electrical so that all subsidiaries of GTE (USA) can be aggregated in one industry grouping.

## CALCULATION OF MULTIPLIERS TO UNIVERSE

For each year, the sample companies' notional R&D ( $R_{not}$ ) is extrapolated to the total sector on the basis of sales. That is, it is assumed that the combined notional R&D of all foreign-controlled companies in each industry sector is a multiple of the combined notional R&D of the sample (foreign-controlled) companies in that sector by a factor based on the ratio of sales. This factor is termed the "multiplier to universe" denoted as "K", and is determined by dividing the total sales of the sample companies into the total sales of all foreign-controlled companies in that sector. The former quantity is derived simply by summing the sample companies' sales figures. The latter quantity is taken from Statistics Canada CALURA figures.

At the time of this study, the most recent CALURA data available was 1974 and 1975, taken from CALURA Part 1 (corporations), 1974-75, page 148. To determine K values for 1976, 1975 sales were determined for the companies used in the 1976 sample, and were divided into CALURA total sector sales for 1975.

Consideration was given to projecting the 1975 CALURA data to 1976, for comparison with the companies' 1976 sales, but this notion was discarded because of the inaccuracy that would result from projecting all sectors equally with a single aggregate growth rate, and because of the unavailability of growth rates for each individual sector.

What follows is the derivation of K for each of the years 1974, 1975 and 1976.

TABLE 7

## CALCULATION OF MULTIPLIER TO UNIVERSE

(\$ millions Can.)

Sector			1974 Sample		1975 Sample		1976 Sample				
Name	1975 Sales	1974 Sales	Name	Companies' 1974 Sales	Multiplier to Universe	Companies' 1975 Sales	Multiplier to Universe	Companies' 1976 Sales	Multiplier to Universe		
Mining	9,062	7,774	Asbeston Corp.	108		85		85			
			Cdn. Johns-Manville	192		223		223			
			Falconbridge Nickel	458		429		429			
			McIntyre Mines	54		98		98			
			Hudson Bay Oil & Gas	183		229		229			
			Intl. Minerals & Chem.	72		135		-			
			Quebec Iron & Titanium	200		200		200			
			Rio Algom Mines	391		367		367			
			Indal	188		219		219			
			Sherritt-Gordon Mines	193		191		191			
			Cnsstar Asbestos	54		83		83			
						<u>2,093</u>	3.71	<u>2,259</u>	4.00	<u>2,124</u>	4.26
			Petroleum	11,475	10,020	BP Canada	446		550		550
Gulf Oil Canada	1,477					1,701		1,701			
Imperial Oil	3,713					4,110		4,110			
Shell Oil	1,602					1,868		1,868			
Sun Oil	269					315		315			
Texaco	754					865		865			
	<u>8,261</u>	1.21				<u>9,409</u>	1.22	<u>9,409</u>	1.22		
Food, Beverages, Tobacco	8,261	7,214	Borden	144		150		150			
			Campbell Soup	100		113		113			
			Canadian Cannery	86		107		107			
			Carnation	56		71		-			
			Christie Brown & Co.	109		132		132			
			Consolidated Foods	186		202		202			
			General Foods	248		317		317			
			General Mills	74		88		88			
			H.J. Heinz	95		119		119			
			Kellogg-Salada	67		78		78			
			Kraft	281		321		321			
			Quaker Oats	59		70		70			
			Kalston-Purina	156		166		166			
			Standard Brands	252		280		280			
				<u>1,913</u>	3.77	<u>2,214</u>	3.73	<u>2,143</u>	3.85		
Machinery, Transportation Equipment	16,771	15,083	Chrysler	1,929		2,474		2,474			
			Ford	4,259		4,438		4,438			
			General Motors	3,614		4,335		4,335			
			International Harvester	566		735		735			
			United Aircraft	150		272		272			
				<u>10,518</u>	1.43	<u>12,254</u>	1.37	<u>12,254</u>	1.37		
Electrical, Utilities, Transportation	5,904	5,168	Aviation Electric	29		36		36			
			Anglo-Canadian Tel.	374		445		445			
			B.C. Telephone	303		361		361			
			GTE Lenkurt	37		52		52			
			CCE	710		822		822			
			Honeywell	101		115		115			
			IBM Canada	668		719		719			
			Raytheon	9		12		12			
			Westinghouse	403		452		452			
			Westcoast Trans-mission	267		417		417			
				<u>5,292</u>	1.78	<u>5,431</u>	1.72	<u>5,431</u>	1.72		
Rubber, Plastics, Chemicals	6,343	5,691	Bristol-Myers	106		124		124			
			CIL	518		595		595			
			Dow Chemical	314		337		337			
			DuPont	368		410		410			
			R.F. Goodrich	164		151		151			
			Goodyear	281		329		329			
			F.W. Horner	19		19		19			
			Lever Brothers	233		266		266			
			Merck, Sharpe, & Dohme	24		28		28			
			Nonsauto Canada	134		145		145			
			Procter & Gamble	216		314		314			
			Sherwin-Williams	50		56		56			
			Union Carbide	341		378		378			
			Uniroyl	203		212		212			
	<u>2,971</u>	1.92	<u>3,364</u>	1.69	<u>3,364</u>	1.69					

TABLE 7 cont'd

(\$ millions Cdn.)

Sector			Selected Companies		1974 Sample		1975 Sample		1976 Sample		
Name	1975 Sales	1974 Sales	Name	Companies' 1974 Sales	Multiplier to Universe	Companies' 1975 Sales	Multiplier to Universe	Companies' 1976 Sales	Multiplier to Universe		
Metal Fabricating	2,884	2,661	American Can	213		230		230			
			Babcock & Wilcox	64		103		103			
			Black & Decker	45		54		54			
			Combustion Engineering - Superheater	-		82		82			
			Continental Group of Canada	-		264		264			
			Foster Wheeler	40		47		-			
			Gillette Canada	32		42		42			
			Horton CBI	29		22		22			
			Koppers Int.	24		24		24			
			Litton Systems	44		52		52			
			Research - Cottrell Canada	7		22		22			
			Stanley Works	19		21		21			
						<u>517</u>	5.15	<u>963</u>	2.99	<u>916</u>	3.15
			Paper & Allied	3,385	3,561	Addressograph - Multigraph Canada	29		33		33
Canadian Int. Paper	720					735		735			
Crown Zellerbach Canada	343					296		296			
Dennison Mfg. Co. Canada	-					16		-			
Masonite Canada	40					45		45			
Rayonier Canada	142					105		105			
Scott Paper	74					85		85			
Spruce Falls Power & Paper	-					80		80			
Weyerhaeuser	146					123		123			
	<u>1,494</u>	2.38				<u>1,518</u>	2.23	<u>1,502</u>	2.25		

## CALCULATION OF ACTUAL CANADIAN R&D

Data for this item has been furnished from unpublished Statistics Canada material by the Science Statistics Centre. It is aggregated by industry groups as follows:

<u>Nominal Industry Sector(s)</u>	<u>Science Statistics Centre Groupings Aggregated to Correspond to Nominal Industry Sectors</u>
Mining	Mines Gas & Oil wells
Petroleum	Petroleum products
Food, Bev., Tobacco	Food, beverages, and tobacco
Machinery Transportation Equipment	Machinery and transportation equipment
Electrical, Utilities, Transportation	Electrical Transportation & other utilities
Rubber, Plastics, Chemical Products	Rubber and plastic products Drugs and medicines Other chemical products
Metal Fabricating	Metal Fabricating
Paper & Allied	Paper & Allied

The types of payments included in this data are current and capital intramural, and current extramural within Canada, R&D expenditures, excluding government grants and contracts, by foreign-controlled corporations. It should be remarked that capital intramural expenditures are included so that Canadian R&D figures will have a comparable base to U.S. expenditures obtained from Securities and Exchange Commission data, which include capital equipment depreciation. (This data comprises the bulk of this study's information on parent companies' R&D.) Similarly, government grants and contracts have been excluded from the Canadian figures because they are not included in the Securities and Exchange Commission material.

The data has been estimated by the Science Statistics Centre for 1974 and 1976 because some of the components are not captured for even-numbered years.

## CALCULATION OF PAYMENTS TO NON-RESIDENTS

Payments to non-residents for imported technology are taken from unpublished CALURA listings of "Payments to Non-Residents," by 34 major industry groups by 27 types of payments. The payments aggregated to reflect payment for all types of technology are:

<u>CALURA No.</u>	<u>Type of Payment</u>
9	Patents of Invention
10	Industrial Design
12	Other Royalties and similar Payments
15	Scientific Research
16	Product and Process Development Research

The industry groups aggregated for this study are:

<u>Industry Sector (s)</u>	<u>CALURA Groups and SIC Classes (1960)</u>
Mining	Total Mining (051-099)
Petroleum	Petroleum & Coal Products (365-369)
Food, Bev., Tobacco	Food (101-139) Beverages (141-147) Tobacco Products (161-169)
Machinery, Trans. Equip.	Machinery (311-318) Transportation Equipment (321-329)
Electrical, Utilities, Transportation	Electrical Products (331-339) Public Utilities (572-579) Transportation (501-519)
Rubber, Plastics, Chemicals	Rubber Products (161-169) Chemicals & Chemical Products (371-379)
Metal Fabricating	Metal Fabricating (301-309)
Paper & Allied	Paper & Allied (271-274)

The most recent CALURA material available at this writing is for 1975. Therefore, this has been used in the invisible R&D calculations for 1976 and 1975, while 1974 CALURA data has been used in the calculations for 1974.

The derivation of payments to non-residents by foreign-controlled companies is shown on the following page.



TABLE 8

1975 Payments to Non-Residents for Technology  
(\$ millions Cdn.)

Sector	Payments by All Companies	-	Payments by Canadian- Controlled Companies	=	Payments by Foreign- Controlled Companies
Mining	14.3		1.6		12.7
Petroleum	17.3		0.1		17.2
Food, Bev., Tobacco	14.4		2.7		11.7
Machinery, Transportation Equip.	74.8		2.9		71.9
Electrical, Utilities, Transportation	28.3		5.9		22.4
Rubber, Plastics, Chemicals	54.2		0.6		53.6
Metal Fabr.	13.5		0.9		12.6
Paper & Allied	8.6		0.9		7.7
Total Payments	225.4		15.6		209.8

TABLE 9

1974 Payments to Non-Residents for Technology  
(\$ millions Cdn.)

Sector	Payments by All Companies	-	Payments by Canadian- Controlled Companies	=	Payments by Foreign- Controlled Companies
Mining	13.4		1.7		11.7
Petroleum	11.9		0.0		11.9
Food, Bev., Tobacco	10.5		2.3		8.2
Machinery, Transportation Equip.	58.3		2.0		56.3
Electrical, Utilities, Transportation	30.5		3.6		26.9
Rubber, Plastics, Chemicals	50.3		0.7		49.6
Metal Fabr.	11.6		0.9		10.7
Paper & Allied	10.3		0.6		9.7
Total Payments	196.8		11.8		185.0

CORRELATION BETWEEN STATISTICAL AGGREGATION METHODS

<u>Quantity</u>	<u>SIC System</u>
Sector total sales *	1960
Actual Canadian R&D	1970
Payments to Foreigners	1960

Notes on discrepancies between systems

Mining	No discrepancies
Petroleum	No discrepancies
Food, Bev., Tobacco	No discrepancies
Machinery Transportation Equipment	1960 category 339 ("Miscellaneous Electrical Products") was split in 1970 to place computers into Office Machinery from Electrical Products. For this study, they have been returned to Electric Products for consistency.
Electrical Utilities Transportation	1960 category 527 ("Other Storage and Warehousing") was split in 1970, and part of it placed in 1970 Category 506 ("Moving & Storage, Used Goods, Uncrated"). This item is included in 1970 data but not in 1960 data. The amount is considered small.
Rubber, Plastics	No discrepancies
Chemical Products	No discrepancies
Metal Fabricating	No discrepancies
Paper & Allied	1960 Category 271 ("Pulp & Paper Mills") was split in 1970, and part of it placed into 1970 Category 031 ("Logging"). Also, 1960 Category 272 ("Asphalt Roofing Manufacturers") was split in 1970, and part of it placed into 1970 Category 399 ("Miscellaneous Manufacturing").

\* Used in computing the Multiplier to Universe, "K".

