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DATASTATS

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These tables have been prepared by the Science and Technology Economic Analysis Division of the Policy Sector of ISTC in Ottawa. As new data are received by the Division, the tables will be updated and distributed to the Administrator of each Local Area Network within ISTC as soon as possible.

If you notice any errors or discrepancies or if you have any suggestions or questions, please contact Adam Holbrook at (613) 954-3477.

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Table A - Canadian Economic Indicators, 1973 to 1988
 Last Updated: April 2, 1990

Year	GDP (\$ B)	GDP Deflator Index (1981 = 100)	Consumer Price Index (1981 = 100)	GDP	Trade Balance (\$ B 1981)	Domestic Product of Industry
1973	127.4	48.2	47.6	264.4	11.3	245.0
1974	152.1	55.1	52.8	276.0	3.6	254.0
1975	171.5	60.6	58.5	283.2	1.1	257.5
1976	197.9	65.8	62.9	300.6	2.4	273.0
1977	217.9	69.9	67.9	311.5	7.4	281.8
1978	241.6	74.2	73.9	325.8	12.7	290.6
1979	276.1	81.6	80.7	338.4	8.7	301.9
1980	309.9	90.2	88.9	343.4	7.1	307.4
1981	356.0	100.0	100.0	356.0	3.9	319.5
1982	374.4	108.7	110.8	344.5	15.9	307.9
1983	405.7	114.1	117.2	355.4	14.8	317.8
1984	444.7	117.7	122.3	377.9	18.0	336.9
1985	478.0	120.7	127.2	395.9	16.3	353.2
1986	504.6	123.6	132.4	408.1	13.5	364.5
1987	550.3	129.0	138.2	426.4	11.5	379.2
1988	601.5	134.3	143.8	447.8	6.9	395.9

Source: Bank of Canada, Bank of Canada Review, July 1989.

OBSERVATIONS:

- Canada's economy continued to grow at a fairly rapid pace in 1988.
- GDP increased by 9.3% in current terms and by 5.0% in constant dollars.
- The domestic product of industry in 1988 was \$395.9 billion, up 4.4% in real terms over the previous year's.
- Canada's balance of payments surplus of \$6.9 billion was, however, down 62% from its high of \$18 billion in 1984.

Table B - Employment Statistics
 Last Updated: April 2, 1990

Year	Civilian Labour Force	Employed	Unemployed as a Per Cent of Labour Force	Population	GDP Per Capita
	('000)		(%)	('000)	(1981 \$)
1975	9,974	9,284	6.9	22,569	12,548
1976	10,203	9,477	7.1	22,884	13,136
1977	10,500	9,651	8.1	23,158	13,451
1978	10,895	9,987	8.3	23,417	13,911
1979	11,231	10,395	7.4	23,645	14,310
1980	11,573	10,708	7.5	23,912	14,360
1981	11,899	11,001	7.5	24,221	14,698
1982	11,926	10,618	11.0	24,483	14,073
1983	12,109	10,675	11.8	24,706	14,387
1984	12,316	10,932	11.2	24,896	15,178
1985	12,532	11,221	10.5	25,090	15,778
1986	12,746	11,531	9.5	25,274	16,149
1987	13,001	11,861	8.8	25,493	16,726
1988	13,275	12,244	7.8	25,787	17,364

Source: Bank of Canada, Bank of Canada Review, July 1989.

OBSERVATIONS:

- Canada had a civilian labour force of 13.3 million in 1988, with 12.2 million or 92% employed.
- During the 1980s, the labour force has increased at almost twice the growth rate of the general population.
- The number of people employed has grown by more than 1.6 million since the 1982 recession, and the unemployment rate has declined from a high of almost 12% in 1983 to about 8% in 1988.
- In constant dollars, GDP per capita has increased 21% from \$14,360 in 1980 to \$17,364 in 1988.

Table C - Federal Expenditures on S&T by Department, 1989-1990*
 Last Updated: April 2, 1990

Department	R&D	RSA	Total S&T	Real Annual Growth Rates 1981 to 1989**
	(\$'000,000)			(%)
NRC	497	53	550	4.9
ENV	81	409	490	0.7
NSERC	347	44	391	4.9
EMR	149	213	362	2.0
AGR	300	38	338	1.9
CIDA	65	260	325	3.9
NDEF	291	4	295	6.9
STCAN	11	280	291	1.9
RIE	254	19	273	6.7
F&O	129	116	245	1.1
MRC	194	8	202	5.2
NHW	42	124	166	4.3
AECL	134	9	143	(1.0)
SSHRC	55	27	82	2.3
FOR***	68	8	76	..
COMM	59	6	65	(5.3)
Others	274	486	760	5.0
Totals	2,950	2,104	5,054	3.4

* Columns may not add due to rounding.

** Fiscal years 1980-81 to 1988-89 with negative figures shown in parentheses.

*** Expenditures for the Forestry program were included in Agriculture for the years 1982 to 1986 and for the earlier period in Environment.

Source: Statistics Canada, Federal Science Expenditures and Personnel, 1989-1990, June 1989.

OBSERVATIONS:

- Federal S&T expenditures will top \$5 billion for the first time in 1989-1990 with almost \$3 billion being spent on R&D.
- S&T expenditures are expected to amount to about 12% of the total non-statutory federal spending.
- The top S&T spenders include NRC, ENV, NSERC, EMR and AGR. These five together account for 42% of the total S&T expenditures.
- During the eighties, the departments with major expenditure growth include NDEF, RIE, MRC, NRC and NSERC.

Table D - Federal Expenditures on R&D and S&T by Application Area, 1989-1990
 Last Updated: April 2, 1990

R&D	S&T	Application
(\$'000,000)		
505	598	Advancement of Knowledge and Research Training
493	605	Agriculture, Fisheries and Forestry
456	534	Industrial Development
288	293	Defence
269	378	Health
214	276	Energy
154	551	Earth and Atmosphere
138	205	Transportation and Telecommunications
107	111	Space
57	133	Environmental Protection
57	681	Social Development
49	78	Urban and Regional Planning
66	325	Other
2,853	4,769	Total

Note: The above data do not include non-program costs.

Source: Statistics Canada, Services, Science and Technology Division.

OBSERVATIONS:

- Advancement of knowledge, agriculture, fisheries and forestry, and industrial development are the major areas of application for federally-supported R&D.
- These three areas will account for 51 per cent of total R&D expenditures in 1989-1990.
- Social development, on the other hand, is the major S&T application area, followed by agriculture, fisheries and forestry, and advancement of knowledge.
- Together, the top four will attract 40 per cent of all S&T expenditures.

Table E - Federal S&T Expenditure by Activity and by Performer, 1989-1990
Last Updated: April 2, 1990

Performer	Intra- mural	Ind'y	Univ.	Non- profit	Prov. & Mun.	Foreign	Other	Total
(\$'000,000)								
In-house R&D	1,056	..	..	..	..	..	..	1,056
R&D Grants	..	373	583	41	16	126	12	1,151
R&D Contracts	7	298	41	7	1	6	15	374
Research Fellow.	20	3	42	0	0	13	0	79
AEP (R&D)	104	..	..	..	..	..	..	104
Capital (R&D)	186	..	..	..	..	..	..	186
Total R&D	1,371	674	666	48	18	145	27	2,950
Data Collection	750	53	8	6	6	4	7	834
Info. Services	318	18	12	20	1	43	7	419
Econ. & Feas.	44	110	5	19	6	19	9	212
Oper. & Policy	91	12	1	5	0	12	1	122
Test & Standard	45	3	1	1	0	1	0	51
Museum Services	156	..	..	..	..	..	0	156
Ed. Support	2	3	115	5	0	21	1	146
AEP (RSA)	36	..	..	..	..	..	..	36
Capital (RSA)	128	..	..	..	..	..	..	128
Total RSA	1,570	198	142	57	12	100	26	2,104
Total Activities	2,942	872	808	105	30	244	53	5,054

Notes: AEP = Administration of contracts and grants to industry, universities, etc.
0 < \$500,000 but greater than zero.
.. = zero.
Columns may not add due to rounding.

Source: Statistics Canada, Federal Science Expenditures and Personnel, 1989-1990, June 1989.

OBSERVATIONS:

- About 58% (\$2.9 billion) of federal S&T expenditures are associated with intramural activities, 17% (\$872 million) with grants and contracts to Canadian industry, and a further 16% (\$808 million) with payments to Canadian universities.
- More than half of the intramural expenditures will be for related scientific activities.
- Industry will perform \$674 million of federal R&D, 12% more than in the previous year.
- Funding for university R&D is expected to increase by 6% to \$666 million.
- Intramural R&D will increase by 5% to \$1,371 million from \$1,310 million in 1988-1989.

Table F - Federal S&T Expenditures by Department & by Performer, 1989-1990
 Last Updated: April 2, 1990

Dept.	Intra- mural	Ind'y	Univ.	Non-Profit Institutes	Prov. Gov't.	Foreign	Other	Total
(\$'000,000)								
AGR	328	4	4	1	0	1	1	338
AECL	116	25	1	0	..	0	1	143
CIDA	9	112	77	11	..	7	9	326
COMM	45	13	1	..	..	6	0	65
EMR	278	40	7	4	14	15	3	362
ENV	448	25	2	4	4	2	5	490
F&O	230	11	2	0	..	0	1	245
FOR*	64	9	2	1	1	0	0	76
IDRC	37	0	7	0	..	69	2	115
NDEF	160	118	14	1	..	3	0	295
NHW	120	4	19	18	3	1	2	166
NRC	346	158	30	0	0	7	8	550
RIE	18	248	1	2	1	..	3	273
STC	291	..	..	..	..	..	..	291
NSERC	17	5	357	0	..	8	4	391
MRC	5	..	189	1	0	7	1	202
SSHRC	7	..	63	5	..	7	..	82
Others	422	100	31	56	7	12	14	643
Total	2,942	872	808	105	30	244	53	5,054

* Expenditures for the Forestry program were included in Agriculture for the years 1982 to 1986 and for the earlier period in Environment.
 0 < \$500,000 but greater than zero.
 .. = zero.

Note: Columns may not add due to rounding.

Source: Statistics Canada, Federal Science Expenditures & Personnel, 1988-1989, June 1989.

OBSERVATIONS:

- Federal intramural expenditures will amount to \$2,942 million or 58% of total S&T expenditures in 1989-1990, down from 63% in 1984/85.
- ENV, NRC, AGR, STC and EMR are the major intramural performers of federal S&T.
- RIE, NRC, NDEF and CIDA will account for 73% of the payments to industry.
- The Granting Councils (NSERC, MRC and SSHRC) will provide an estimated 75% (\$609 million) of the federal funding for university S&T.

Table G - Federal Expenditures on S&T by Major Departments, 1980-81 to 1989-90
 Last Updated: April 2, 1990

Dep't	1980-1981	1981-1982	1982-1983	1983-1984	1984-1985	1985-1986	1986-1987	1987-1988	1988-1989	1989-1990
(\$*000,000)										
AGR	184	211	236	354	391	405	409	312	330	338
AECL	101	103	130	138	150	140	171	139	119	143
CIDA	148	166	185	189	223	226	280	309	358	326
COMM	68	90	103	86	94	78	66	65	66	65
E&I	18	19	21	22	24	27	39	65	65	66
EMR	194	232	257	289	338	388	397	383	383	362
ENV	297	338	377	349	376	384	417	441	459	490
F&O	143	149	184	212	254	246	224	213	220	245
FOR*	..	..	..	..	..	..	..	78	88	76
IDRC	40	43	48	64	76	82	91	94	106	115
NDEF	104	119	145	162	195	214	225	251	269	295
NHW	73	87	94	110	118	115	123	142	164	166
NLC	21	29	34	37	38	42	45	46	48	47
NMC	61	67	73	82	86	97	114	103	152	140
NRC	230	286	352	412	485	424	468	482	526	550
RIE	98	135	130	164	173	203	189	219	235	273
STCAN	158	247	208	230	249	263	361	287	282	291
NSERC	163	202	245	282	313	311	321	339	366	391
MRC	82	100	114	141	157	162	168	175	189	202
SSHRC	43	47	57	61	63	64	71	71	76	82
Others	177	221	249	276	279	270	268	293	360	389
Total	2,402	2,890	3,242	3,658	4,082	4,140	4,449	4,506	4,860	5,054
S&T as a percentage of non-statutory expenditures	9.3	10.3	10.6	10.7	11.1	11.3	11.9	11.9	11.9	11.8

* Expenditures for the Forestry program were included in Agriculture for the years 1982 to 1986 and for the earlier period in Environment.

Note: Columns may not add due to rounding.

Source: Statistics Canada, special tabulations, August 1989.

OBSERVATIONS:

- In current dollar terms, federal S&T expenditures have compounded at an annual average rate of 8.6% from \$2.4 billion in 1980-1981 to an estimated \$5.0 billion in 1989-1990.
- In inflation-adjusted dollars, federal S&T expenditures have grown on average by 3.4% per annum.
- As a proportion of non-statutory spending, federal S&T expenditures have increased during the early part of the period, but have remained fairly steady since 1986-1987.
- However, as a share of program expenditures (i.e., total spending net of public debt charges), S&T increased from 4.6% in 1980/81 to 4.7% in 1984/85, and an estimated 4.9% in 1989/90.

Table H - Federal Expenditures on R&D by Department, 1980-81 to 1989-90
Last Updated: April 2, 1990

Dep't	1980- 1981	1981- 1982	1982- 1983	1983- 1984	1984- 1985	1985- 1986	1986- 1987	1987- 1988	1988- 1989	1989- 1990
(\$'000,000)										
AGR	162	187	210	313	348	367	372	286	297	300
AECL	79	91	114	121	132	123	151	131	112	134
CIDA	32	36	42	42	48	51	62	66	76	66
COMM	53	78	94	83	86	68	63	61	61	60
E&I	2	2	..	..	..	..	..	..	..	..
EMR	85	109	118	136	156	180	182	146	165	149
ENV	98	107	117	67	60	59	65	66	75	81
F&O	82	90	108	127	139	143	128	114	116	129
FOR	..	..	..	..	..	..	..	70	80	68
IDRC	33	37	42	53	60	65	75	77	88	95
NOEF	101	116	143	159	192	210	221	247	265	291
NHW	28	32	29	36	34	32	36	40	41	43
NMC	3	6	8	8	9	10	13	14	16	18
NRC	193	240	306	361	435	378	415	428	475	497
RIE	96	131	118	146	168	198	186	209	221	254
STCAN	6	4	6	9	11	11	9	11	11	11
NSERC	147	182	218	249	273	272	282	301	325	347
MRC	80	97	109	136	151	155	162	169	182	195
SSHRC	26	29	37	40	41	39	43	44	51	55
Others	58	77	85	95	114	108	97	100	134	159
Total	1,363	1,649	1,905	2,179	2,454	2,468	2,562	2,581	2,789	2,950

* Expenditures for the Forestry program were included in Agriculture for the years 1982 to 1986 and for the earlier period in Environment.

Note: Columns may not add due to rounding.

Source: Statistics Canada special tabulations, August 1989.

OBSERVATIONS:

- In current dollar terms, federal spending on R&D has more than doubled from \$1.4 billion in 1980-1981 to \$2.9 billion in 1989-1990. Most of the growth, however, was achieved prior to 1985-1986. Whereas expenditures increased 80% during the early part of the period, the subsequent gain has been only 20%.
- In real terms, federal R&D expenditures have grown on average by 3.7% during the eighties.
- Expenditures are highly concentrated within a small number of departments and agencies. Five of these - NRC, NSERC, AGR, NOEF and RIE - will account for 57% of total R&D expenditures in 1989-1990.

Table I - Federal S&T Expenditures by Performing Sector, 1981-1982 to 1989-1990
Last Updated: April 2, 1990

Sector	1981- 1982	1982- 1983	1983- 1984	1984- 1985	1985- 1986	1986- 1987	1987- 1988	1988- 1989	1989- 1990
(\$'000,000)									
Intramural	1,836	2,072	2,303	2,558	2,571	2,790	2,720	2,838	2,942
Industry	389	422	488	572	611	635	702	803	872
Universities	422	499	566	636	637	663	697	769	808
Non-profit									
Institutions	25	30	47	44	42	53	77	89	104
Other	84	59	78	79	74	73	85	97	83
Foreign	133	160	176	194	206	235	224	263	244
Total	2,889	3,242	3,658	4,083	4,141	4,449	4,505	4,859	5,053

Source: Statistics Canada, Science Statistics, Cat. No. 88-001, Vol. 13, No. 5, July 1989.

OBSERVATIONS:

- Of the three major performers of federally-funded S&T, the federal scientific establishment has historically been, by far, the largest, and in 1989-1990 will spend \$2.9 billion or about 58% of the total.
- The eighties have, however, been a period of continuing decrease in the share spent on intramural S&T. That share has now declined to 58% from a high of 64% in 1982-1983.
- Industry's share, on the other hand, has increased from 13% to 17% and the universities' only slightly from 15% to 16%.

Table J - Federal Personnel Engaged in S&T Activities, by Major Department, 1983-84 to 1989-90
Last Updated: April 2, 1990

Department	1983- 1984	1984- 1985	1985- 1986	1986- 1987	1987- 1988	1988- 1989	1989- 1990
(person-years)							
AGR	5,636	5,550	5,213	5,019	4,018	4,032	4,009
AECL	2,665	2,649	2,562	2,603	2,562	2,442	2,489
CIDA	139	146	152	146	147	151	147
COMM	613	660	409	395	434	405	415
EMR	2,661	2,718	2,783	2,712	2,662	2,675	2,602
ENV	4,415	4,538	4,448	4,402	4,541	4,583	4,589
F&O	2,403	2,512	2,548	2,435	2,291	2,313	2,353
FOR*	..	..	..	..	949	953	928
IDRC	266	289	284	289	293	308	308
NDEF	1,947	1,913	1,891	1,901	1,935	1,943	1,941
NHW	1,445	1,446	1,450	1,313	1,642	1,684	1,716
NRC	3,424	3,515	3,400	3,256	3,320	3,415	3,457
RIE	171	198	237	167	201	209	208
STC	4,651	4,596	4,569	4,416	4,383	4,225	4,104
NSERC	111	138	148	143	151	159	173
MRC	51	54	54	53	53	54	53
SSHRC	104	104	107	103	95	97	96
Others	5,058	4,777	4,629	4,584	4,157	4,385	4,400
Total	35,760	35,803	34,884	33,937	33,834	34,033	33,988

* The Forestry program was included in Agriculture for the years 1983-1984 to 1986-1987.

Source: Statistics Canada, Federal Personnel Engaged in Scientific Activities, 1975-76 to 1989-1990, August 1989.

OBSERVATIONS:

- Federal PYs devoted to S&T activities in 1989-1990 are estimated at 33,990, down from a high of 35,800 in 1984-1985 and at about the same level as in 1986-1987.
- This 5% decrease in S&T person-years since 1984-85 is about the same order of magnitude as the overall contraction in the size of the public service.
- Person-years engaged in R&D have declined 6% from 16,380 in 1984-1985 to 15,340 in 1989-1990.
- Four departments - ENV, STC, AGR and NRC - will account for almost 48% of the S&T person-years in 1989-90.

Table K - Federal S&T Expenditures in the Natural Sciences by Region, 1982-1983 to 1987-1988
Last Updated: April 2, 1990

Region	1982- 1983	1983- 1984	1984- 1985	1985- 1986	1986- 1987	1987- 1988
(\$'000,000)						
Atlantic	209	277	274	298	281	282
Quebec	328	425	490	551	552	621
Ontario	1,099	1,240	1,355	1,328	1,494	1,526
Manitoba	122	152	163	134	132	126
Saskatchewan	53	68	71	79	77	83
Alberta	106	129	153	162	155	172
B.C.	194	232	238	270	259	270
Canada*	2,112	2,525	2,748	2,846	2,974	3,100
NCR	660	749	792	714	832	881

* Includes the Yukon and Northwest Territories.

Source: Statistics Canada, Regional Distribution of Federal Expenditures on Science and Technology, 1987-1988, June 1989.

OBSERVATIONS:

- Because of the methodology used in collecting regional statistics, federal expenditures by province do not add up to the totals reported elsewhere. The differences lie mainly in unallocated overheads, and the exclusion of S&T expenditures outside of Canada.
- Ontario receives almost one-half of the S&T expenditures in the natural sciences and engineering.
- The large Ontario share is due mainly to the high concentration of federal establishments in the NCR.
- Expenditures in the NCR declined to a 25% share in 1985-1986 but have since rebounded to 28%.
- Quebec receives the second largest amount and its share has increased from 15% in 1983 to 20% in 1988.

COMMENT:

- Regional statistics on activities in the social sciences and humanities are of fairly recent origin. Hence, historical series are limited to federal expenditures in the natural sciences and engineering.

Table L - Federal S&T Expenditures by Region and by Performer, 1987-1988
 Last Updated: April 2, 1990

Region	Intramural	Extramural			Total	Per Cent of Total
		Industry	University	Other		
						(%)
						(\$'000,000)
Nfld.	50	5	10	4	69	2
P.E.I.	8	6	1	1	16	0
N.S.	131	24	23	5	183	5
N.B.	37	5	9	4	56	1
Quebec	314	240	190	33	777	20
Ontario	1,495	285	259	57	2,097	53
Man.	93	16	25	5	139	4
Sask.	51	13	20	6	91	2
Alta	104	23	56	6	190	5
B.C.	136	54	99	12	301	8
Yukon & NWT	23	2	..	4	29	1
Canada	2,443	674	693	138	3,948	100
NCR	1,289	95	30	15	1,429	36

Source: Statistics Canada, Regional Distribution of Federal Expenditures on Science and Technology, 1987-1988, June 1989.

OBSERVATIONS:

- In 1987-1988, the latest year for which regional data are available, the federal government spent \$3.9 billion on S&T in the natural sciences, engineering, social sciences and humanities.
- Of this amount, \$3.1 billion, as indicated in the previous table, was spent on activities in the natural sciences and engineering.
- Almost two-thirds (\$2.4 billion) of the total went to government establishments with almost one-half of this being spent in the NCR.
- Ontario and Quebec, followed by B.C., are the largest recipients of federal S&T funds.
- The Yukon and Northwest Territories, Nova Scotia, Newfoundland, Manitoba and New Brunswick are very dependent on federal intramural activities - each of these regions had more than two-thirds of the federal expenditures earmarked for intramural programs.

Table M - Federal R&D Funding by Region and by Performer, 1987-1988
 Last Updated: April 2, 1990

Region	Intramural	Extramural			Total	Per Cent of Total
		Industry	University	Other		
						(%)
						(\$'000,000)
Nfld.	22	3	9	2	36	2
P.E.I.	7	4	1	..	12	1
N.S.	65	17	19	3	104	5
N.B.	24	4	7	2	38	2
Quebec	144	180	149	19	492	21
Ontario	681	231	213	16	1,142	49
Man.	64	12	21	2	99	4
Sask.	36	11	17	3	67	3
Alta.	53	13	48	3	117	5
B.C.	76	31	88	5	200	9
Yukon & NWT	1	..	..	..	1	0
Canada	1,173	507	572	56	2,308	100
NCR	501	82	22	4	609	26

Note: Columns and rows may not add due to rounding.

Source: Statistics Canada, Regional Distribution of Federal Expenditures on Science and Technology, 1987-88, June 1989.

OBSERVATIONS:

- In 1987-1988, the Federal Government spent \$2.3 billion, or about 58% of the total S&T expenditures on R&D.
- About one-half (\$1.2 billion) of the R&D funds went to government establishments, most of which are located in the NCR.
- Ontario, Quebec and B.C. were the largest recipients of federal R&D funds.
- Provincial shares varied with performance sectors. Quebec, for example, received 36% of total industrial R&D grants and contracts, 26% of university payments, but only 12% of federal intramural expenditures.

Table N - Federal R&D Grants and Contracts to Industry in the Natural Sciences, 1987-1988
 Last Updated: April 2, 1990

Region	Grants		Contracts		Grants & Contracts	
	Millions of \$	Per Cent of Total	Millions of \$	Per Cent of Total	Millions of \$	Per Cent of Total
Nfld.	1.0	0.3	1.8	0.9	2.8	0.6
P.E.I.	3.1	1.0	0.3	0.2	3.4	0.7
N.S.	7.7	2.6	6.9	3.4	14.6	2.9
N.B.	1.9	0.6	0.9	0.4	2.8	0.6
Quebec	151.8	51.0	28.4	14.0	180.2	36.0
Ontario	104.7	35.2	124.2	61.2	228.9	45.7
Man.	3.2	1.1	9.2	4.5	12.4	2.5
Sask.	3.9	1.3	7.5	3.7	11.4	2.3
Alta.	5.5	1.8	7.5	3.7	13.0	2.6
B.C.	14.7	4.9	16.1	7.9	30.8	6.1
Yukon & NWT	0.1	0.0	0.1	0.0	0.2	0.0
Canada	297.6	100.0	202.9	100.0	500.5	100.0
NCR	18.6	6.3	62.9	31.0	81.5	16.3

Source: Statistics Canada, Science Statistics, Vol. 13, No. 1, June 1989.

OBSERVATIONS:

- Federal grants and contracts for R&D to industry in the natural sciences and engineering amounted to \$500 million in 1987-1988, with another \$7 million being spent on activities in the social sciences and humanities.
- Grants (\$298 million) accounted for about three-fifths of the total and almost one-half of these were directed to Quebec.
- Contracts amounted to about \$200 million, with Ontario receiving over 60% of the payments.
- Outside of Ontario and Quebec, there was no other province with more than 7% of the federal industrial R&D payments.

Table 0 - Gross Expenditures on R&D (GERD) and GERD/GDP, 1972 to 1989
 Last Updated: April 2, 1990

Year	GERD (\$'000,000)	GERD/GDP (%)
1972	1,357	1.25
1973	1,450	1.14
1974	1,666	1.10
1975	1,876	1.09
1976	2,044	1.03
1977	2,291	1.05
1978	2,578	1.07
1979	2,935	1.06
1980	3,448	1.11
1981	4,285	1.20
1982	5,035	1.34
1983	5,348	1.32
1984	6,015	1.35
1985	6,709	1.40
1986	7,221	1.43
1987	7,395	1.34
1988p	7,877	1.31
1989p	8,315	1.28

p Preliminary figures.

Source: Statistics Canada, Science Statistics, Cat. No. 88-001, Vol. 13, No. 6, August 1989.

OBSERVATIONS:

- After years of continuous decrease during the sixties and early seventies, GERD/GDP rose significantly from 1.03% in 1976 to 1.43% in 1986.
- However, the estimate for 1989 is only 1.28%, marking the third consecutive year in which this indicator has declined.
- The 1989 GERD is estimated at \$8,315 million, a 5.6% increase over 1988 in nominal value or 1.2% larger in inflation-adjusted dollars.

Table P - GERD by Major Funder, 1972 to 1989
Last Updated: April 2, 1990

Year	Fed. Gov't.		Industry		University		Prov. Gov't.		Total*
	(\$ B)	(%)	(\$ B)	(%)	(\$ B)	(%)	(\$ B)	(%)	
1972	0.61	45	0.37	27	0.21	16	0.09	7	1.36
1973	0.65	45	0.41	28	0.21	14	0.10	7	1.45
1974	0.72	43	0.51	31	0.23	14	0.11	7	1.67
1975	0.77	41	0.58	31	0.29	16	0.12	7	1.88
1976	0.83	40	0.63	30	0.33	16	0.15	7	2.04
1977	0.90	39	0.70	31	0.38	17	0.17	7	2.29
1978	1.00	39	0.84	32	0.39	15	0.19	7	2.58
1979	1.03	35	1.12	38	0.43	15	0.21	7	2.94
1980	1.15	33	1.41	41	0.47	14	0.25	7	3.45
1981	1.42	33	1.83	43	0.50	12	0.30	7	4.28
1982	1.71	34	2.00	40	0.60	12	0.37	7	5.04
1983	1.92	36	1.94	36	0.58	11	0.38	7	5.35
1984	2.20	36	2.21	37	0.58	10	0.40	7	6.02
1985	2.22	33	2.81	42	0.64	10	0.42	6	6.71
1986	2.30	32	3.09	43	0.71	10	0.47	6	7.22
1987	2.31	31	3.09	42	0.70	9	0.48	6	7.40
1988p	2.41	31	3.33	42	0.74	9	0.51	6	7.88
1989p	2.54	30	3.52	42	0.80	9	0.54	6	8.32

* Includes funding from other sources.

p Preliminary figures.

Source: Statistics Canada, Services, Science and Technology Division, August 1989.

OBSERVATIONS:

- In 1989, the federal government is expected to fund 30% of GERD, industry 42%, the university sector 9% and provincial governments 6%.
- Other funders - non-profit organizations and the foreign sector - will account for the remaining 11%.
- Over the period, Canadian industry has been funding an increasing share of our national R&D effort. This has resulted in significant decreases in the shares funded by universities and by the federal government.

Table Q - GERD by Major Performer, 1972 to 1989
 Last Updated: April 2, 1990

Year	Fed. Gov't.		Industry		University		Other		Total
	(\$ B)	(%)	(\$ B)	(%)	(\$ B)	(%)	(\$ B)	(%)	(\$ B)
1972	0.40	29	0.46	34	0.43	32	0.07	5	1.36
1973	0.43	30	0.50	35	0.45	31	0.08	4	1.45
1974	0.49	29	0.61	37	0.49	29	0.08	5	1.67
1975	0.52	28	0.70	37	0.57	30	0.09	5	1.88
1976	0.57	28	0.76	37	0.62	30	0.10	5	2.04
1977	0.61	26	0.86	37	0.71	31	0.12	6	2.58
1978	0.68	26	1.01	39	0.77	30	0.13	5	2.58
1979	0.68	23	1.27	43	0.84	29	0.14	5	2.94
1980	0.73	21	1.57	46	0.97	28	0.17	5	3.45
1981	0.86	20	2.12	50	1.10	26	0.20	5	4.28
1982	1.03	20	2.49	49	1.27	25	0.24	5	5.04
1983	1.16	22	2.58	48	1.35	25	0.26	5	5.35
1984	1.32	22	2.99	50	1.43	24	0.28	5	6.02
1985	1.29	19	3.61	54	1.53	23	0.29	4	6.71
1986	1.33	18	3.95	55	1.64	23	0.30	4	7.22
1987	1.28	17	4.07	55	1.72	23	0.32	4	7.40
1988p	1.31	17	4.39	56	1.82	23	0.35	4	7.88
1989p	1.37	16	4.64	56	1.93	23	0.37	4	8.32

p. Preliminary figures.

Source: Statistics Canada, Services, Science and Technology Division, August 1989.

OBSERVATIONS:

- The more rapid growth in industry's funding has been accompanied by an increasing share of GERD performed in the industrial sector.
- As a result, the percentage performed in federal laboratories and in Canadian universities have both been in decline.
- In 1989, industry is expected to perform 56% of the national R&D effort, universities 23%, and the federal government 16%.

Table R - Higher Education R&D Expenditures by Source of Funds, 1980 to 1989
 Last Updated: April 2, 1990

Source of Funds	1980	1982	1984	1986	1988	1989	Per Cent of Total 1989
	(\$'000,000)						(%)
Fed. Govt.	288	393	517	523	594	629	32.6
Prov. Govts.	96	142	169	207	230	244	12.6
Business	56	68	87	105	145	154	8.0
Higher Ed.	473	603	576	708	736	780	40.4
Private Non- Profit	49	53	70	81	105	111	5.7
Foreign Sources	8	10	11	11	12	13	0.7
Total	970	1,269	1,430	1,635	1,822	1,931	100.0
Total (1981 \$)	988	1,167	1,215	1,323	1,357	1,376	

Source: Statistics Canada, Services, Science and Technology Division.

OBSERVATIONS:

- University-based R&D expenditures are expected to total over \$1,900 million in 1989, showing a steady increase from 1980 in constant dollar terms.
- In 1989, the federal government will directly fund \$629 million or 33% of total university R&D through the Granting Councils and various government departments.
- Indirectly, the federal government funds a further amount through its EPF transfer payments, since some of these revenues are applied by universities themselves to the support of R&D activities.
- Provincial governments will directly fund 13% of the total (\$244 million), business 8% (\$154 million) and private non-profit 6% (\$111 million).
- Business financing of university R&D has grown from 6%, prior to 1986, to its current 8% share.

Table S - Industrial R&D, 1972 to 1989
Last Updated: April 2, 1990

Year	Industrial R&D		Industrial R&D/GDP
	(\$'000,000)	(\$'000,000 1981)	(%)
1972	462	1,043	0.43
1973	503	1,042	0.39
1974	613	1,112	0.40
1975	700	1,155	0.41
1976	755	1,147	0.38
1977	857	1,225	0.39
1978	1,006	1,355	0.42
1979	1,266	1,550	0.46
1980	1,571	1,741	0.51
1981	2,124	2,124	0.60
1982	2,489	2,288	0.66
1983	2,585	2,264	0.64
1984	2,994	2,543	0.67
1985*	3,610	2,980	0.75
1986*	3,950	3,180	0.78
1987	4,069	3,138	0.74
1988p	4,391	3,251	0.73
1989p	4,640	3,307e	0.71e

* Improved coverage and response have increased observed R&D expenditures by about 10% for 1985 and 1986.

e ISTC estimate.

p preliminary.

Source: Statistics Canada, Industrial Research and Development Statistics, 1987 (with 1988 and 1989 estimates), September 1989.

OBSERVATIONS:

- Industrial R&D expenditures are expected to total about \$4,640 million in 1989, an increase of \$249 million or about 6% more than in the previous year.
- In constant dollar terms, industrial performance of R&D has more than tripled since 1972.
- As a percentage of GDP, spending on industrial R&D peaked at about 0.8% in 1986 and has since declined to an estimated 0.7% in 1989.

Table T - Current R&D Expenditures, by Application and by Industry Group, 1987
Last Updated: April 2, 1990

Industry Group	Basic Research	New Product Development	Existing Product Development	New Process Development	Existing Process Development	New Services Development	Existing Services Development	Total
(\$'000,000)								
Food, Beverages and Tobacco	4.1	21.2	19.0	7.1	6.6	3.2	3.3	64.5
Wood, Pulp and Paper	11.1	16.4	14.7	12.7	24.4	3.7	5.4	88.4
Mines, Metals and Non-metallic Products	8.5	41.3	33.5	27.4	57.09	6.4	10.1	185.1
Transportation Equipment	38.4	298.0	151.0	5.7	6.1	1.4	4.2	504.8
Electrical and Electronic Products	82.9	553.9	321.3	17.7	14.2	3.9	5.1	999.0
Oil Wells and Petroleum Products	2.7	2.9	15.3	19.3	27.1	4.6	28.9	100.9
Chemical Products	15.0	106.0	56.5	13.6	18.7	3.6	6.0	219.4
Other Manufacturing Industries	7.6	111.9	41.6	17.0	11.9	3.4	2.0	195.4
Engineering and Scientific Services	13.7	97.4	44.9	23.6	10.7	25.7	17.6	233.6
Other Service Industries	32.0	228.3	138.3	42.8	35.9	63.8	70.6	611.8
Total	216.0	1,477.3	836.2	187.0	213.3	119.7	153.2	3,203.0

Source: Statistics Canada, Services, Science and Technology Division, July 1989.

OBSERVATIONS:

- Almost half of the current expenditures on industrial R&D are incurred for the development of new products, and about one-quarter for improvements to existing products.
- Process R&D accounts for about 13% of the current expenditures, followed by services at 9% and basic research at 7%.
- The distribution of R&D expenditures by application varies widely with industry sector. Basic research, for example, accounts for 13% of the expenditures in the wood, pulp and paper sector as against only 3% in oil wells and petroleum products.
- On the other hand, oil wells and petroleum products spend some 33% of its funds on services R&D as compared with a 1% share in transportation equipment and in electrical and electronic products.
- Resource-based industries favour R&D investments directed towards incremental changes whereas in the more high-technology sectors the orientation is towards radical change (i.e., basic research and the development of new products, processes or services).

Table U - Concentration of Industrial R&D by Sector, 1984 to 1989
 Last Updated: April 2, 1990

Sector	1984	1985	1986	1987	1988p	1989p	1989p
	(per cent of total)						(\$'000,000)
Telecommunications Equipment	18	17	16	17	16	17	771
Aircraft and Parts	9	9	9	11	12	12	559
Engineering and Scientific Services	7	8	9	8	8	8	388
Drugs, Medicines & Other Chemical Products	7	7	7	7	7	8	365
Electronic Parts, Components & Other Electronic Equipment	7	8	8	8	7	7	340
Business Machines	6	5	6	7	7	7	302
Electrical Power	5	5	5	5	6	6	256
Wells and Petroleum Products	10	8	5	4	4	4	181
Primary Metals (Ferrous and Non-ferrous)	4	3	3	3	4	3	160
Transportation and Other Utilities	3	3	4	3	3	3	135
Other Industries	25	27	28	27	26	25	1,183

p preliminary.

Source: Statistics Canada, Industrial Research and Development Statistics, 1987 (with 1988 and 1989 estimates), September 1989.

OBSERVATIONS:

- In Canada, as elsewhere, most of the industrial R&D is performed within a very few sectors. These are the "high R&D-intensive" or "high-technology" sectors.
- Telecommunications equipment accounts for about one-sixth of total industrial R&D; aircraft and parts around one-tenth; and engineering and scientific services almost one-twelfth.
- One of the distinctive features of Canadian industrial R&D is the high share performed in the service sector. This share is estimated at 27% in 1989, which is significantly higher than its shares of 21% in 1984 and 14% in 1980.

Table V - Expenditures in Industry by Size of R&D Program, 1987
 Last Updated: April 2, 1990

R&D Size	Number of Firms	Expenditures (\$'000,000)	Average Expenditures (\$'000)
< \$50,000	1,066	31	30
\$50,000 - 99,999	628	53	84
\$100,000 - 199,999	576	94	163
\$200,000 - \$399,999	434	138	318
\$400,000 - 999,999	393	278	707
> \$999,999	401	3,475	8,665
Total	3,498	4,069	1,163

Source: Statistics Canada, Services, Science and Technology Division, December 4, 1989.

OBSERVATIONS:

- Although only about 400 firms, or approximately 12% of all performing firms, had R&D programs of \$1 million or more in 1987, they accounted for more than 85% of all R&D in the industrial sector.
- The number of these large R&D performers has increased considerably since 1982, when the 251 such firms accounted for 87% of the total industrial R&D.
- At the other end of the spectrum, almost one-half of the firms had R&D programs of less than \$100,000 and more than three-fifths of these less than \$50,000.
- Industrial R&D is mainly concentrated in the large firms. The 46 firms (1.3% of all R&D-performing firms) with employment size of 5,000 or more performed \$1,797 million of R&D, or about 44% of the total.
- Firms with employment sizes of less than 200, of which there were 2,925, accounted for only 21% of the R&D total.

Table W - Self-funded R&D as a Percentage of Performing Company Sales by Industry, and by Country of Control, 1987
 Last Updated: April 2, 1990

Industry	Canadian Control	Foreign Control	Total
Mining	..	..	0.626
Crude Petroleum and Natural Gas	..	..	0.196
Total Mining and Oil Wells	0.466	0.406	0.446
Food, Beverages and Tobacco	0.145	0.868	0.269
Rubber and Plastic Products	1.614	0.321	0.766
Textiles	0.428	1.563	1.152
Wood	..	..	0.650
Pulp and Paper	0.355	0.122	0.325
Primary Metals (Ferrous)	..	..	0.377
Primary Metals (Non-ferrous)	..	..	0.488
Metal Fabricating	1.790	0.762	1.097
Machinery	3.676	1.671	2.992
Aircraft and Parts	..	..	11.018
Other Transportation Equipment	1.556	0.184	0.303
Telecommunication Equipment	..	..	8.692
Electronic Parts and Components	7.006	3.780	5.820
Other Electronic Equipment	19.017	5.196	8.172
Business Machines	10.974	1.122	1.917
Other Electrical Equipment	2.033	0.964	1.205
Non-Metallic Mineral Products	0.220	0.562	0.406
Refined Petroleum and Coal Products	..	..	0.490
Drugs and Medicines	8.127	2.455	3.122
Other Chemical Products	1.595	1.269	1.362
Scientific and Professional Equipment	9.291	0.911	2.279
Other Manufacturing Industries	2.639	0.820	2.138
Total Manufacturing	1.148	1.071	1.108
Transportation and Other Utilities	..	..	0.448
Electric Power	..	..	1.100
Computer Services	7.932	13.399	8.273
Engineering and Scientific Services	4.512	7.187	4.608
Other Non-manufacturing Industries	1.236	0.452	0.736
Total Services	1.099	0.555	0.986
TOTAL	1.092	0.973	1.042

.. = Data suppressed to maintain confidentiality of individual returns.

Source: Statistics Canada, Services, Science and Technology Division, December 13, 1989.

OBSERVATIONS:

- When all sources of funding are included, public as well as private, Canadian-controlled firms perform significantly more R&D per dollar sales (i.e., are more R&D-intensive) than those that are foreign-owned.
- However, when only self-funding is considered, there is, at the aggregate level, very little difference in R&D intensity between these two categories of firms (1.09% vs. 0.97%).
- Industries in which, relative to sales, foreign-owned R&D performers outspend those that are Canadian-controlled include computer services, engineering and scientific services, textiles, and food, beverages and tobacco.

Table X - Balance of Trade in "R&D-intensive" Products, 1980-1987
 Last Updated: April 2, 1990

Product Group	1980	1981	1982	1983	1984	1985	1986	1987
	(\$'000,000)							
Aerospace	-252	-279	626	58	-48	-209	228	410
Computers & Related Eq.	-890	-1,376	-1,607	-1,652	-2,458	-2,126	-2,381	-2,680
Electronic Equipment	-501	-504	-511	-722	-946	-718	-863	-1,115
Telecommuni- cations Eq.	-4	20	215	222	487	441	-67	-36
Scientific Instruments	-944	-1,146	-1,026	-967	-1,294	-1,386	-1,410	-1,393
Electrical Machinery	-434	-537	-490	-543	-580	-579	-629	-669
Non-elec. Machinery	-1,418	-1,490	-1,096	-892	-1,042	-1,497	-1,803	-1,468
Chemicals (incl. Drugs)	-147	-134	-321	-607	-517	-309	-87	-215
Total	-4,590	-5,447	-4,230	-5,103	-6,399	-6,384	-7,011	-7,166
Per Cent of GDP	1.48	1.53	1.13	1.26	1.44	1.34	1.40	1.30

Source: Statistics Canada, "International Trade in R&D Intensive Products", Science Statistics, Vol 12, No. 3, May 1988.

OBSERVATIONS:

- Canada has been incurring a large and increasing trade deficit in "R&D-intensive" products throughout most of the 1980s.
- Product groups with large trade deficits include computers and related equipment, non-electrical machinery, scientific instruments, and electronic equipment.
- Aerospace and telecommunications equipment are the product groups in which Canadian performance is strongest.

Table Y - Gross Expenditures on R&D (GERD), 1989
Last Updated: April 2, 1990

Funder	Performer						Total	Total (%)
	Fed.	Prov.	PRO	BE	Univ.	PNP		
	('000,000)							(%)
Federal	1,372	..	8	496	629	30	2,535	(30%)
Prov.	..	168	53	51	244	23	539	(6%)
PRO	..	..	2	..	..	..	2	(0%)
BE	..	..	22	3,332	154	7	3,515	(42%)
Univ.	..	..	..	..	780	..	780	(9%)
PNP	..	..	..	..	111	57	168	(2%)
Foreign	..	..	2	761	13	..	776	(9%)
Total	1,372 (16%)	168 (2%)	87 (1%)	4,640 (56%)	1,931 (23%)	117 (1%)	8,315 (100%)	

PRO Provincial Research Organizations
BE Business Enterprises
PNP Private Non-profit Organizations

Source: Statistics Canada, Services, Science and Technology Division, August 1989.

OBSERVATIONS:

- In 1989, the federal government will directly fund 30% and perform 16% of all R&D in Canada. Both of these figures indicate a continuing decline of the federal role in R&D.
- The business sector will finance 42% and perform 56% of the national R&D effort.
- Provincial governments will provide 6% and perform 2% of the total.
- Institutions of higher education will fund 9% and perform 23% of GERD.
- Expenditures by the foreign sector will account for 9% of the total. During the 1980s, this sector has been the fastest growing source of funds for R&D in Canada.

Table 2 - Major Canadian R&D Spenders
Last Updated: April 2, 1990

Company	Rank	1987	1988	1989p
	1989			
(\$'000,000)				
BCE Inc.	1	730.0	768.0	813.0
Pratt & Whitney Canada	2	243.0	219.0	247.0
IBM Canada	3	132.0	151.0	181.0
Atomic Energy Canada	4	172.0	163.0	166.0
Ontario Hydro	5	100.4	116.8	150.0
Hydro Québec	6	103.6	128.7	135.6
Alcan Aluminium	7	71.1	105.0	110.8
Canadair	8	45.0	91.2	106.3
Boeing of Canada	9	42.7	83.0	91.0
CAE Industries	10	55.5	60.0	75.0
Imperial Oil	11	54.3	67.0	70.0
Allied Signal Canada	12	30.1	36.8	37.9
Inco	13	23.5	33.1	37.0
BC Telephone	14	33.0	34.0	36.5
Digital Equipment	15	25.1	38.1	36.3
Shell Canada	16	26.6	31.0	33.0
Mitel	17	45.2	28.8	29.0
C-I-L	18	22.9	27.0	29.0
MacMillan Bloedel	19	22.3	23.7	25.0
DuPont Canada	20	21.0	17.9	21.1
Canadian Marconi	21	17.0	21.0	20.0
Gulf Canada Resources	22	18.0	19.0	19.0
Cognos	23	12.0	14.4	19.0
Gandalf Technologies	24	13.4	16.3	17.9
General Electric Canada	25	11.9	17.0	..
Xerox Canada	26	13.8	14.5	15.2
Glaxo Canada	27	2.9	6.9	15.2
Amdahl Canada	28	16.6	16.8	13.2
Hewlett-Packard Canada	29	9.0	11.8	13.0
Ciba-Geigy Canada	30	8.0	9.4	11.7
Domtar	31	9.1	10.6	11.5
Matrox Electronic Systems	32	5.7	8.2	11.0
Q.I.T-Fer et Titane	33	8.6	9.0	9.9
Canadian National Railway	34	17.2	11.0	9.0
Fiberglas Canada	35	9.9	10.3	8.9
Stelco Canada	36	11.4	12.1	8.7
Sandoz Canada	37	2.5	5.5	7.5
Canada Packers	38	7.1	7.2	7.3
Bull Honeywell	39	..	8.0	7.2
Westinghouse Canada	40	10.8	8.6	7.0
Allelix	41	..	6.0	6.5
Glenayre Electronics	42	4.4	4.5	5.2
Astra Pharma	43	4.1	3.7	5.0
Spar Aerospace	44	4.1	4.3	4.5
MacDonald Dettwiler	45	4.0	3.9	4.3
Linear Technology	46	3.2	3.9	4.3
Miles Canada	47	2.0	3.1	4.2
Indal Technologies	48	2.5	5.5	4.0
Johnson & Johnson	49	3.7	3.2	3.5
Manitoba Hydro	50	2.9	2.8	3.0

Source: Financial Post, "Financial Post R&D Survey", December 4, 1989.

Table AA - Total Expenditure on R&D, GDP, Population by Province, 1987
 Last Updated: April 2, 1990

Province	GERD (\$'000,000)	GDP	Population ('000)	GERD/GDP (%)	GERD per capita (\$)
Nfld.	70	7,138	568	0.98	123
P.E.I.	13	1,608	127	0.81	102
N.S.	159	13,374	878	1.19	181
N.B.	89	10,588	712	0.84	125
Que.	1,713	131,822	6,593	1.30	260
Ont.	4,010	224,674	9,265	1.78	433
Man.	186	20,049	1,079	0.93	172
Sask.	148	17,291	1,016	0.85	146
Alta.	546	58,982	2,378	0.92	230
B.C.	459	61,636	2,925	0.74	157
Canada*	7,395	549,397	25,617	1.35	289

* Including the Yukon and Northwest Territories.

Sources: Statistics Canada, Services, Science and Technology Division, August 1989.
 Statistics Canada, Canadian Economic Observer, July 1989.

OBSERVATIONS:

- Some 54% of the national R&D effort is performed in Ontario, 23% in Quebec, 18% in the West, and 4% in the Atlantic Region.
- At 1.8%, Ontario had the highest provincial GERD to GDP ratio. Quebec is second at 1.3% and Nova Scotia third. No other province had a ratio greater than 1.0%.
- It should be noted, however, that for the smaller provinces there can be considerable year-to-year variations in their GERD to GDP ratios.
- On a per capita basis, R&D expenditures are again highest in Ontario, with Quebec and Alberta vying for second and third positions.

Table BB - Provincial R&D by Funders and by Performers, 1987
 Last Updated: April 2, 1990

Province	Funder			Performer		
	Federal Govt.	Prov. Govt. & PRO*	Business Enterprise	Federal Govt.	Prov. Govt. & PRO*	Business Enterprise
(\$'000,000)						
Nfld.	36	4	7	24	4	7
P.E.I.	10	..	1	7	..	3
N.S.	103	5	17	71	6	24
N.B.	39	5	17	26	5	28
Que.	483	175	834	157	66	1,063
Ont.	1,174	136	1,769	744	68	2,440
Man.	96	7	28	70	3	28
Sask.	64	18	45	39	9	48
Alta.	113	100	196	59	49	211
B.C.	190	29	170	83	18	216
Canada**	2,309	479	3,085	1,281	228	4,069

* PRO = Provincial Research Organizations
 ** Includes the Yukon and the Northwest Territories.

Source: Statistics Canada, Estimates of Canadian Research and Development Expenditures (GERD), August 1989.

OBSERVATIONS:

- In all provinces, other than Quebec, Ontario and Alberta, the federal government is the major source of R&D funds, with its share of provincial totals varying from a high of 77% in P.E.I. to 41% in British Columbia.
- Federal R&D spending is nevertheless highly concentrated in Ontario and Quebec. These two provinces also receive large shares of the business enterprise funds.
- The provincial governments are not large R&D spenders. Only in Alberta, Saskatchewan and Quebec did they account for 10% or more of the provincial total.
- With more than a 60% share, the business enterprise sector is the largest R&D performer in Ontario and Quebec. It also performs large shares in British Columbia and Alberta.
- Although its major scientific establishments are mostly located in Ontario and Quebec, the federal government's contribution, as measured by the percentage of the provincial R&D that it performs, is greatest in the Atlantic and Prairie provinces.

Table CC - Higher Education R&D by Province and by Source of Funds, 1987
 Last Updated: April 2, 1990

Source of Funds	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.
(\$'000,000)						
Fed. Govt.	10	1	22	10	149	216
Prov. Govts.	..	..	1	2	90	64
Business	3	..	3	2	39	62
Higher Ed.	21	2	27	15	82	322
Private Non-profit	1	..	3	..	27	42
Foreign	..	..	1	..	3	4
Total	35	3	57	29	390	710
Per Cent Canada	2.0	0.2	3.3	1.7	22.7	41.3

Source of Funds	Man.	Sask.	Alta.	B.C.	Canada	Per Cent of Total
(\$'000,000)						(%)
Fed. Govt.	24	20	47	62	561	32.6
Prov. Govts.	4	10	39	7	217	12.6
Business	2	3	12	10	136	7.9
Higher Ed.	41	17	119	49	695	40.4
Private Non-profit	8	2	9	7	99	5.8
Foreign	2	..	1	1	12	0.7
Total	81	52	227	136	1,720	100.0
Per Cent Canada	4.7	3.0	13.2	7.9	100.0	

Source: Statistics Canada, Estimates of Canadian Research and Development Expenditures (GERD), August 1989.

OBSERVATIONS:

- University-based R&D totaled \$1.7 billion in 1987 with Ontario accounting for 41%, Quebec 23% and B.C. 13%.
- In dollar terms, federal government sponsorship is highest in Ontario; with Quebec next and B.C. and Alberta following.
- However, as a percentage of provincial total, federal direct support is largest in B.C., followed by Nova Scotia, Saskatchewan and Quebec.
- Among provincial governments, Quebec, Saskatchewan and Alberta were the only ones to fund more than 10% of their province's university R&D.
- With Ontario universities receiving 46% of the national total and Quebec 29%, business funding is much less regionally dispersed than federal spending.

Table DD - International Economic Indicators
Last Updated: April 2, 1990

Country	1987 Population (^{'000,000})	1987 Labour Force	Unemployment Rate, 1988 (%)	GDP at Current Prices and Exch. Rates (^{'000,000,000})	GDP Volume Change '87 to '88 (%)
Canada	25.7	13.2	7.8	479.5	4.2
U.S.	243.9	121.6	5.4	4,805.5	3.9
U.K.	56.9	28.2	8.3	805.6	4.2
Japan	122.1	60.8	2.5	2,853.0	6.0
France	55.6	24.1	10.3	941.9	3.2
W. Germany	61.2	28.2	6.2	1,204.6	3.4
Italy	57.3	24.0	11.9	826.0	4.0
Neth.	14.7	5.9	9.5	227.2	3.1
Swit.	6.6	3.3	0.7	184.8	3.0
Ausl.	16.3	7.8	7.2	242.9	2.9
Spain	38.8	14.7	20.1	339.3	4.9

Country	GDP per Capita 1988 (^{'000 US})	Consumer Price Change from Dec. '87-Dec. '88 (1977=100)	Average Exchange Rates, 1988 (units/US\$)	Short Term Interest Rates Dec. 1988 (%)
Canada	17.2	4.0	1.23	10.97
U.S.	18.3	4.4	1.00	9.25
U.K.	12.3	6.8	0.56	13.14
Japan	13.2	0.9	128.20	4.16
France	12.8	3.1	5.96	8.47
W. Germany	13.3	1.6	1.76	5.39
Italy	12.3	5.4	1.30	11.72
Neth.	12.3	1.2	1.98	5.66
Swit.	15.8	2.0	1.46	4.92
Ausl.	12.6	7.7	1.28	15.20
Spain	8.7	5.8	116.49	13.65

Source: OECD, OECD in Figures: Statistics on the Member Countries, 1989 Edition, June/July 1989.

OBSERVATIONS:

- Canada's unemployment rate of 7.8% in 1988 ranked sixth highest among the OECD countries listed above. Switzerland, at 0.7%, had the lowest and Spain the largest (20.1%).
- Although Canada's GDP is far less than that of the other G-7 countries, on a per capita basis it ranks second only to that of the U.S.
- Canada, along with the U.K., had the third highest real GDP growth (4.2%) in 1988. Japan, at 6.0%, had the highest, followed by Spain with 4.9%.
- Canada's annual consumer price change of 4.0% was greater than that of Japan, West Germany and France but less than that of the U.S., Italy and the U.K., where prices advanced by almost 7%.
- Short-term interest rates were relatively high in all G-7 countries, with the exceptions of Japan and West Germany where the spread between inflation and interest rates was only about 3 percentage points.

Table EE - Selected International Comparisons of GERD, 1987
 Last Updated: April 2, 1990

Country	GDP	GERD	GERD/ GDP	Non-Def. GERD/GDP	Population	GERD Per Capita
	(\$'000,000,000 US)		(%)		('000,000)	(US \$)
Sweden	116	3.4	2.91	2.58	8.4	400
Switzerland*	99	2.9	2.88	2.82	6.6	436
Japan	1,609	46.1	2.87	2.84	122.1	378
W. Germany	813	22.9	2.81	2.68	61.2	374
U.S.	4,473	121.3	2.71	1.84	243.9	497
Netherlands	180	4.2	2.32	2.29	14.7	284
France	714	16.3	2.29	1.79	55.6	294
U.K.	712	16.2	2.29	1.73	56.9	285
Norway	64	1.2	1.83	1.77	4.2	282
Finland	63	1.1	1.73	1.71	4.9	222
Canada	443	6.0	1.36	1.31	25.7	234
Austria	88	1.2	1.32	1.32	7.6	153
Italy	697	8.3	1.19	1.14	57.3	145
Ireland	27	0.3	0.95	0.95	3.5	71

* 1986 data.

Note: OECD data for Canada may differ from that of Statistics Canada.

Sources: OECD, Main Science and Technology Indicators, December 1989.

OECD, OECD in Figures: Statistics on Member Countries, 1989 Edition, June/July 1989.

OBSERVATIONS:

- GERD/GDP is the most commonly used measure for comparing national R&D efforts. While not an entirely reliable gauge of relative technological capacity or competitiveness, it is nevertheless the most readily available international indicator.
- By this measure, Canada ranks eleventh among the 24 OECD nations and sixth, ahead of Italy, among G-7 nations.
- Canada's GERD/GDP is only about one-half of that of Sweden (2.91%), Switzerland (2.88%), Japan (2.87%), West Germany (2.81%) and the U.S. (2.71%).
- In dollar terms, the U.S., with a roughly one-half share, is by far the largest R&D performer in the OECD area. By this same measure, Canada ranks seventh among OECD nations.

Table FF - International Comparisons of GERD/GDP, 1981-1987
 Last Updated: April 2, 1990

Country	1981	1982	1983	1984	1985	1986	1987
	(%)						
Sweden	2.22	..	2.46	..	2.79	..	2.91
Switzerland	2.29	..	2.28	..	..	2.88	..
Japan	2.32	2.42	2.56	2.65	2.81	2.79	2.87
W. Germany	2.42	..	2.51	..	2.71	2.69	2.81
U.S.	2.45	2.60	2.66	2.69	2.77	2.73	2.71
Netherlands	1.99	1.97	2.02	1.96	2.09	2.22	2.32
France	1.97	2.06	2.11	2.21	2.25	2.24	2.29
U.K.	2.42	..	2.26	..	2.29	2.36	2.29
Norway	1.29	1.37	1.41	1.51	1.62	1.83	1.83
Finland	1.19	..	1.32	1.42	1.55	1.65	1.73
Canada	1.23	1.37	1.35	1.38	1.41	1.44	1.36
Austria	1.17	1.22	1.23	1.27	1.27	1.31	1.32
Italy	0.87	0.90	0.95	1.01	1.12	1.14	1.19
Ireland	0.73	0.73	0.70	0.76	0.83	0.91	0.95

Source: OECD, Main Science and Technology Indicators, December 1989.

OBSERVATIONS:

- Despite the severe recession, there has been almost continuous growth in the GERD to GDP ratios of most OECD countries throughout the 1980s.
- The greatest gains have been recorded by Sweden, Switzerland, Japan, Norway and Finland, where the ratio advanced by more than half a percentage point.
- Canada's GERD/GDP increased much more modestly, from 1.23% in 1981 to 1.44% in 1986, before falling back to 1.36% in 1987.

Table GG - GERD by Performing and Funding Shares, Selected Countries, 1987
 Last Updated: April 2, 1990

Country	Performing			Funding		
	Industry	Govt.	Other	Industry	Public	Other
	(%)					
U.S.	71	11	18	47	51	2
Japan	66	10	24	69	22	10
Sweden	70	4	26	63	35	3
W. Germany	74	13	13	65	34	1
U.K.	67	15	18	50	39	12
France	59	25	16	42	52	7
Netherlands*	59	17	24	52	44	4
Norway	62	16	22	50	47	3
Finland	59	20	21	59	39	2
Canada	55	20	25	42	45	13
Italy	57	23	20	42	54	4
Austria**	55	8	37	49	49	3
Ireland*	57	24	19	48	44	8
Switzerland***	78	6	16	79	21	0

* 1987 performing; 1986 funding.

** 1985 performing; 1987 funding.

*** 1986.

Note: Rows may not add due to rounding.

Source: OECD, Main Science and Technology Indicators, December 1989.

OBSERVATIONS:

- Governments in Canada perform a larger share of national R&D effort than their counterparts in most other major industrialized countries.
- The public funding share in Canada is, however, not significantly different from that in most major industrial nations.
- Conversely, the private sector R&D shares in Canada are lower than in most other countries, even though its contribution has increased substantially over the past decade.
- In Canada, as in most other countries, industry performs much more R&D than it funds. Governments, on the other hand, fund more than they perform.

Table HH - Percentage of GERD Financed by Industry, G-7 Nations, 1974 to 1988
 Last Updated: April 2, 1990

Year	U.S.	Japan	West Germany	U.K.	France	Canada	Italy
				(%)			
1974	44	60	48	..	38	29	52
1975	43	58	50	41	39	30	51
1976	44	58	51	..	42	29	50
1977	44	59	53	..	41	30	47
1978	45	58	52	44	..	31	50
1979	46	59	56	..	43	37	55
1980	48	61	..	..	44	39	52
1981	49	62	58	41	41	42	50
1982	50	64	..	..	42	40	48
1983	49	65	60	42	42	39	45
1984	49	67	..	..	41	36	44
1985	48	69	62	46	41	42	45
1986	47	69	62	47	41	43	40
1987	47	68	65	50	42	42	42
1988	47	..	65	..	43	42	41

Sources: OECD, Main Science and Technology Indicators, December 1989.
 OECD, S&T Statistical Indicators, GERD, 1969-1982, 1985.

OBSERVATIONS:

- Over the period, the proportion of Canada's GERD that is funded by industry increased by 45%, from 29% in 1974 to 42% in 1987.
- This was substantially higher than the growth in the industry-funded share of GERD in other G-7 nations.
- As a result, industry's spending on R&D in Canada, as a per cent of GERD, is now more in line with that in other countries.

Table II - BERD as a Percentage of GERD, G-7 Nations, 1974 to 1988
 Last Updated: April 2, 1990

Year	U.S.	Japan	West Germany	U.K.	France	Canada	Italy
				(%)			
1974	67	59	61	..	59	36	55
1975	66	57	63	62	60	37	56
1976	67	57	63	..	60	36	55
1977	67	58	65	..	60	37	54
1978	67	57	65	66	60	38	55
1979	68	58	70	..	60	43	58
1980	69	60	..	..	60	45	59
1981	70	61	70	62	59	49	56
1982	72	62	..	..	58	49	57
1983	71	64	71	61	57	48	57
1984	72	65	..	..	57	49	56
1985	71	67	73	63	59	54	57
1986	70	67	73	67	59	55	58
1987	70	66	74	67	59	55	57
1988	70	..	74	..	60	56	54

Sources: OECD, Main Science and Technology Indicators December 1989.
 OECD, S&T Statistical Indicators, GERD, 1969-1982, 1985.

OBSERVATIONS:

- During the period, there has been a growing industrialization of R&D in the OECD area. In most countries, industry-performed R&D has grown faster than GERD.
- A similar trend is evident in Canada, where industrial R&D now accounts for 56% of the total, up from 36% in 1974.
- In spite of these gains, the industrial share in Canada is still low by international standards.

Table JJ - Researchers per Thousand Labour Force, 1981 - 1987
 Last Updated: April 2, 1990

Country	1981	1982	1983	1984	1985	1986	1987
Japan	6.9	7.0	7.4	7.6	7.9	8.1	8.4
U.S.	6.2	6.3	6.4	6.5	6.6	6.6	6.6
W. Germany	4.5	..	4.7	..	5.2	..	..
Norway	3.8	3.9	4.1	4.4	4.7	4.7	5.3
Sweden	3.5	..	3.9	..	4.6	..	4.8
U.K.	..	..	..	..	4.4	4.5	4.5
France	3.6	3.8	3.9	4.1	4.3	4.4	4.5
Canada	3.5	3.8	3.8	4.0	4.2	4.4	4.4
Netherlands	3.7	..	3.8	..	4.2	..	..
Italy	2.3	2.5	2.7	2.7	2.7	2.8	2.9
Denmark	2.5	2.7	2.8	3.0	3.1	3.3	3.5

Source: OECD, Main Science and Technology Indicators, December 1989.

OBSERVATIONS:

- The number of research scientists and engineers per 1000 workers is often used as an indicator of technological capability and competitiveness.
- According to this indicator, Japan (8.4 researchers per 1,000 labour force) and the U.S. (6.6) are substantially ahead of the other OECD countries.
- The proportion of researchers in the Canadian labour force has been increasing since 1981, and now stands at a more respectable 4.4 per 1,000 workers.

Table KK - Government Appropriations for R&D, 1988
 Last Updated: April 2, 1990

Country	Total	Civil	Billions of PPP Dollars	Per Cent Defence R&D
(per cent of GDP)				
France	1.37	0.85	10.4	37.6
Sweden	1.25	0.95	1.5	24.1
U.S.	1.23	0.40	59.1	67.8
U.K.	1.06	0.55	8.1	48.5
West Germany	1.05	0.92	9.2	12.5
Norway	0.97	0.90	0.6	7.6
Netherlands	0.95	0.92	1.8	3.0
Denmark	0.84	0.84	0.6	0.4
Italy	0.82	0.74	6.1	10.2
Finland	0.74	0.73	0.5	1.6
Japan*	0.62	0.59	9.9	3.5
Canada	0.57	0.53	2.7	7.8
Ireland	0.42	0.42	0.1	0.0
Switzerland	0.38	0.31	0.4	18.4

* 1987.

Source: OECD, Main Science and Technology Indicators, December 1989.

OBSERVATIONS:

- As a share of GDP, Canada ranks twelfth among OECD nations in terms of budget appropriations for R&D. These are R&D expenditures as reported by the funder rather than the recipients and, hence, may differ from those recorded in the normal GERD statistics
- There are large differences in the share of government R&D funds allocated to defence. At one extreme, there is the U.S. with a 68% defence share and at the other the middle-powers, such as Canada, with defence spending less than 10% of total government R&D appropriations.
- With respect to support for civil R&D, Canadian appropriations are more in line with those of other OECD nations.
- Government appropriations tend to reflect the degree of direct state intervention in the economy. Moreover, these figures do not include revenue foregone through R&D tax incentives.

Table LL - Higher Education Sector R&D Expenditures, 1987
 Last Updated: April 2, 1990

Country	Current PPP (\$'000,000,000)	Per Cent of GERD (%)	Per Cent of GDP (%)
U.S.	18.5	15.2	0.41
Japan	9.2	19.9	0.57
West Germany	2.9	12.9	0.36
France	2.4	15.0	0.34
U.K.	2.3	14.2	0.32
Italy	1.7	20.2	0.24
Canada	1.4	23.3	0.32
Netherlands	0.9	21.3	0.49
Sweden	0.9	25.6	0.74
Australia*	0.7	27.1	0.34
Switzerland*	0.4	12.8	0.37

* 1986 data.

Source: OECD, Main Science and Technology Indicators, December 1989.

OBSERVATIONS:

- As a percentage of GERD, Canadian R&D expenditures in the higher education sector are relatively high by international standards.
- The Royal Society of Canada, in conjunction with the Advisory Board for the Research Councils in the U.K. and the U.S. National Science Foundation, has carried out a study of government funding of R&D in the university sector. The methodology is somewhat different, but the study gives similar results to the above, moving Canada up the list of nations in terms of level of investment.

Table MM - Technological Competitiveness Indicators, 1986
 Last Updated: April 2, 1990

Country	Patent Applications Per 100,000 Total Population	Exports/imports High-tech Products	Export Market Shares*	
			All Mfg. Products	High-tech Mfg.
Switzerland	417	1.50	2.79	3.68
Japan	300	5.70	15.88	23.87
Sweden	238	0.92	2.76	2.06
West Germany	220	1.29	17.72	14.49
Finland	119	0.56	1.21	0.52
Austria	118	0.75	1.70	1.17
Netherlands	116	0.86	5.21	3.74
Denmark	114	0.88	1.40	1.06
U.K.	111	1.00	6.82	8.74
France	95	0.99	8.28	7.03
U.S.	94	0.83	13.07	21.93
Norway	83	0.24	0.76	0.31
Canada	36	0.46	5.21	2.29
Italy	35	0.85	7.37	4.29

* 1986 OECD = 100.

Source: OECD, OECD in Figures: Statistics on the Member Countries, 1989 Edition, June/July 1989.

OBSERVATIONS:

- Canadians are among the least inventive people in the OECD area. Their 36 patent applications per 100,000 of population is much less than in most other major industrialized nations.
- Canada imports almost twice as much high-technology products as it exports. Its trade coverage ratio of 0.46 is one of the lowest for a developed country. Only in aircraft and parts is this ratio significantly higher than one-half.
- It is therefore not surprising that Canada's market share of OECD high-technology exports is less than that of all other G-7 countries and of many of the smaller economies.
- The Canadian export share of manufactured products is also less than that of other G-7 countries.