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Symbols

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published

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Highlights

Gross domestic expenditure on research and development, 2007 intentions

- Total spending on research and development (R&D) in Canada this year is projected to increase slightly, according to preliminary estimates (Table 1-1).
- R&D spending is anticipated to reach nearly \$29.0 billion in 2007, up 3.3% from the estimated \$28.1 billion in 2006 (Table 1-1).
- The higher education sector is projected to account for half (\$459 million) of the anticipated overall growth of \$917 million. The business enterprise sector will likely account for 43% or \$416 million of the increase (Table 1-3).
- The intentions indicate that the business enterprise sector will continue to be the largest R&D performer. Its investment will amount to \$15.8 billion, followed by the higher education sector at \$10.4 billion (Table 1-3).
- Combined, these two sectors should continue to perform 90% of total R&D in 2007 as they have been since 2003 (Table 1-3).
- The value of the federal government's performance of R&D is expected to increase by \$40 million, or 1.7%, to reach \$2.3 billion (Table 1-3).
- In terms of R&D funding, business enterprises are expected to account for nearly 48% of the total funding. The federal government will continue as the second largest funder, accounting for almost 19% of the total (Table 1-3).
- Figures on provincial distribution of R&D spending are available up to 2005. In four provinces – Newfoundland and Labrador, Nova Scotia, New Brunswick and Manitoba – the higher education sector performed over half of the total R&D in 2005. In Quebec, Ontario and British Columbia, business enterprises performed over half (Table 5-1).

Analysis

Gross domestic expenditure on research and development, 2007 intentions

Gross domestic expenditure on research and development (GERD) represents total research and development (R&D) expenditures performed in a country's national territory during a given year. GERD includes R&D performed within a country and funded from all sources, including governments, business enterprises, non-profit organizations, higher education institutions and foreign sources, but excludes payments sent abroad for R&D performed in other countries.

International comparisons

International comparisons of the levels of effort devoted to research and development (R&D) can be confounded by constantly fluctuating exchange rates among international currencies and changes in the relative costs of human resources and financial imports into the R&D programs of different nations. One of the methods the Organisation for Economic Co-operation and Development (OECD) employs to circumvent these difficulties is to express the gross domestic expenditure on research and development (GERD) as a ratio of gross domestic product (GDP). This ratio has become a standard OECD tool for international comparisons and also a convenient summary statistic. However, as a summary statistic, it is influenced by the economic structure and by the propensity to perform R&D in particular sectors. Both change from country to country.

The GERD/GDP ratio for 2006 is 1.94, down from the high of 2.05 hit in 2004. Total R&D spending registered a slight decline (-1.0%) between 2005 and 2006 in constant dollars indicating that investment in R&D in Canada is slowing while the overall economy is expanding (2.8%) (Table 1-1).

Internationally comparable data are available from the OECD for 2005. In that year Sweden with a GERD/GDP ratio of 3.89 led OECD countries with Finland following at 3.48. Canada ranks eleventh on the list of countries while the United States of America is in sixth place (Table 1-2).

Regional comparisons

Estimates of R&D activities by region may be easily misunderstood. For example, the financial data are identified with the region of the physical location of the R&D performer. It would be wrong to assume all of the expenditures of a performer are spent in the region of location. Supplies and equipment can be purchased from other regions or countries. Furthermore, in cases such as the National Capital Region (NCR), labour moves freely between Quebec and Ontario so that even wages and salaries paid by an R&D performer are partly spent outside the reference province.

Expenditures for R&D performed by the federal government in the NCR are excluded from the provincial totals and are reported separately. However, these expenditures, distributed geographically, are presented in Table 6.

The private non-profit (PNP) sector appears in both the performing and funding sector for the gross domestic expenditures on research and development (GERD) for Canada. Commencing with reference year 2000, the data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development by performing sector include the PNP sector. The data for the private non-profit sector funding research and development continue to be distributed by provinces, territories and the National Capital Region.

Figures on provincial distribution of R&D spending are available up to 2005. Quebec continued to lead the provinces in the provincial GERD to provincial GDP ratio at 2.6 in 2005; Ontario followed at 2.3. New Brunswick, Saskatchewan and Alberta at 1.0 reported the lowest provincial GERD to provincial GDP ratios slightly higher than the ratio reported by Hungary (0.94) and lower than Spain (1.12) (Table 3).

Ontario was the major performer of R&D in Canada with 45% of total R&D performance, Quebec followed at 26%. Taken together the Atlantic provinces represented 3.8% of total Canadian GERD whereas the three Prairies provinces combined for 12% (Table 3).

Related products

Selected publications from Statistics Canada

88-202-X	Industrial Research and Development...intentions
88-204-X	Federal Scientific Activities
88-522-X	Science and Technology Activities and Impacts: A Framework for a Statistical Information
88F0006X	Science, Innovation and Electronic Information Division Working Papers
88F0006X2001005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1990-91 to 1998-99
88F0006X2002008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1991-92 to 1999-2000
88F0006X2003008	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1994-95 to 2000-2001
88F0006X2004005	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1995-1996 to 2001-2002
88F0006X2005002	Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1996-1997 to 2002-2003
88F0006X2005019	Estimation of Research and Development Expenditures in the Higher Education Sector, 2003-2004
88F0017M	Science, Innovation and Electronic Information Division Research Papers

Selected technical and analytical products from Statistics Canada

88F0017M1999006	Diffusion of Biotechnologies in Canada: Results from the Survey of Biotechnology Use in Canadian Industries
88F0017M2000008	Explaining Rapid Growth in Canadian Biotechnology Firms
88F0017M2001009	Internationally Comparable Indicators on Biotechnology: A Stocktaking, a Proposal for Work and Supporting Material
88F0017M2001010	Analysis of the Survey on Innovation, Advanced Technologies and Practices in the Construction and Related Industries, 1999

88F0017M2001011	Capacity to Innovate, Innovation and Impact: The Canadian Engineering Services Industry
88F0017M2001012	Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998 AMT Survey Results

Selected CANSIM tables from Statistics Canada

358-0001	Gross domestic expenditures on research and development, by science type and by funder and performer sector, annual
358-0024	Business enterprise research and development (BERD) characteristics, by industry group based on the North American Industry Classification System (NAICS), annual
358-0026	Intellectual property management, by federal departments and agencies indicators, annual

Selected surveys from Statistics Canada

4201	Research and Development in Canadian Industry
4204	Research and Development of Canadian Private Non-Profit Organizations
4208	Provincial Research Organizations (PRO)
4209	Provincial Government Activities in the Natural Sciences
4212	Federal Science Expenditures and Personnel, Activities in the Social Sciences and Natural Sciences

Selected summary tables from Statistics Canada

- *Research and development performed by the business enterprise sector*
- *Domestic spending on research and development (GERD), funding sector, by province*
- *Domestic spending on research and development (GERD), performing sector, by province*
- *Domestic spending on research and development (GERD)*

Statistical tables

Table 1-1
Gross domestic expenditure on research and development — In current dollars, in 2002 dollars and as a percentage of the gross domestic product

	Current dollars		Gross domestic expenditure on research and development over Gross domestic product	Gross ² domestic product implicit price index	2002 constant dollars
	Gross domestic expenditure on research and development	Gross ¹ domestic product				Gross domestic^{3} expenditure on research and development
	millions of dollars		ratio	index = 2002	millions of dollars
1993	12,184	727,184	1.68	87.2	13,972
1994	13,341	770,873	1.73	88.2	15,126
1995	13,754	810,426	1.70	90.2	15,248
1996 r	13,817	836,864	1.65	91.6	15,084
1997 r	14,635	882,733	1.66	92.7	15,787
1998 r	16,088	914,973	1.76	92.3	17,430
1999 r	17,638	982,441	1.80	93.9	18,784
2000 r	20,581	1,076,577	1.91	97.8	21,044
2001 r	23,132	1,108,048	2.09	98.9	23,389
2002 r	23,532	1,152,905	2.04	100.0	23,532
2003 r	24,635	1,213,175	2.03	103.3	23,848
2004 r	26,480	1,290,828	2.05	106.6	24,841
2005 r	27,699	1,375,080	2.01	110.2	25,135
2006 p	28,067	1,446,307	1.94	112.8	24,882
2007 p	28,984	..	..	..	..

1. CANSIM, table 380-0017.

2. CANSIM, table 384-0036.

3. Gross domestic expenditure on research and development data are deflated by the gross domestic product implicit price index.

Table 1-2
Gross domestic expenditure on research and development — As a percentage of gross domestic product for selected OECD countries

	2001 r	2002 r	2003 r	2004 r	2005 p	2006 p	2005
	ratio						rank
Total OECD	2.27	2.23	2.24	2.21	2.25	..	
Austria	2.03	2.12	2.23	2.22	2.41	2.45	9
Belgium	2.08	1.94	1.89	1.87	1.86	1.85	12
Canada	2.09	2.04	2.01	2.01	1.98	1.97	11
Denmark	2.39	2.51	2.58	2.50	2.45	2.43	8
Finland	3.30	3.36	3.43	3.45	3.48	3.45	2
France	2.20	2.23	2.17	2.15	2.13	2.12	10
Germany	2.46	2.49	2.52	2.49	2.48	2.51	7
Iceland	2.98	2.97	2.82	..	2.78	..	5
Italy	1.09	1.13	1.11	1.10	1.10	..	14
Japan	3.12	3.17	3.20	3.17	3.33	..	3
Korea	2.59	2.53	2.63	2.85	2.98	..	4
Sweden ¹	4.25	..	3.95	3.71	3.89	3.82	1
United Kingdom	1.83	1.83	1.79	1.73	1.78	..	13
United States of America ²	2.76	2.66	2.66	2.59	2.62	2.62	6

1. Underestimated or based on underestimated data.

2. Excludes most or all capital expenditures.

Source: Main Science and Technology Indicators, No. 2, DSTI, OECD, 2007.

Table 1-3
Gross domestic expenditure on research and development — By performing sector and funding sector

	Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit organizations	Foreign	Total
millions of dollars							
Performing sector							
1998 r	1,743	216	9,682	4,370	77	...	16,088
1999 r	1,859	233	10,399	5,082	63	...	17,637
2000 r	2,080	255	12,395	5,793	57	...	20,580
2001 r	2,103	276	14,266	6,424	63	...	23,132
2002 r	2,190	282	13,541	7,455	63	...	23,532
2003 r	2,083	278	14,039	8,143	92	...	24,635
2004 r	2,083	290	14,947	9,058	103	...	26,480
2005 r	2,414	300	15,356	9,518	112	...	27,699
2006 p	2,298	318	15,360	9,974	116	...	28,067
2007 p	2,338	324	15,773	10,433	116	...	28,984
Funding sector							
1998 r	2,830	640	7,355	2,339	372	2,552	16,088
1999 r	3,216	770	7,917	2,649	380	2,705	17,637
2000 r	3,560	879	9,224	2,892	445	3,580	20,580
2001 r	4,096	1,043	11,618	2,928	536	2,911	23,132
2002 r	4,250	1,172	12,098	3,462	628	1,921	23,532
2003 r	4,524	1,378	12,371	3,589	637	2,136	24,635
2004 r	4,648	1,392	13,082	4,147	735	2,476	26,480
2005 r	5,243	1,367	13,431	4,340	777	2,541	27,699
2006 p	5,265	1,428	13,463	4,549	814	2,548	28,067
2007 p	5,437	1,482	13,840	4,758	849	2,618	28,984

Table 2
Provincial statistics and their relationship to gross domestic expenditure on research and development, 2005

	Provincial gross domestic product ¹		Gross domestic expenditure on research and development		Population ²		Gross domestic expenditure on research and development	
	millions of dollars	%	millions of dollars	%	thousands	%	Over provincial gross domestic product ratio	Per capita dollars
Canada ³	1,375,080	100	27,699	100	32,137	100	2.0	862
Newfoundland and Labrador	21,496	2	267	1	516	2	1.2	517
Prince Edward Island	4,118	0	63	0	138	0	1.5	457
Nova Scotia	31,575	2	464	2	938	3	1.5	497
New Brunswick	24,190	2	243	1	752	2	1.0	324
Quebec	272,672	20	7,193	26	7,574	24	2.6	950
Ontario	536,908	40	12,447	45	12,480	39	2.3	999
Manitoba	41,682	3	578	2	1,173	4	1.4	504
Saskatchewan	43,773	3	450	2	993	3	1.0	454
Alberta	222,159	16	2,286	8	3,239	10	1.0	712
British Columbia	169,404	12	2,462	9	4,230	13	1.5	593
National Capital Region								
Quebec	..	..	83	0	..	..	..	..
Ontario	..	..	1,040	4	..	..	..	..

1. CANSIM, table 384-0002.

2. CANSIM, table 051-0005.

3. Includes the Yukon Territory, Northwest Territories and Nunavut.

Note(s): Quebec and Ontario figures exclude federal government expenditures on research and development performed in the National Capital Region. The private non-profit (PNP) sector appears in both the performing and funding sector for the gross domestic expenditure on research and development (GERD) for Canada. Commencing with reference year 2000 the data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development by performing sector include the PNP sector. The data for the private non-profit sector funding research and development continue to be distributed by provinces, territories and the National Capital Region.

Table 3
Provincial distribution of the gross domestic expenditure on research and development

	Total ¹ Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
millions of dollars							
1996 r	13,817	102	17	257	152	3,800	6,174
1997 r	14,635	103	17	259	129	3,933	6,788
1998 r	16,088	119	24	311	157	4,325	7,464
1999 r	17,638	127	25	341	167	4,885	8,114
2000 r	20,581	138	37	361	159	5,678	9,558
2001 r	23,132	142	37	376	162	6,377	10,848
2002 r	23,532	153	31	399	211	6,682	10,427
2003 r	24,635	173	43	409	215	6,943	10,970
2004 r	26,480	173	41	443	224	7,171	11,927
2005	27,699	267	63	464	243	7,193	12,447
percent							
Canada total as a percentage							
1996 r	100.0	0.7	0.1	1.9	1.1	27.5	44.7
1997 r	100.0	0.7	0.1	1.8	0.9	26.9	46.4
1998 r	100.0	0.7	0.1	1.9	1.0	26.9	46.4
1999 r	100.0	0.7	0.1	1.9	0.9	27.7	46.0
2000 r	100.0	0.7	0.2	1.8	0.8	27.6	46.4
2001 r	100.0	0.6	0.2	1.6	0.7	27.6	46.9
2002 r	100.0	0.7	0.1	1.7	0.9	28.4	44.3
2003 r	100.0	0.7	0.2	1.7	0.9	28.2	44.5
2004 r	100.0	0.7	0.2	1.7	0.9	27.1	45.0
2005	100.0	1.0	0.2	1.7	0.9	26.0	45.0
Provincial gross domestic product as a percentage							
1996 r	1.7	1.0	0.6	1.3	0.9	2.1	1.8
1997 r	1.7	1.0	0.6	1.3	0.8	2.1	1.9
1998 r	1.8	1.1	0.8	1.5	0.9	2.2	2.0
1999 r	1.8	1.0	0.8	1.5	0.9	2.3	2.0
2000 r	1.9	1.0	1.1	1.5	0.8	2.5	2.2
2001 r	2.1	1.0	1.1	1.5	0.8	2.8	2.4
2002 r	2.0	0.9	0.8	1.5	1.0	2.8	2.2
2003 r	2.0	1.0	1.1	1.4	1.0	2.8	2.2
2004 r	2.1	0.9	1.0	1.5	0.9	2.7	2.3
2005	2.0	1.2	1.5	1.5	1.0	2.6	2.3

See footnotes at the end of the table.

Table 3 – continued

Provincial distribution of the gross domestic expenditure on research and development

	Manitoba	Saskatchewan	Alberta	British Columbia	National Capital Region
millions of dollars					
1996 r	294	232	1,005	1,001	771
1997 r	271	288	1,051	1,038	757
1998 r	298	279	1,183	1,113	811
1999 r	385	323	1,165	1,290	808
2000 r	394	377	1,319	1,606	889
2001 r	457	396	1,587	1,760	926
2002 r	453	435	1,709	1,949	1,015
2003 r	456	398	1,878	2,051	999
2004 r	514	423	2,153	2,338	960
2005	577	450	2,286	2,462	1,123
percent					
Canada total as a percentage					
1996 r	2.1	1.7	7.3	7.3	5.6
1997 r	1.9	2.0	7.2	7.1	5.2
1998 r	1.9	1.7	7.4	6.9	5.0
1999 r	2.2	1.8	6.6	7.3	4.6
2000 r	1.9	1.8	6.4	7.8	4.3
2001 r	2.0	1.7	6.9	7.6	4.0
2002 r	1.9	1.8	7.3	8.3	4.3
2003 r	1.9	1.6	7.6	8.3	4.1
2004 r	1.9	1.6	8.1	8.8	3.6
2005	2.1	1.6	8.3	9.1	4.1
Provincial gross domestic product as a percentage					
1996 r	1.0	1.0	1.0	0.9	...
1997 r	0.9	1.0	1.0	0.9	...
1998 r	1.0	0.9	1.1	1.0	...
1999 r	1.2	1.0	1.0	1.1	...
2000 r	1.2	1.1	0.9	1.2	...
2001 r	1.4	1.2	1.1	1.3	...
2002 r	1.3	1.3	1.1	1.4	...
2003 r	1.3	1.1	1.1	1.4	...
2004 r	1.3	1.0	1.1	1.5	...
2005	1.4	1.0	1.0	1.5	...

1. Includes the Yukon Territory, Northwest Territories and Nunavut.

Note(s): Quebec and Ontario figures exclude federal government expenditures on research and development performed in the National Capital Region. The private non-profit (PNP) sector appears in both the performing and funding sector for the gross domestic expenditure on research and development (GERD) for Canada. Commencing with reference year 2000 the data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development by performing sector include the PNP sector. The data for the private non-profit sector funding research and development continue to be distributed by provinces, territories and the National Capital Region.

Table 4-1
Research and development expenditures in the provinces — By the federal government

	Total Canada ¹	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
millions of dollars							
Performing sector							
1996	1,792	25	10	79	32	226	348
1997	1,720	23	10	71	29	212	302
1998	1,743	26	10	77	32	227	276
1999	1,859	25	12	72	32	250	322
2000	2,080	30	16	88	27	350	314
2001	2,103	27	16	70	26	372	328
2002	2,190	32	8	76	46	370	324
2003	2,083	23	12	66	30	315	351
2004	2,083	23	10	81	26	320	329
2005	2,414	28	28	66	26	368	395
Funding sector							
1996 r	2,814	42	12	112	44	546	718
1997 r	2,813	40	11	108	43	546	741
1998 r	2,830	45	12	113	45	541	736
1999 r	3,216	48	14	113	50	665	867
2000 r	3,560	54	19	129	43	806	899
2001 r	4,096	52	20	121	45	999	1,127
2002 r	4,250	63	13	131	69	993	1,114
2003 r	4,524	61	20	131	62	1,053	1,286
2004 r	4,648	60	18	157	57	1,067	1,323
2005	5,243	80	37	150	62	1,168	1,497
percent							
Canada total as a percentage							
Performing sector							
1996	100.0	1.4	0.6	4.4	1.8	12.6	19.4
1997	100.0	1.3	0.6	4.1	1.7	12.3	17.5
1998	100.0	1.5	0.6	4.4	1.8	13.0	15.8
1999	100.0	1.3	0.6	3.9	1.7	13.4	17.3
2000	100.0	1.4	0.8	4.2	1.3	16.8	15.1
2001	100.0	1.3	0.8	3.3	1.2	17.7	15.6
2002	100.0	1.5	0.4	3.5	2.1	16.9	14.8
2003	100.0	1.1	0.6	3.1	1.4	15.1	16.9
2004	100.0	1.1	0.5	3.9	1.2	15.4	15.8
2005	100.0	1.2	1.2	2.7	1.1	15.2	16.4
Funding sector							
1996 r	100.0	1.5	0.4	4.0	1.6	19.4	25.5
1997 r	100.0	1.4	0.4	3.8	1.5	19.5	26.4
1998 r	100.0	1.6	0.4	4.0	1.6	19.1	26.0
1999 r	100.0	1.5	0.4	3.5	1.5	20.7	27.0
2000 r	100.0	1.5	0.5	3.6	1.2	22.6	25.3
2001 r	100.0	1.3	0.5	3.0	1.1	24.4	27.5
2002 r	100.0	1.5	0.3	3.1	1.6	23.4	26.3
2003 r	100.0	1.3	0.4	2.9	1.3	23.3	28.4
2004 r	100.0	1.3	0.4	3.4	1.2	23.0	28.5
2005	100.0	1.5	0.7	2.9	1.2	22.3	28.6

See footnotes at the end of the table.

Table 4-1 – continued

Research and development expenditures in the provinces — By the federal government

	Manitoba	Saskatchewan	Alberta	British Columbia	Subtotal Canada ¹	National Capital Region
millions of dollars						
Performing sector						
1996	77	47	94	78	1,021	771
1997	59	74	96	83	963	757
1998	49	54	94	85	932	811
1999	58	60	108	106	1,051	808
2000	69	62	117	111	1,191	889
2001	77	63	98	97	1,177	926
2002	72	53	92	99	1,175	1,015
2003	63	54	87	80	1,084	999
2004	73	54	110	91	1,123	960
2005	83	68	130	91	1,291	1123
Funding sector						
1996 r	108	74	192	205	2,059	755
1997 r	88	97	195	200	2,072	741
1998 r	81	78	182	198	2,032	798
1999 r	98	103	219	238	2,421	795
2000 r	111	120	234	262	2,688	872
2001 r	123	123	282	289	3,189	907
2002 r	131	113	281	338	3,256	994
2003 r	131	121	321	340	3,541	983
2004 r	146	123	326	408	3,703	945
2005	157	126	400	416	4,140	1,103
percent						
Canada total as a percentage						
Performing sector						
1996	4.3	2.6	5.2	4.4	57.0	43.0
1997	3.4	4.3	5.6	4.8	56.0	44.0
1998	2.8	3.1	5.4	4.9	53.4	46.6
1999	3.1	3.2	5.8	5.7	56.6	43.4
2000	3.3	3.0	5.6	5.3	57.3	42.7
2001	3.7	3.0	4.7	4.6	56.0	44.0
2002	3.3	2.4	4.2	4.5	53.7	46.3
2003	3.0	2.6	4.2	3.8	52.0	48.0
2004	3.5	2.6	5.3	4.4	53.9	46.1
2005	3.4	2.8	5.4	3.8	53.5	46.5
Funding sector						
1996 r	3.8	2.7	6.8	7.3	73.2	26.8
1997 r	3.1	3.4	6.9	7.1	73.7	26.3
1998 r	2.9	2.7	6.5	7.0	71.8	28.2
1999 r	3.0	3.2	6.8	7.4	75.3	24.7
2000 r	3.2	3.4	6.6	7.4	75.5	24.5
2001 r	3.1	3.0	6.9	7.1	77.9	22.1
2002 r	3.1	2.7	6.6	8.0	76.6	23.4
2003 r	2.9	2.7	7.1	7.5	78.3	21.7
2004 r	3.1	2.6	7.0	8.8	79.7	20.3
2005	3.0	2.4	7.6	7.9	79.0	21.0

1. Includes the Yukon Territory, Northwest Territories and Nunavut.

Note(s): Quebec and Ontario figures exclude federal government expenditures on research and development performed in the National Capital Region.

Table 4-2
Research and development expenditures in the provinces — By business enterprise

	Total Canada ¹	New- found- land and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskat- chewan	Alberta	British Columbia
millions of dollars											
Performing sector											
1996 r	7,997	16	3	54	59	2,393	4,257	93	58	524	538
1997 r	8,739	14	3	54	35	2,519	4,833	89	82	545	564
1998 r	9,682	17	3	62	39	2,764	5,394	102	74	618	608
1999 r	10,399	18	3	62	39	3,047	5,799	148	78	490	714
2000 r	12,395	20	5	67	40	3,642	6,857	133	76	583	973
2001 r	14,266	21	6	91	41	4,158	7,899	173	87	710	1,079
2002 r	13,541	22	4	93	62	4,155	7,064	155	112	782	1,093
2003 r	14,039	31	7	79	64	4,202	7,384	150	88	861	1,173
2004 r	14,947	29	7	89	79	4,301	7,717	178	112	1,030	1,399
2005	15,356	86	8	94	83	4,183	8,030	196	150	1,073	1,450
Funding sector											
1996 r	6,395	18	3	49	60	2,142	3,107	87	59	466	389
1997 r	7,030	19	2	39	41	2,219	3,574	96	80	486	459
1998 r	7,355	23	3	44	44	2,461	3,591	105	58	481	531
1999 r	7,917	18	2	62	43	2,721	3,852	120	72	406	608
2000 r	9,225	20	5	67	44	3,251	4,260	140	77	507	835
2001 r	11,619	15	6	82	43	3,673	5,906	179	85	677	935
2002 r	12,098	23	4	84	64	3,718	6,158	157	117	802	952
2003 r	12,371	31	5	70	69	3,797	6,319	157	98	842	966
2004 r	13,082	36	6	77	84	3,883	6,713	178	122	1,014	951
2005	13,431	98	7	94	84	3,768	6,967	197	154	1,077	965
percent											
Canada total as a percentage											
Performing sector											
1996 r	100.0	0.2	0.0	0.7	0.7	29.9	53.2	1.2	0.7	6.6	6.7
1997 r	100.0	0.2	0.0	0.6	0.4	28.8	55.3	1.0	0.9	6.2	6.5
1998 r	100.0	0.2	0.0	0.6	0.4	28.5	55.7	1.1	0.8	6.4	6.3
1999 r	100.0	0.2	0.0	0.6	0.4	29.3	55.8	1.4	0.8	4.7	6.9
2000 r	100.0	0.2	0.0	0.5	0.3	29.4	55.3	1.1	0.6	4.7	7.8
2001 r	100.0	0.1	0.0	0.6	0.3	29.1	55.4	1.2	0.6	5.0	7.6
2002 r	100.0	0.2	0.0	0.7	0.5	30.7	52.2	1.1	0.8	5.8	8.1
2003 r	100.0	0.2	0.0	0.6	0.5	29.9	52.6	1.1	0.6	6.1	8.4
2004 r	100.0	0.2	0.0	0.6	0.5	28.8	51.6	1.2	0.7	6.9	9.4
2005	100.0	0.6	0.1	0.6	0.5	27.2	52.3	1.3	1.0	7.0	9.4
Funding sector											
1996 r	100.0	0.3	0.0	0.8	0.9	33.5	48.6	1.4	0.9	7.3	6.1
1997 r	100.0	0.3	0.0	0.5	0.6	31.6	50.8	1.4	1.1	6.9	6.5
1998 r	100.0	0.3	0.0	0.6	0.6	33.5	48.8	1.4	0.8	6.6	7.2
1999 r	100.0	0.2	0.0	0.8	0.5	34.4	48.7	1.5	0.9	5.1	7.7
2000 r	100.0	0.2	0.1	0.7	0.5	35.3	46.2	1.5	0.8	5.5	9.1
2001 r	100.0	0.1	0.1	0.7	0.4	31.6	50.8	1.5	0.7	5.8	8.0
2002 r	100.0	0.2	0.0	0.7	0.5	30.7	50.9	1.3	1.0	6.6	7.9
2003 r	100.0	0.3	0.0	0.6	0.5	30.7	51.1	1.3	0.8	6.8	7.8
2004 r	100.0	0.3	0.0	0.6	0.6	29.7	51.3	1.4	0.9	7.8	7.3
2005	100.0	0.7	0.0	0.7	0.6	28.1	51.9	1.5	1.1	8.0	7.2

1. Includes the Yukon Territory, Northwest Territories and Nunavut and Industry funding of federal research and development in the National Capital Region.

Table 5-1
Provincial distribution of gross domestic expenditure on research and development — By performing sector, 2005

	Total ¹ Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
percent							
Canada total as a percentage							
All sectors	100.0	1.0	0.2	1.7	0.9	26.0	44.9
Federal government	100.0	1.2	1.2	2.7	1.1	15.2	16.4
Provincial governments ²	100.0	1.6	0.0	2.0	1.3	28.3	14.0
Business enterprise	100.0	0.6	0.0	0.6	0.5	27.2	52.3
Higher education	100.0	1.6	0.3	3.1	1.4	26.9	41.8
Private non-profit institutions	100.0	..	..	..	..	..	..
Provincial total as a percentage							
All sectors	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Federal government	8.7	10.5	44.4	14.2	10.7	5.1	3.2
Provincial governments ²	1.1	1.9	0.0	1.3	1.6	1.2	0.3
Business enterprise	55.4	32.2	12.7	20.3	34.2	58.2	64.5
Higher education	34.4	55.4	42.9	64.2	53.5	35.5	32.0
Private non-profit institutions	0.4	..	..	..	..	..	..
millions of dollars							
All sectors	27,699	267	63	464	243	7,193	12,447
Federal government	2,414	28	28	66	26	368	395
Provincial governments ²	300	5	0	6	4	85	42
Business enterprise	15,356	86	8	94	83	4,183	8,030
Higher education	9,518	148	27	298	130	2,557	3,980
Private non-profit institutions	112	..	..	..	..	..	..

See footnotes at the end of the table.

Table 5-1 – continued

Provincial distribution of gross domestic expenditure on research and development — By performing sector, 2005

	Manitoba	Saskatchewan	Alberta	British Columbia	National Capital Region
	percent				
Canada total as a percentage					
All sectors	2.1	1.6	8.3	8.9	4.1
Federal government	3.4	2.8	5.4	3.8	46.5
Provincial governments ²	1.3	5.0	40.7	5.7	0.0
Business enterprise	1.3	1.0	7.0	9.4	0.0
Higher education	3.1	2.3	10.1	9.5	0.0
Private non-profit institutions	..	..	..	..	..
As a percentage of the provincial total					
All sectors	100.0	100.0	100.0	100.0	100.0
Federal government	14.3	15.1	5.7	3.7	100.0
Provincial governments ²	0.7	3.3	5.3	0.7	0.0
Business enterprise	34.0	33.3	46.9	58.9	0.0
Higher education	51.0	48.3	42.1	36.7	0.0
Private non-profit institutions	..	..	..	..	..
	millions of dollars				
All sectors	577	450	2,286	2,462	1,123
Federal government	83	68	130	91	1,123
Provincial governments ²	4	15	122	17	0
Business enterprise	196	150	1,073	1,450	0
Higher education	294	217	961	904	0
Private non-profit institutions	..	..	..	..	..

1. Includes the Yukon Territory, Northwest Territories and Nunavut.

2. Includes provincial research councils and foundations.

Note(s): Quebec and Ontario figures exclude federal government expenditures on research and development performed in the National Capital Region. The private non-profit (PNP) sector appears in both the performing and funding sector for the gross domestic expenditure on research and development (GERD) for Canada. Commencing with reference year 2000 the data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development by performing sector include the PNP sector. The data for the private non-profit sector funding research and development continue to be distributed by provinces, territories and the National Capital Region.

Table 5-2
Provincial distribution of gross domestic expenditure on research and development — By funding sectors, 2005

	Total ¹ Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
percent							
Canada total as a percentage							
All sectors	100.0	1.0	0.2	1.7	0.9	26.0	45.0
Federal government	100.0	1.5	0.7	2.9	1.2	22.3	28.6
Provincial governments ²	100.0	0.5	0.0	1.0	0.5	28.7	34.7
Business enterprise	100.0	0.7	0.1	0.7	0.6	28.1	51.9
Higher education	100.0	1.8	0.4	3.6	1.8	12.1	41.3
Private non-profit institutions	100.0	0.3	0.1	3.1	0.8	21.3	46.0
Foreign	100.0	0.2	0.0	1.0	0.2	20.7	54.0
Provincial total as a percentage							
All sectors	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Federal government	18.9	29.9	58.7	32.3	25.5	16.2	12.0
Provincial governments ²	4.9	2.6	1.6	2.8	2.9	5.5	3.8
Business enterprise	48.5	36.6	11.1	20.3	34.6	52.4	56.0
Higher education	15.7	28.4	25.4	34.0	32.9	16.4	14.4
Private non-profit institutions	2.8	0.7	1.6	5.0	2.5	2.2	2.8
Foreign	9.2	1.8	1.6	5.6	1.6	7.3	11.0
millions of dollars							
All sectors	27,699	267	63	464	243	7,193	12,447
Federal government	5,244	80	37	150	62	1,168	1,497
Provincial governments ²	1,367	7	1	13	7	393	475
Business enterprise	13,431	98	7	94	84	3,768	6,966
Higher education	4,340	76	16	158	80	1,180	1,793
Private non-profit institutions	777	2	1	23	6	158	342
Foreign	2,540	5	1	26	4	526	1,373

See footnotes at the end of the table.

Table 5-2 – continued

Provincial distribution of gross domestic expenditure on research and development — By funding sectors, 2005

	Manitoba	Saskatchewan	Alberta	British Columbia	National Capital Region
percent					
Canada total as a percentage					
All sectors	2.1	1.6	8.3	8.9	4.1
Federal government	3.0	2.4	7.6	7.9	21.1
Provincial governments ²	1.5	2.2	21.7	8.0	0.1
Business enterprise	1.4	1.1	8.0	7.2	0.1
Higher education	3.4	2.6	9.1	8.7	0.0
Private non-profit institutions	4.9	0.2	8.2	13.2	..
Foreign	0.7	0.4	2.4	19.6	0.0
Provincial total as a percentage					
All sectors	100.0	100.0	100.0	100.0	100.0
Federal government	27.2	27.9	17.5	16.9	98.2
Provincial governments ²	3.6	6.7	13.0	4.4	0.1
Business enterprise	33.6	34.1	46.9	39.1	1.7
Higher education	25.9	25.6	17.3	15.3	0.0
Private non-profit institutions	6.4	3.3	2.7	4.0	..
Foreign	3.3	2.4	2.6	20.3	0.0
millions of dollars					
All sectors	577	450	2,286	2,462	1,123
Federal government	157	126	400	416	1,103
Provincial governments ²	21	30	297	109	1
Business enterprise	194	153	1,072	963	19
Higher education	149	115	396	377	0
Private non-profit institutions	37	15	61	98	..
Foreign	19	11	60	499	0

1. Includes the Yukon Territory, Northwest Territories and Nunavut.

2. Includes provincial research councils and foundations.

Note(s): Quebec and Ontario figures exclude federal government expenditures performed in the National Capital Region. The private non-profit (PNP) sector appears in both the performing and funding sector for the gross domestic expenditure on research and development (GERD) for Canada. Commencing with reference year 2000 the data for the private non-profit sector performing research and development are not distributed by provinces, territories or the National Capital Region. The national totals of research and development by performing sector include the PNP sector. The data for the private non-profit sector funding research and development continue to be distributed by provinces, territories and the National Capital Region.

Table 6

Research and development expenditures performed by the federal government in the National Capital Region

	National Capital Region		
	Quebec	Ontario	Total
millions of dollars			
1996	21	750	771
1997	20	737	757
1998	30	781	811
1999	33	775	808
2000	39	850	889
2001	41	885	926
2002	65	950	1,015
2003	49	950	999
2004	48	912	960
2005	83	1,040	1,123

Definitions

Gross domestic expenditure on research and development (GERD) is a statistical series, constructed by adding together the intramural expenditures on research and development (R&D) as reported by the performing sectors. As a term used by OECD Member countries, it is defined as "total intramural expenditure on R&D performed on the national territory during a given period. GERD includes R&D performed within a country and funded from abroad but excludes payments for R&D performed abroad".¹ GERD is constructed by adding together the intramural expenditures of the performing sectors.

GERD is often displayed as a matrix of performing and funding sectors. The GERD and GERD matrix are fundamental to the national and international examination of R&D expenditures.

The matrix illustrates three aspects of a country's R&D effort:

- it shows how much R&D each sector performed over a 12-month period;
- it shows the amount of R&D each sector financed over a 12-month period (as indicated by the R&D performing sector); and
- it indicates the flow of funds between sectors.

The GERD is an indicator of science and technology (S&T) activities; it is appropriately used as a summary of R&D activities and the basic flow of funds. General guidelines to follow when using a summary statistical series such as the GERD, include:

- Such series provide only a summary of very complex patterns of activities. The series should, therefore, be used in conjunction with other relevant information;
- Users generally refer to R&D data with a question in mind: "Is our national university research effort declining?" "Does my firm spend a higher proportion of its funds on R&D than the average for my industry?" etc. It is, therefore, necessary to identify the basic data relevant to each question in order to know which R&D indicator is best suited to answering the question. The user should keep in mind that the data used for the R&D indicator may be accurate enough to answer one question but not another.

Provincial estimates of GERD

In a country as large as Canada it is useful to have a general idea of where R&D activities are located both to indicate the level of scientific and technical endeavour in a particular area and to use the statistics in association with other provincial data. For these reasons, an estimate of the provincial distribution of the Canadian GERD has been prepared.

The definition of GERD in a provincial context is similar to that provided above.

The expenditures are assigned to the province in which the performing establishment is located. Personnel may live in an adjoining province (e.g., the National Capital Region) and materials and equipment will often come from another province or country; these factors must be taken into consideration when using GERD as a provincial indicator of S&T activity.

1. The Measurement of Scientific and Technological Activities - Proposed Standard Practice for Surveys of Research and Experimental Development, Frascati Manual 2002. OECD, Paris, 2002, p. 121.

The funding shown is of R&D carried out in a province; it is not R&D funding from a province. For example, when the federal government is shown as the funder for R&D in a province, the funds are received from the central government and are to be spent on R&D in an establishment in that province. The federal government, of course, raises funds from many sources, outside of that province. Similarly, when R&D is shown as being funded by the business enterprise sector, the funds are not necessarily raised from activities within the province.

Limitations of GERD

The GERD, like any other social or economic statistic, can only be approximately true. Different components are of different accuracy: sector estimates probably vary from 5% to 15% in accuracy. However, the GERD estimates are sufficiently reliable for their main use as an aggregate indicator for science policy.

One of the most important problems relating to GERD concerns its definition. There remains some ambiguity in defining precisely what constitutes R&D or, for example, in a continuing project, determining the precise point at which the project passes the boundary of R&D and becomes exploitation of a process or product on which it may be said that the R&D stage has been completed. This ambiguity is perhaps less serious in internal time series, where it may be expected that the year-to-year application of the definitions by the same reporting units are at least consistent.

A second difficulty arises with regards to survey design. The people best qualified to apply the R&D definitions and classifications - scientific and technical personnel engaged in the direct management of S&T activity - rarely participate in the statistical agency's data collection process. Because the data collected are concerned not with scientific and technical content, but financial and labour inputs to achieving this content, the questionnaires tend to be addressed to and completed by financial and management staff. This is a fundamental problem of all surveys addressed to large organizations, whether they are public or private.

These two problems account for the limited amount of geographic and scientific detail in the published GERD. The amount of detail presented, for example, in the Canadian GERD as published by Statistics Canada is limited by the nature of the surveys, and the other data collection and analysis instruments. Nor is it possible to increase the amount of detail because this would require switching to new kinds of data collection instruments in a vastly expanded survey operation.

Another reason for the limited detail about sectors stems from the fact that R&D is often a secretive endeavour. Private sector companies usually want to surprise competitors with a new product. Thus the money spent on the R&D may be reported, but details about R&D projects would not. Similarly, a government department such as National Defence might report R&D expenditures but not the nature and detail of the respective R&D projects.

To summarize, the GERD serves as a general indicator of R&D activity and not as a detailed inventory of R&D projects within an organization, sector, or province. It is an estimate and as such can show trends in R&D expenditures by sector and sub-sector, by province and country, from year-to-year. In this capacity, the GERD estimates are sufficiently reliable for their main use as an aggregate indicator for science policy.

R&D performers and funders categorized

Sectoring

Considering that the GERD is the aggregate of the total R&D expenditures of the performing sectors, it is useful now to look at these sectors individually. Sectors are reviewed in terms of an international (OECD) framework for measuring R&D expenditures. There are five major sectors of R&D performance and funding:

- Government;
- Business enterprise;
- Higher education;

- Private non-profit organizations;
- Foreign.

The sectors for the GERD, as chosen and defined by the OECD, are based largely on existing United Nations classifications and in particular, the System for National Accounts (SNA). Under the general heading of "Institutional classifications", the OECD approach focuses on the characteristic properties of the performing and funding institutions. Each statistical unit is classified according to its principal economic activity and, consequently, the whole of the R&D resources of the unit classified are allocated to one sector or sub-sector.

Government

The OECD definition of this sector is: "All departments, offices and other bodies which furnish, but normally do not sell to the community, those common services, other than higher education, which cannot otherwise be conveniently and economically provided, as well as those that administer the state and the economic and social policy of the community. (Public enterprises are included in the business enterprise sector)".²

Public enterprises such as Petro-Canada and Ontario Hydro are excluded from this sector and included in the business enterprise sector. Many non-profit organizations and bodies, however, are included in this sector if they either serve or are controlled by government, or both.

In Canada the distribution of GERD amongst the government sub-sectors are published. The sub-sectors are the federal government, the provincial governments and the provincial research organizations (PRO's). Currently Canada has seven PRO's. They are the New Brunswick Research and Productivity Council, the "Centre de recherche industrielle du Québec (CRIQ)", the Industrial Technology Centre (Manitoba), the Saskatchewan Research Council, the Yukon Research Institute, the Nunavut Research Institute and the Aurora Research Institute.

Business enterprise

This sector is composed of all firms, organizations and institutions whose primary activity is the production of goods or services for sale to the general public at a price intended approximately to cover at least the cost of production as well as non-profit institutes serving such firms. Included are government-owned enterprises such as Ontario Hydro and Canadian National Railways.

Higher education

This sector is composed of all universities, colleges of technology and other institutes of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating **under the direct control of** or **administered by** higher education establishments.

Private non-profit organizations

This sector comprises private or semi-private organizations which are not established primarily with the aim of making a profit.

It consists of voluntary associations (scientific and professional societies, health-oriented groups), philanthropic foundations and research institutes supported by the associations and foundations. These kinds of institutions are usually maintained by fees, dues and donations from members and sponsors and by grants from governments and enterprises. They may also obtain revenue from the sale of their products such as publications or special studies.

2. *Ibid.*, p. 62.

Non-profit institutes and organizations excluded from this sector are those which are controlled by enterprises, government, or higher education. Such non-profit institutes and organizations are included with the respective sectors whose interests they mainly serve.

The PNP sector appears in both the performing and funding sector for the GERD for Canada. Commencing with reference year 2000, the data for the PNP sector performing research and development are not distributed by provinces, territories or the national capital region. However, the national totals of research and development by performing sector include the PNP sector. The PNP sector continues to be distributed for the funding sector.

Foreign

This sector consists of: "All institutions and individuals located outside the political borders of a country, except vehicles, ships, aircraft and space satellites operated by domestic entities and testing grounds acquired by such entities.³

This sector also includes all international organizations (except business enterprises), including facilities and operations within the country's borders. Foreign-owned subsidiaries are not included in this sector (e.g., Ford Canada is, for the purposes for measuring R&D expenditures, a domestic organization in the Canadian business enterprise sector, even though its parent company is the Ford Motor Company of the United States).

The foreign sector is included in the GERD only as a funding sector (see matrix), since by definition the GERD includes R&D performed within a country and **funded from abroad** but excludes payments made abroad for R&D. Thus, funding from the foreign sector is implicitly included in the intramural expenditures of the four performing sectors.

Science type

Definitions for the natural sciences:

The natural sciences field embraces the disciplines of study concerned with understanding, exploring, developing or utilizing the natural world. Included are the engineering, mathematical, life and physical sciences.

Definitions for the social sciences:

The social sciences field embraces all disciplines involved in studying human actions and conditions and the social, economic and institutional mechanisms affecting humans. Included are such disciplines as anthropology, demography, economics, geography, history, languages, literature and linguistics, law, library science, philosophy, political science, psychology, religious studies, social work, sociology, and urban and regional studies.

3. *Op cit.*, p.72.