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Industrial Research and Development: Intentions

2007

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Note of appreciation

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Foreword

Innovation is essential to economic progress. Properly applied in developing new products and services, innovation may also conserve resources, preserve the environment, and add to our quality of life. The innovation process involves a number of elements concerned with the generation, dissemination and application of new knowledge: research and development (R&D) to provide new ideas; education and information services to develop the required personnel; and design, engineering and marketing services to incorporate the new ideas into the production and distribution systems.

R&D statistics, therefore, measure only part of the effort necessary for innovation. However, R&D is at the heart of the innovation process.

While R&D is also carried out by other sectors, such as governments and universities, industrial R&D is most clearly linked to technological innovation and, hence, economic growth. Canada does not, of course, rely only on domestic R&D for new ideas and innovation. A great deal of information comes from abroad in the form of information embodied in new machinery and equipment, in the minds of scientists and engineers, in scientific and technical journals, and in designs, drawings, tooling and manufacturing specifications. Some data are presented on the acquisition of R&D from abroad, but much of the flow of technological information cannot be measured.

In many ways it is more efficient to acquire the results of R&D performed by others since the cost of securing such information is usually less than the cost of duplicating it. However, some indigenous R&D is necessary not only to ensure that new inventions are appropriate to Canadian industry and market conditions, but also to ensure that foreign R&D can be properly assimilated, i.e., understood and adapted. It also provides Canadian firms with a better bargaining position for exchanges of technological information. Domestic performance of R&D is, therefore, necessary even if we wish only to be effective imitators and adapters.

Statistics Canada has collected data on R&D in Canadian industry for more than 50 years. Maintaining the continuity and comparability of these data over time is of considerable importance. This publication, the twentieth issue of an annual series, summarizes industrial R&D activities in Canada. It presents historical and current statistical information on industrial research and development activities for the years 1985 to 2007. Actual data for 2005 expenditures, 2006 preliminary estimates, and 2007 spending intentions are derived from the survey “Research and Development in Canadian Industry” conducted in 2006.

We are grateful to the responding firms who cooperated in this survey. We realize that the data requested are generally not readily available and require considerable effort to prepare. Any suggestions from these firms, or other users, for modifications to either the questionnaire or publication will be carefully considered.

This publication was prepared by Gisèle Bellefeuille, Senior Statistical Officer and Rob Schellings, Subject Matter Manager under the direction of Louise Earl, Chief, Science and Technology Surveys Section of the Science, Innovation and Electronic Information Division.

Enquiries regarding this publication should be directed to the Science, Innovation and Electronic Information Division.

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Highlights

- In 2007, firms performing research and development (R&D) dedicated $15.8 billion to industrial R&D spending up from $15.4 billion the previous year. Reported growth in R&D expenditures between 2005 and 2006 was flat while the estimated growth between 2006 and 2007 was 2.7% (table 1.3).

- The six leading industries performing R&D in 2007 continued to be information and cultural industries ($1.7 billion), communications equipment ($1.4 billion), scientific research and development (1.3 billion), computer system design and related services (1.3 billion), pharmaceutical and medicine ($1.1 billion), and aerospace products and parts ($1.0 billion). Together these industries represent half (49.5%) of industrial R&D expenditures (table 1.17).

- R&D activities provided employment to 137,686 full-time equivalents in 2005, up (8.9%) from 126,431 in 2003. Scientists and engineers accounted for 81,955 full-time jobs or 60% of the R&D personnel. Technicians, administrators and support staff comprised the remaining 55,731 full-time equivalents (table 2.2).

- The four most important provincial contributors to gross domestic product are the provinces in which the highest levels of industrial R&D spending occur. The largest amount spent on R&D by industry occurred in Ontario ($8.0 billion or 52%) followed by Québec ($4.2 billion or 27%), British Columbia ($1.5 billion or 9%) and Alberta ($1.1 billion or 7%) (table 1.30).

- The number of industrial research and development (R&D) performers in Canada is multiplying up from 9,967 in 1999 to 17,222 in 2004 representing an increase of 72.8% (table B.2).

- Between 1999 and 2004, R&D performers in manufacturing lost ground slightly dropping from 47% of all R&D performers in 1999 to 45% in 2004 whereas the proportion of R&D performers in the services gained a very small share, up from 47% in 1999 to 48% six years later (table B.4).

- The industries making the greatest increases in R&D performers between 1999 and 2004 based on percentage change are printing (231.3%), agriculture (179.3%), and furniture and related products (161.6%). These industries all started as small performers in 1999, printing had just 67 performers, agriculture 179 and furniture and related products 99 (table B.4).

- Between 1999 and 2004 the number of R&D performers in computer system design and related services increased by a count of 926 to attain 2,203 in 2004. Computer system design and related services was also the industry with the largest number of R&D performers in 2004 and represented 13% of all R&D performers (table B.4).

- The next largest increase in number of R&D performers was in wholesale trade which increased by 609 over the period to reach 1,383 in 2004. Some of the wholesale trade performers will be performing R&D related to their products, for instance pharmaceutical products. This is due to how the firms are classified by industry (table B.4).

- Only two industries, mining and computer and peripheral equipment, lost R&D performers between 1999 and 2004 (table B.4).

- Geographically, R&D performers are concentrated in Quebec and Ontario. Between 1999 and 2004, Quebec's share of R&D performers has remained stable at 40% and Ontario's share has increased from 34% in 1999 to 38% in 2004. Provinces that saw decreases in their shares of R&D performers between 1999 and 2004 were Nova Scotia, New Brunswick, Saskatchewan and Alberta (table B.3).

- The number of R&D performers in Ontario increased by 3,127 between 1999 and 2004 while Quebec saw an increase of 2,864 during the same period. Together these provinces accounted for the vast majority in the increase of R&D performers (5,991 or 83%) in the six years (table B.2).

- R&D performers represented just 1.1% of firms with at least one employee in 1999 while in 2004 this share had increased to 1.8%. Perhaps indicating a growing interest in innovation, all sectors and industries studied showed increases in their propensity to perform R&D between 1999 and 2004 (table B.6).

- Of interest is the fact that 14% of manufacturing firms with at least one employee were R&D performers whereas just 1.1 service sector firms performed R&D in 2004 (table B.6).

- The R&D intensity of manufacturing firms has almost doubled from 1999 (7.3%) to its 2004 height of 14% which reflects a combination of a decrease (-13.7% or 8,687) of manufacturing firms between the two years as well as an increase in the number of R&D performers over the same time (66.3% or 3,075 additional R&D performers). This suggests that R&D performance is perceived as important by those manufacturing firms with one or more employees operating in 2004 (table B.1, B.5 and B.6).

- The communications equipment industry at 56.5% was the industry in which firms had the highest propensity to perform R&D in 2004 while firms in health care and social assistance (0.2%), retail trade (0.3%) and transportation and warehousing (0.3%) were the least likely to be R&D performers (table B.6).

- Other R&D intensive industries included pharmaceutical and medicine (47.4%), semiconductor and other electronic components (37.8%) and scientific research and development (37.2%) in 2004 (table B.6).

1. R&D expenditures

International comparisons

- The business enterprise expenditure on research and development (BERD) ratio, business research and development (R&D) expenditures as a percentage of the gross domestic product (GDP), is a measure of the intensity, and therefore the degree of commitment, of business to R&D activity in a given country. The gross domestic expenditure on research and development (GERD) ratio measures R&D by all sectors of the economy, while the BERD measures R&D intensity by the business sector. Both ratios tend to shift fairly slowly over time.

- Overall, the BERD ratio for selected OECD member countries has increased from 1.38 in 1995 to 1.53 in 2005. For Canada, the BERD ratio moved from 0.99 in 1995 to 1.07 in 2005.

- The ratio has two components, the numerator, is business R&D expenditures, and the denominator, is the GDP, therefore changes in either component can shift the ratio. This is illustrated by the BERD ratio for Canada. The ratio's decline between 2004 and 2005 indicates Canadian businesses intended to spend slightly less on R&D while the Canadian GDP grew.

Table 1.1 International comparison of business enterprise expenditures on research and development (BERD) as a percentage of GDP, by selected OECD countries

	2005[r]	2004[r]	2003[r]	2002	1995
	percent				
Sweden	2.88	2.73	2.93	..	2.46
Japan	2.54	2.38	2.40	2.36	1.90
Finland	2.47	2.42	2.42	2.34	1.43
Korea	2.29	2.18	2.00	1.90	1.75
United States	1.83	1.79	1.84	1.86	1.77
Germany	1.72	1.73	1.76	1.72	1.45
Denmark	1.67	1.70	1.78	1.73	1.04
Austria	1.64	1.51	..	1.42	..
Iceland	1.43	..	1.46	1.70	0.49
Luxembourg	1.39	1.46	1.48	..	..
France	1.34	1.36	1.36	1.41	1.39
Belgium	1.26	1.29	1.31	1.37	1.19
United Kingdom	1.09	1.09	1.14	1.19	1.27
Canada	**1.07**	**1.12**	**1.13**	**1.17**	**0.99**
Australia	1.04	0.96	0.92	0.89	0.84
Netherlands	1.01	1.03	1.01	0.98	1.03
Czech Republic	0.91	0.79	0.76	0.73	0.62
Ireland	0.83	0.82	0.80	0.76	0.88
Norway	0.82	0.87	0.98	0.95	0.96
Switzerland	..	2.14	..	..	..
Total OECD	1.53	1.49	1.51	1.51	1.38

Note: Countries are presented in descending order of BERD as a percentage of GDP based on their information for the most recent year reported on the table.

Source: OECD, Main Science and Technology Indicators, volume 2007/2

Compared to GERD

- The distribution of R&D activities, as measured by R&D expenditures by performing sectors, has slowly shifted in Canada over the years. In 1984, the general distribution was one half by business, one quarter by higher education, one quarter by government and a small amount by private not-for-profit organizations.

- Business R&D reached its highest share in 2001 at 62% of all R&D, following the height of the "high-tech bubble". The business share of GERD has continued to drop slowly from 58% in 2002 through to 54% based on 2007 intentions.

- The share of R&D performed by government has declined from 25% (federal and provincial governments) in 1984 to 10% by 2001. Since 2001, R&D performance by the higher education sector has increased from 28% in 2001 to 36% in 2006 and 2007.

- R&D expenditures by business are seen as a significant component of GERD because they typically are focused on bringing new products to market. R&D performed by other sectors tends to be more focused on basic and applied research. Overall, Canada reports a very high proportion of R&D performed by higher education institutions and a lower proportion by businesses when compared with many OECD members.

Table 1.2 Gross domestic expenditures on research and development (GERD), by performing sector

	Federal government	Provincial government	Business enterprise[1]	Higher education	Private non-profit organizations	**Total**
	percent					
2007[p]	8	1	54	36	0	**100**
2006[p]	8	1	55	36	0	**100**
2005[p]	9	1	55	34	0	**100**
2004[p]	8	1	56	34	0	**100**
2003[p]	8	1	57	33	0	**100**
2002[r]	9	1	58	32	0	**100**
2001[r]	9	1	62	28	0	**100**
2000	10	1	60	28	0	**100**
1999	11	1	59	29	0	**100**
1998	11	1	60	27	0	**100**
1997	12	1	60	27	1	**100**
1996	13	2	58	27	1	**100**
1995	13	2	58	27	1	**100**
1994	13	2	57	28	1	**100**
1993	14	2	53	30	1	**100**
1992	15	3	51	31	1	**100**
1991	16	3	50	31	1	**100**
1990	16	3	50	30	1	**100**
1989	16	3	50	30	1	**100**
1988	16	3	51	30	1	**100**
1987	17	3	55	24	1	**100**
1986	19	3	53	24	1	**100**
1985	19	3	52	25	1	**100**
1984	22	3	48	26	1	**100**

1. Excludes R&D in the social sciences and humanities.
Note: Components may not add to totals due to rounding.

Trends

- Total intramural R&D expenditures fall in two general categories: current and capital expenditures. Current expenditures are those which relate to items "consumed" during the year such as wages and salaries, purchase of equipment and materials consumed in the course of performing R&D, annual subscriptions to technical journals, etc. By contrast, capital expenditures relate to the acquisition of longer-term assets. Examples would include the purchase of land, the construction of a new laboratory or the purchase of a piece of equipment which can be used for many years. Both current and capital expenditures are included in their entirety in the year in which they were incurred.

- The proportion of R&D expenditures composed of capital has been dropping steadily for 25 years. In 1985, capital accounted for 16% of all R&D expenditures; in 2006 and 2007 the figure was 6%.

- Constant dollars factor in the impact of inflation and enable more meaningful comparisons across extended time periods. What these figures indicate is that there have been two significant periods of growth in Canadian business R&D performance: 1999 to 2001 and 1992 to 1994. Since the major drop between 2001 and 2002 and the small revival in 2004, real expenditures by business have dropped slightly in each year. Despite this, real expenditures on R&D performance by Canadian business have increased by a factor of 2.8 between 1985 and 2007.

Chart 1.1 Current intramural research and development (R&D) expenditures

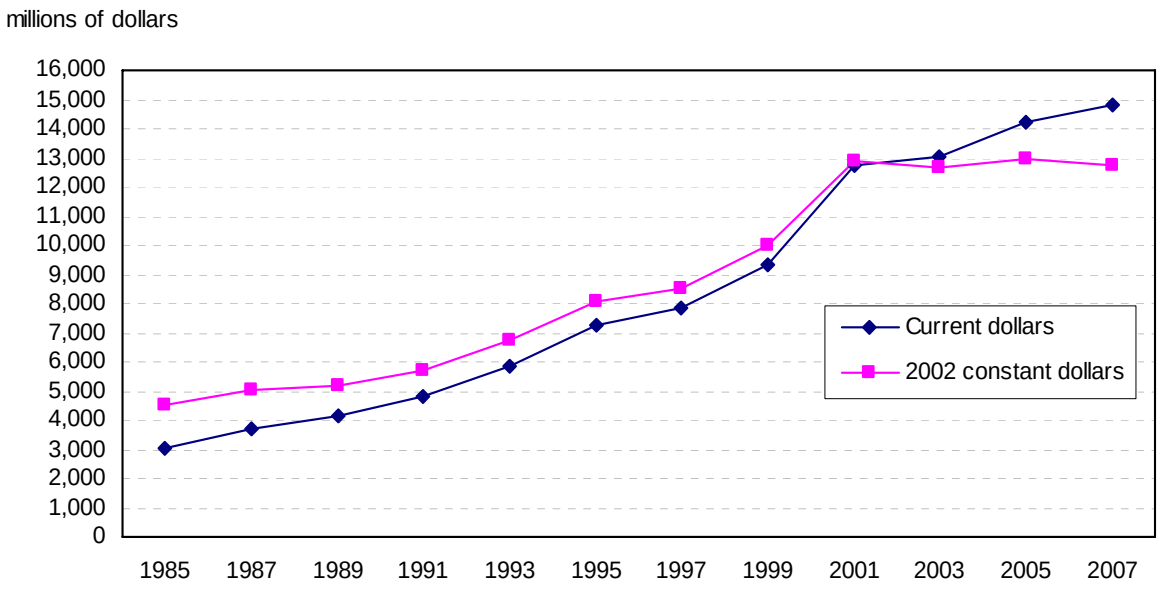


Table 1.3 Summary of industrial research and development (R&D) expenditures

	current dollars				2002 constant dollars	
	Current intramural expenditures[1]	Capital expenditures[1]	Total intramural expenditures[1]	GDP Implicit price index (2002)[2]	Current intramural expenditures	Capital expenditures
	millions of dollars			percent	millions of dollars	
2007[p]	14,846	927	15,773	116.4	12,754	796
2006[p]	14,363	997	15,360	112.8	12,734	883
2005[p]	14,246	1,110	15,356	110.2	12,927	1,007
2004[r]	13,888	1,059	14,947	106.6	13,028	993
2003[r]	13,062	977	14,039	103.3	12,645	945
2002[r]	12,490	1,052	13,541	100	12,490	1,052
2001[r]	12,767	1,499	14,266	98.9	12,909	1,516
2000	11,201	1,194	12,395	97.8	11,453	1,221
1999	9,361	1,039	10,399	93.9	9,969	1,106
1998	8,727	955	9,682	92.3	9,455	1,034
1997	7,874	865	8,739	92.8	8,485	932
1996	7,159	838	7,997	91.6	7,816	914
1995	7,286	705	7,991	90.2	8,077	781
1994[e]	6,938	629	7,567	88.2	7,866	713
1993	5,878	546	6,424	87.2	6,741	626
1992[e]	5,286	457	5,742	85.9	6,153	532
1991	4,812	543	5,355	84.8	5,674	640
1990	4,541	628	5,169	82.4	5,511	763
1989	4,155	624	4,779	79.8	5,207	782
1988	3,980	643	4,623	76.4	5,210	842
1987	3,691	649	4,340	73.1	5,049	888
1986	3,447	575	4,022	69.9	4,932	822
1985	3,054	579	3,633	67.8	4,504	854

1. Source: CANSIM table 358-0024
2. Source: CANSIM table 380-0056
Note: Components may not add to totals due to rounding.

Concentration among companies

- Concentration of industrial R&D is a longstanding phenomenon, but appears to be weakening over time. In 1985, the top 25 firms accounted for almost one half of industrial R&D performed. This dropped to just over one third by 2007. Looking at the top 100 performers, they accounted for over two-thirds of industrial R&D in 1985, falling to just over one-half in 2007.

- Another way of looking at the figures is to ask: "what is being performed by all the others?" Looked at this way, in 1985 all firms outside the top 100 were performing 32% of industrial R&D, while in 2007, they were performing 47%. By either measure, R&D activities are now more widely distributed across Canadian industry, with relatively less reliance on the top firms, than in the 1980s or 1990s.

Table 1.4 Concentration of total intramural industrial research and development (R&D) expenditures among companies

	Top 25	Top 50	Top 75	Top 100	**Total intramural expenditures**
	percent				millions of dollars
2007[p]	34	43	49	53	**15,773**
2006[p]	34	44	50	54	**15,360**
2005[p]	34	44	50	54	**15,356**
2004[r]	34	45	51	55	**14,947**
2003[r]	34	44	50	54	**14,039**
2002[r]	34	44	50	54	**13,541**
2001[r]	41	49	55	59	**14,266**
2000	46	54	60	64	**12,395**
1999[r]	44	54	59	63	**10,399**
1998	46	55	60	64	**9,682**
1997	44	53	59	63	**8,739**
1996	41	50	56	61	**7,997**
1995	39	48	54	58	**7,991**
1994[e]	39	49	54	58	**7,567**
1993	43	54	60	64	**6,424**
1992[e]	45	55	60	64	**5,742**
1991	47	57	63	67	**5,355**
1990	47	58	64	68	**5,169**
1989	48	59	64	68	**4,779**
1988	49	59	64	68	**4,623**
1987	49	58	64	67	**4,340**
1986	47	57	63	67	**4,022**
1985	48	58	64	68	**3,633**

Concentration among industries

- Certain industries are more likely to report performing R&D and they also report larger expenditures on performance.

- Historically, communications equipment has accounted for the largest share of Canadian business R&D performance, but in 2005 this industry group was overtaken by information and cultural industries, which now accounts for 11% of all industrial R&D in Canada. The industries included in information and cultural services which are most significant in terms of R&D expenditures are: wireless telecommunications, software publishing, followed by telecommunications resellers and data processing, hosting and related services.[1]

- Other high-R&D performing industries include pharmaceuticals, scientific R&D services, computer systems design and related services, aerospace products and parts and semiconductors and other electronic equipment. These top industries have accounted for about 45% of all industrial R&D throughout the period 2002 to 2007.

Table 1.5 Concentration of total intramural research and development (R&D) expenditures among selected industries

	2007[p]	2006[p]	2005[p]	2004[p]	2003[r]	2002[r]
	millions of dollars					
Total expenditures, all industries	**15,773**	**15,360**	**15,356**	**14,947**	**14,039**	**13,541**
	percent					
Information and cultural industries	11	11	10	9	8	5
Communications equipment	9	9	9	10	12	15
Pharmaceutical and medicine	7	7	8	8	8	9
Scientific research and development	8	8	8	8	7	7
Computer system design and related services	8	8	7	8	8	8
Aerospace products and parts	6	6	x	x	6	6
Semiconductor and other electronic components	6	6	5	5	5	6
Other industries	45	45	x	x	46	44

[1] Source: RDCI database, 2007

By company size

- A total of 17,222 firms reported performing R&D in 2004. Smaller firms with less than $10 million in revenues accounted for 81% of all performers, but only 22% of all R&D performed. By contrast, the largest firms with revenues of $400 million or more accounted for only 1% of all R&D performers but 42% of all R&D performed.

- Non-commercial firms are typically entities organized by industry associations to coordinate R&D related to a particular industry, industry consortia and R&D establishments funded from abroad and set up to perform R&D without any directly affiliated commercial activity in Canada.

- The average amount of R&D performed increased steadily by revenue size class. Firms with less than $1 million in revenues averaged $200,000 in R&D expenditures while those with revenues of $400 million or more averaged over $28 million in R&D expenditures. See Table 1.10 for measures of R&D commitment relative to firm revenues, where the smaller firms report a much higher proportion of revenue being allocated to the performance of R&D.

Table 1.6 Average total intramural research and development (R&D) expenditures, by revenue size, 2004

	Firms	Expenditures	Average expenditures
	number	millions of dollars	millions of dollars
Total	**17,222**	**14,947**	**0.9**
Non-commercial firms	17	193	11.3
Less than $1,000,000 dollars	6,726	1,187	0.2
$1,000,000 to $9,999,999 dollars	7,280	2,093	0.3
$10,000,000 to $49,999,999 dollars	2,210	1,825	0.8
$50,000,000 to $99,999,999 dollars	386	820	2.1
$100,000,000 to $399,999,999 dollars	382	2,525	6.6
$400,000,000 dollars or greater	221	6,304	28.5

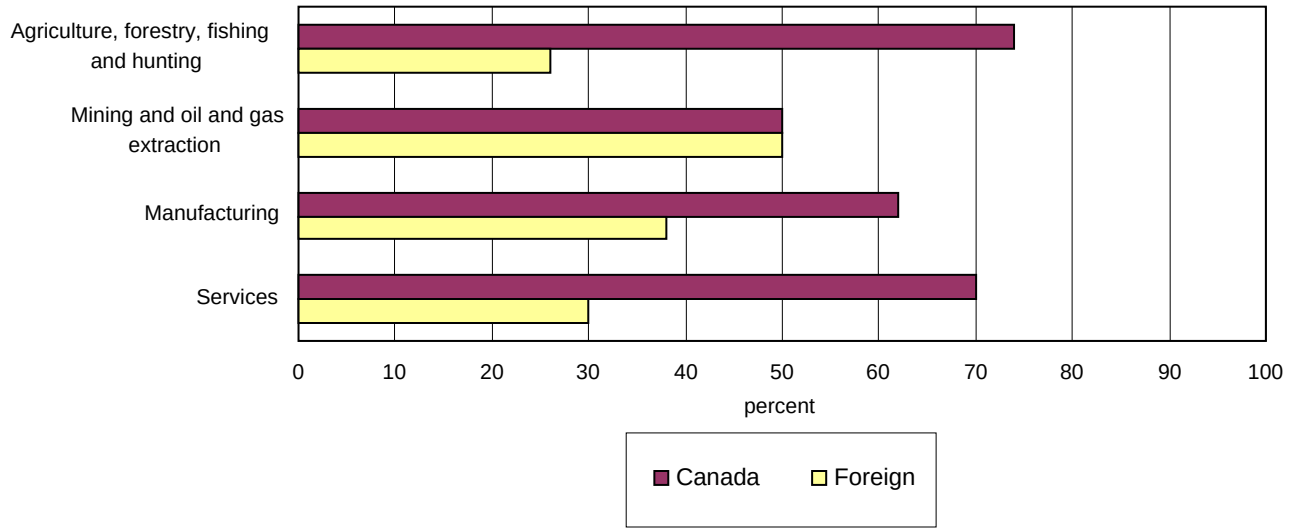
By country of control of performers

- The proportion of R&D performed by Canadian controlled companies has dropped slowly and steadily from 71% in 2001 to 66% in 2005. In mining, oil and gas and in the manufacturing sector, the proportion is about 60% and 61% respectively. Both of these two sectors have seen a reduced proportion of R&D performed by Canadian controlled firms over the period (table 1.7).

Table 1.7 Total intramural research and development (R&D) expenditures of Canadian-controlled companies compared to industry totals, by industry group

	2005[p]	2004[p]	2003[r]	2002[r]	2001[r]
	percent				
Total	**66**	**67**	**68**	**68**	**71**
Agriculture, forestry, fishing and hunting	74	74	78	77	73
Mining and oil and gas extraction	60	60	68	69	71
Utilities	x	x	100	100	100
Construction	x	x	x	100	x
Manufacturing	61	62	63	64	69
Services	71	x	x	73	x

Chart 1.2 Distribution of total intramural research and development (R&D) expenditures, by country of control of performers and by selected industry group, 2005



By size of R&D program

- R&D performance is, not surprisingly, highly concentrated by the size of the R&D spending of firms. Those firms performing $1 million or more worth of R&D accounted for 83% of all R&D performed. What is noteworthy is that this proportion dropped between 2001, when it was 88%, and 2005. All of the other categories reported an increased share of total R&D expenditures between 2001 and 2005 (table 1.8).

- "Internal corporate funds" was by far the largest single source of funds for industrial R&D, accounting for 78% of all funding for R&D performed. For firms with the smallest expenditure, it was almost the only source (table 1.9).

- For firms with the largest R&D programs ($1 million or more in R&D expenditures) the picture was rather different. These firms were able to draw upon a wider range of sources of funds. Internal funding accounted for 75% of all funds, while foreign sources accounted for the next largest share at 19% (table 1.9).

Table 1.8 Total intramural research and development (R&D) expenditures, by size of R&D program[1]

	2005[p]	2004[p]	2003[r]	2002[r]	2001[r]
	millions of dollars				
Total	**15,356**	**14,947**	**14,039**	**13,541**	**14,266**
Less than $50,000	152	150	134	116	107
$50,000 to $99,999	281	273	241	200	175
$100,000 to $199,999	497	458	421	351	314
$200,000 to $399,999	654	617	580	459	439
$400,000 to $999,999	976	883	863	786	720
$1,000,000 or greater	12,797	12,566	11,799	11,628	12,511

1. R&D program size is based on current intramural expenditures.
Note: Components may not add to totals due to rounding.

Table 1.9 Sources of funds for total intramural research and development (R&D), by size of R&D program[1], 2005

	Performing company	Federal government	Provincial governments	Other Canadian sources	Foreign sources	**Total**
	percent					
Total	**78**	**2**	**1**	**4**	**16**	**100**
Less than $50,000	98	1	0	1	0	**100**
$50,000 to $99,999	98	1	0	1	0	**100**
$100,000 to $199,999	97	1	0	1	1	**100**
$200,000 to $399,999	95	1	0	2	2	**100**
$400,000 to $999,999	92	1	1	4	2	**100**
$1,000,000 or greater	75	2	1	4	19	**100**

1. R&D program size is based on current intramural expenditures.
Note: Components may not add to totals due to rounding.

Compared to performing company revenues

- The distribution of "R&D intensity" (current intramural R&D expenditures as a percentage of performer revenues) by revenue size class has remained quite consistent in the interval from 2001 through 2005.

- R&D performers with revenues of $400 million or more accounted for 42% of all industrial R&D performed in 2004 (Table 1.6) and when their commitment is measured as a percentage of their revenues a very different picture emerges. These firms spend about 1% of their revenues on R&D performance. The proportion of R&D expenditures to revenues increases as revenue size category decreases. R&D performers with $10 million or more in revenues allocate about 3% to R&D expenditures, while those with revenues between $1 million and $10 million allocated 8%.

- The firms with less than $1 million in revenues reported allocating on average 42% of all their revenues to R&D in 2005. When looking at this figure, it is important to keep in mind that there are firms which may not report any revenues in a given year. Some R&D performing firms may rely on external financing including venture funds for their continued operation.

- Canadian controlled firms report consistently higher R&D intensity than foreign controlled firms.

Table 1.10 Current intramural research and development (R&D) expenditures as a percentage of performing company revenues, by company revenue size

	2005[p]	2004[p]	2003[r]	2002[r]	2001[r]
	percent				
Total	**1.7**	**1.9**	**1.8**	**1.9**	**2.1**
Less than $1,000,000	42.0	48.6	45.5	45.9	41.5
$1,000,000 to $9,999,999	8.2	7.6	8.8	9.4	10.2
$10,000,000 to $49,999,999	3.2	3.7	3.5	4.2	4.4
$50,000,000 to $99,999,999	2.9	2.9	2.8	3	3.2
$100,000,000 to $399,999,999	2.7	3.2	2.6	2.5	2.4
$400,000,000 or greater	1.0	1.1	1.1	1.1	1.4

Table 1.11 Current intramural research and development (R&D) expenditures of company revenues, by country of control

	2005[p]	2004[p]	2003[r]	2002[r]	2001[r]
	percent				
Total	**1.7**	**1.9**	**1.8**	**1.9**	**2.1**
Canada	2.0	2.2	1.9	2.0	2.5
Foreign	1.4	1.6	1.7	1.7	1.5

By sources of funds

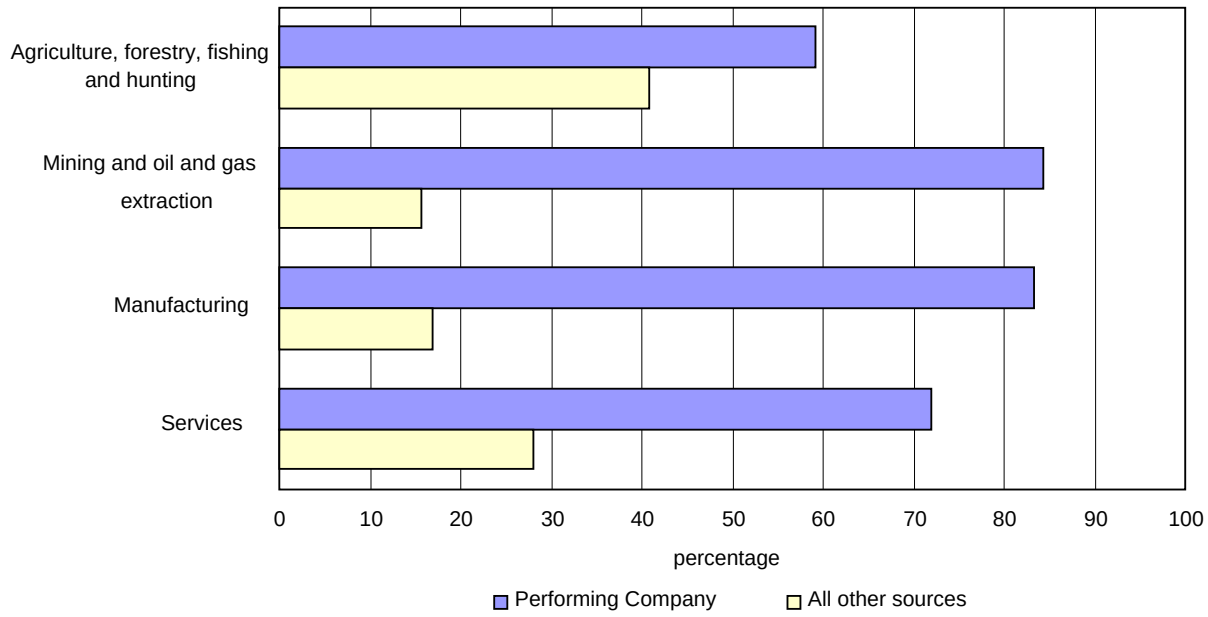
- Funding for intramural R&D came predominantly from Canadian sources. In 2005, Canadian sources accounted for 84% of all funding and foreign sources 16%. Over three quarters of all funding came from the performing firms themselves. The reliance on foreign funding varies by industry, with health care and social assistance, scientific R&D services, wholesale trade and pharmaceutical firms reporting the highest reliance on foreign funding for their R&D performance (see Table 1.26).

Table 1.12 Sources of funds for total intramural research and development (R&D)

	2005[p]	2004[p]	2003[r]	2002[r]	2001[r]
	percent				
Total	**100**	**100**	**100**	**100**	**100**
Canadian	**84**	**84**	**85**	**87**	**80**
Performing firm	77	78	79	79	73
Federal government	2	2	2	2	3
Provincial governments	1	0	1	0	0
Other	4	3	4	5	3
Foreign	**16**	**16**	**15**	**13**	**20**

Note: Components may not add to totals due to rounding.

Chart 1.3 Sources of funds for total intramural research and development (R&D), by industry group, 2005



By province

- Quebec and Ontario, the two largest R&D performing provinces, reported exactly the same mix of current and capital expenditures – 6% capital, 94% current expenditures (table 1.13).

Table 1.13 Provincial distribution of intramural research and development (R&D) expenditures, 2005

	Current expenditures	Capital expenditures	**Total expenditures**
	millions of dollars		
Total	**14,246**	**1,110**	**15,356**
Newfoundland and Labrador	x	x	**86**
Prince Edward Island	x	x	**8**
Nova Scotia	x	x	**94**
New Brunswick	x	x	**83**
Quebec	3,944	239	**4,183**
Ontario	7,582	448	**8,030**
Manitoba	189	6	**196**
Saskatchewan	124	26	**150**
Alberta	830	244	**1,073**
British Columbia	1,362	88	**1,450**
Yukon Territory, Northwest Territories and Nunavut	x	x	**3**

Note: Components may not add to totals due to rounding.

Supplementary tables

- Tables 1.14 to 1.30 present additional R&D expenditure data.

- In real dollars, the amount of R&D performed by the government sectors (federal and provincial governments) have not changed substantially in over 30 years, ranging from $1.9 billion to a high of $2.3 billion. Real growth in R&D performance has come from the business sector and recently, the higher education sector (table 1.15).

- Manufacturing and services industries account for the vast majority of industrial R&D in Canada. Between 2003 and 2007 they accounted for 94 to 96% of the total. In 2007, mining and oil and gas accounted for 2.3% and construction 0.4% (table 1.17).

- In the period 2003 to 2007, there were some shifts between sectors. Construction did not change, while mining and oil and gas increased slightly. The largest shift occurred between manufacturing and services. In 2003, manufacturing accounted for 58.0% of total industrial R&D, while services accounted for 38.1%. By 2007, manufacturing R&D had dropped to 52.7% and services increased to 42.3%. This shift toward the service sector is part of a longer, continuing trend (table 1.17).

- The capital intensity (capital expenditures as a percentage of total R&D expenditures) is fairly consistent across industries, with a few exceptions. Industries with higher capital intensity include: oil and gas extraction, pharmaceutical and medicine, communications equipment, semiconductors, information and cultural services and scientific research and development services. Industries with very low rates of capital related to R&D include: forestry and logging, fishing, hunting and trapping, other utilities, beverages and tobacco, printing, non-metallic minerals and furniture and related products. The capital intensity of industries did not change from year to year during the period 2003 to 2007, except for pharmaceuticals and medicine, wholesale trade, scientific research and development, health care and social assistance and information and cultural services, each of which reported a decline in the capital intensity of R&D (table 1.19).

- The industries reporting the highest overall capital expenditures related to R&D were: information and cultural industries ($137 million), communications equipment ($88 million), semiconductors ($73 million) and oil and gas extraction ($66 million) (table 1.19).

- Wages and salaries are typically the largest component of R&D expenditures. They averaged 58% of all current expenditures and 53% of total intramural expenditures on R&D. Generally, those industries with high wage and salary components tended to be in services, while those with low wage and salary components were in resource industries or manufacturing (table 1.20).

- Industries with high absolute current costs not related to wages and salaries were: pharmaceuticals ($753 million), information and cultural ($640 million), scientific research and development ($524 million), communications equipment ($484 million) and aerospace products ($454 million) (table 1.20).

- R&D intensity (current R&D expenditures as a percentage of total revenues) varies considerably by industry, and by country of control (table 1.22).

- On average, the R&D intensity of Canadian-controlled R&D performers is higher than that reported by foreign-controlled R&D performers. Industries with the highest R&D intensities overall were in the service sector: scientific R&D services and health computer system design and related services (table 1.21).

- Canadian-controlled R&D performers have consistently reported the highest R&D intensities, while US-controlled R&D performers have consistently reported higher R&D intensities than other foreign-controlled R&D performers (table 1.23).

- The proportion of R&D performed by Canadian-controlled R&D performers has dropped slightly between 2003 and 2004 and 2004 and 2005, while the share of both US-controlled and other foreign-controlled firms has increased (table 1.23).

- Government funding for industrial R&D has fallen from its highest point 11% in the mid-1980s, to 2% in 2005. Federal government grants and contracts have fallen the most such that provincial governments are now a more significant source of funding than federal contracts, a shift occurring in 2003 (table 1.25).

- Internal or self-funded R&D has increased to over 80% (78% from Canadian performing companies and 3% from related companies). As recently as 1998 to 2000 this component was less than 70% (table 1.25).

- Canadian-controlled firms obtained 87% of their funding from their own internal operations, followed by 7% from foreign sources. Federal, provincial governments and other Canadian sources (this includes related companies and R&D contracts for other firms) accounted for the remaining 6% (table 1.27).

- By contrast, foreign sources were much more important for foreign-controlled firms. Both US and other foreign-controlled firms obtained 32% of their funding from foreign sources. Internal funding accounted for 59% of funds for US-controlled firms and 64% for other foreign-controlled firms (table 1.27).

- “Other Canadian sources” were significant for Canadian and US-controlled firms at 4% of funds, but not as significant for other foreign-controlled firms at 1% (table 1.27).

- From 2003 to 2005, the trend in distribution of industrial R&D expenditures was away from the centre. In 2003, Ontario and Quebec accounted for 82.5% of all industrial R&D and 17.2% elsewhere, with 1.3% in Atlantic Canada, 7.8% in the Prairie provinces, and 8.4% in British Columbia (table 1.28).

- By 2005, a slight shift had occurred, with 79.5% of industrial R&D being performed in Ontario and Quebec and 19.1% in the rest of Canada. Atlantic Canada increased to 1.8%, the Prairie provinces to 9.2% and British Columbia to 9.4% (table 1.28).

- Both Ontario and Quebec reported a drop in share, but the drop was most noticeable for the province of Quebec which fell from 29.9% of all industrial R&D in 2003 to 27.2% by 2005 and which reported an absolute drop in R&D performance between 2004 and 2005 (table 1.28).

Provincial profiles

- Atlantic Canada represented 1.8% of all industrial R&D spending in 2005. Industries performing in Atlantic Canada with shares greater than 3.6% of national industrial R&D were generally resource-based (table 1.30).

- Quebec represented 27.2% of all industrial R&D spending in 2005. Industries that concentrated their R&D spending in Quebec crossed the economy from resource-based such as primary manufacturing industries to technology-based including aerospace (table 1.30).

- Ontario represented 52.3% of all industrial R&D spending in 2005. In Ontario, industrial concentration of R&D spending was generally in secondary and tertiary manufacturing (table 1.30).

- Manitoba represented 1.3% of all industrial R&D spending in 2005. A broad spectrum of industries had R&D spending shares exceeding the provincial industrial share for Manitoba (table 1.30).

- Saskatchewan represented 1.0% of all industrial R&D spending in 2005. Similar to Manitoba, a broad spectrum of industries had R&D spending shares exceeding the provincial industrial share for Saskatchewan (table 1.30).

- Alberta represented 7.0% of all industrial R&D spending in 2005 (table 1.30).

- British Columbia represented 9.4% of all industrial R&D spending in 2005. Technical or science-based services appeared to prefer British Columbia as the site for their industrial R&D spending at 28.2% of the total (table 1.30).

Table 1.14 Gross domestic expenditures on research and development (GERD) by performing sector, current dollars

	Federal government	Provincial government	Business enterprise	Higher education	Private non-profit organizations	**Total**
	millions of dollars					
2007[p]	2,338	324	15,773	10,433	116	**28,984**
2006[p]	2,298	318	15,360	9,974	116	**28,067**
2005[p]	2,414	300	15,356	9,518	112	**27,699**
2004[r]	2,083	290	14,947	9,058	103	**26,480**
2003[r]	2,083	278	14,039	8,143	92	**24,635**
2002[r]	2,190	282	13,541	7,455	63	**23,532**
2001[r]	2,103	276	14,266	6,424	63	**23,132**
2000	2,080	255	12,395	5,793	58	**20,581**
1999	1,859	233	10,399	5,082	63	**17,638**
1998	1,743	216	9,682	4,370	77	**16,088**
1997	1,720	214	8,739	3,879	82	**14,635**
1996	1,792	242	7,997	3,697	89	**13,817**
1995	1,727	254	7,991	3,691	91	**13,754**
1994	1,753	260	7,567	3,675	86	**13,341**
1993	1,757	269	6,424	3,660	74	**12,184**
1992	1,716	293	5,742	3,519	68	**11,338**
1991	1,685	328	5,355	3,289	110	**10,767**
1990	1,654	302	5,169	3,033	102	**10,260**
1989	1,533	272	4,779	2,844	89	**9,517**
1988	1,429	242	4,623	2,669	82	**9,045**
1987	1,383	228	4,341	1,934	64	**7,950**
1986	1,407	217	4,022	1,839	61	**7,546**
1985	1,356	213	3,635	1,722	59	**6,985**
1984	1,389	206	3,022	1,604	52	**6,273**
1983	1,219	201	2,602	1,452	43	**5,517**
1982	1,103	194	2,489	1,373	39	**5,198**
1981	916	162	2,124	1,177	36	**4,415**
1980	779	140	1,571	1,055	30	**3,575**
1979	717	113	1,266	921	27	**3,044**
1978	711	98	1,006	769	25	**2,609**
1977	638	93	857	713	21	**2,322**
1976	593	82	755	624	17	**2,071**
1975	545	72	700	568	16	**1,901**
1974	508	68	613	485	15	**1,689**
1973	450	55	503	449	13	**1,470**
1972	414	50	462	434	12	**1,372**
1971	383	43	413	436	10	**1,285**

Note: Components may not add to totals due to rounding.
Source: CANSIM Table 358-0001

Table 1.15 Gross domestic expenditures on research and development (GERD) by performing sector, constant 2002 dollars

	Federal government	Provincial government	Business enterprise	Higher education	Private non-profit organizations	**Total**
	millions of dollars					
2007[p]	2,009	278	13,551	8,963	100	**24,900**
2006[p]	2,037	282	13,617	8,842	103	**24,882**
2005[p]	2,191	272	13,935	8,637	102	**25,135**
2004[r]	1,954	272	14,022	8,497	97	**24,841**
2003[r]	2,016	269	13,591	7,883	89	**23,848**
2002[r]	2,190	282	13,541	7,455	63	**23,532**
2001[r]	2,126	279	14,425	6,495	64	**23,389**
2000	2,127	261	12,674	5,923	59	**21,044**
1999	1,980	248	11,075	5,412	67	**18,784**
1998	1,888	234	10,490	4,735	83	**17,430**
1997	1,853	231	9,417	4,180	88	**15,770**
1996	1,956	264	8,730	4,036	97	**15,084**
1995	1,915	282	8,859	4,092	101	**15,248**
1994	1,988	295	8,579	4,167	98	**15,126**
1993	2,015	308	7,367	4,197	85	**13,972**
1992	1,998	341	6,685	4,097	79	**13,199**
1991	1,987	387	6,315	3,879	130	**12,697**
1990	2,007	367	6,273	3,681	124	**12,451**
1989	1,921	341	5,989	3,564	112	**11,926**
1988	1,870	317	6,051	3,493	107	**11,839**
1987	1,892	312	5,938	2,646	88	**10,876**
1986	2,013	310	5,754	2,631	87	**10,795**
1985	2,000	314	5,361	2,540	87	**10,302**
1984	2,111	313	4,593	2,438	79	**9,533**
1983	1,914	316	4,085	2,279	68	**8,661**
1982	1,826	321	4,121	2,273	65	**8,606**
1981	1,645	291	3,813	2,113	65	**7,926**
1980	1,549	278	3,123	2,097	60	**7,107**
1979	1,569	247	2,770	2,015	59	**6,661**
1978	1,713	236	2,424	1,853	60	**6,287**
1977	1,640	239	2,203	1,833	54	**5,969**
1976	1,625	225	2,068	1,710	47	**5,674**
1975	1,637	216	2,102	1,706	48	**5,709**
1974	1,688	226	2,037	1,611	50	**5,611**
1973	1,724	211	1,927	1,720	50	**5,632**
1972	1,739	210	1,941	1,824	50	**5,765**
1971	1,702	191	1,836	1,938	44	**5,711**

Note: Components may not add to totals due to rounding.
Source: CANSIM Table 358-0001

Table 1.16 Business expenditures on research and development (BERD) compared to gross domestic expenditures on research and development (GERD) and gross domestic product (GDP)

	BERD[1]	GERD[1]	GDP[2]	BERD/GERD	BERD/GDP
	millions of dollars			percent	
2007[p]	15,773	28,984	1,531,427	54.42	1.03
2006[p]	15,360	28,067	1,446,307	54.73	1.06
2005[p]	15,356	27,699	1,375,080	55.44	1.12
2004[r]	14,947	26,480	1,290,828	56.45	1.16
2003[r]	14,039	24,635	1,213,175	56.99	1.16
2002[r]	13,541	23,532	1,152,905	57.54	1.17
2001[r]	14,266	23,132	1,108,048	61.67	1.29
2000	12,395	20,581	1,076,577	60.23	1.15
1999	10,399	17,638	982,441	58.96	1.06
1998	9,682	16,088	914,973	60.18	1.06
1997	8,739	14,635	882,733	59.71	0.99
1996	7,997	13,817	836,864	57.88	0.96
1995	7,991	13,754	810,426	58.10	0.99
1994	7,567	13,341	770,873	56.72	0.98
1993	6,424	12,184	727,184	52.72	0.88
1992	5,742	11,338	700,480	50.64	0.82
1991	5,355	10,767	685,367	49.74	0.78
1990	5,169	10,260	679,921	50.38	0.76
1989	4,779	9,517	657,728	50.22	0.73
1988	4,623	9,045	613,094	51.11	0.75
1987	4,341	7,950	558,949	54.60	0.78
1986	4,022	7,546	512,541	53.30	0.78
1985	3,635	6,985	485,714	52.04	0.75
1984	3,022	6,273	449,582	48.17	0.67
1983	2,602	5,517	411,386	47.16	0.63
1982	2,489	5,198	379,859	47.88	0.66

1. Source: CANSIM 358-0001
2. Source: CANSIM 380-0017

Table 1.17 Total intramural research and development (R&D) expenditures, by industry

	2007[p]	2006[p]	2005[p]	2004[r]	2003[r]
	millions of dollars				
Total	**15,773**	**15,360**	**15,356**	**14,947**	**14,039**
Agriculture, forestry, fishing and hunting	**x**	**x**	**109**	**96**	**94**
Agriculture	x	x	78	73	66
Forestry and logging	19	19	19	18	21
Fishing, hunting and trapping	12	13	12	5	6
Mining and oil and gas extraction	**368**	**398**	**409**	**333**	**283**
Oil and gas extraction	321	354	360	279	224
Mining	46	44	49	54	59
Utilities	**x**	**x**	**261**	**242**	**x**
Electric power	x	x	249	230	x
Other utilities	13	13	12	12	10
Construction	**64**	**63**	**66**	**53**	**x**
Manufacturing	**8,316**	**8,095**	**8,224**	**8,177**	**8,140**
Food	120	117	128	129	119
Beverage and tobacco	29	30	31	27	43
Textile	53	54	58	56	52
Wood products	102	99	96	77	66
Paper	321	319	322	413	420
Printing	37	36	36	33	27
Petroleum and coal products	187	154	x	189	139
Pharmaceutical and medicine	1,145	1,129	1,221	1,189	1,110
Other chemicals	197	188	196	216	272
Plastic products	134	132	126	113	119
Rubber products	x	29	28	26	26
Non-metallic mineral products	66	61	57	41	49
Primary metal (ferrous)	41	x	36	46	36
Primary metal (non-ferrous)	170	193	243	218	x
Fabricated metal products	213	201	206	190	188
Machinery	560	552	526	484	473
Computer and peripheral equipment	159	151	159	165	192
Communications equipment	1,433	1,392	1,386	1,509	1,698
Semiconductor and other electronic components	917	857	832	808	743
Navigational, measuring, medical and control instruments	385	416	469	366	351
Other computer and electronic products	31	29	29	x	x
Electrical equipment, appliance and components	144	137	140	146	175
Motor vehicle and parts	524	534	555	575	454
Aerospace products and parts	1,021	963	x	x	891
All other transportation equipment	x	x	x	45	47
Furniture and related products	28	28	29	28	28
Other manufacturing industries	202	193	x	179	170
Services	**6,667**	**6,445**	**6,287**	**6,045**	**5,343**
Wholesale trade	780	756	790	774	650
Retail trade	34	34	35	27	37
Transportation and warehousing	58	58	56	50	49
Information and cultural industries	1,671	1,654	1,545	1,346	1,124
Finance, insurance and real estate	356	342	354	318	235
Architectural, engineering and related services	432	420	449	507	501
Computer system design and related services	1,265	1,212	1,134	1,152	1,119
Management, scientific and technical consulting services	76	69	70	66	79
Scientific research and development	1,267	1,214	1,183	1,209	937
Health care and social assistance	444	408	404	363	381
All other services	283	278	267	232	230

Note: Components may not add to totals due to rounding.

Table 1.18 Current intramural research and development (R&D) expenditures, by industry

	2007[p]	2006[p]	2005[p]	2004[r]	2003[r]
	millions of dollars				
Total	**14,846**	**14,363**	**14,246**	**13,888**	**13,062**
Agriculture, forestry, fishing and hunting	**99**	**103**	**x**	**92**	**90**
Agriculture	69	72	x	x	63
Forestry and logging	19	19	18	x	21
Fishing, hunting and trapping	12	13	12	5	6
Mining and oil and gas extraction	**298**	**273**	**305**	**x**	**211**
Oil and gas extraction	255	235	260	x	156
Mining	43	39	46	51	54
Utilities	**158**	**156**	**x**	**x**	**122**
Electric power	146	144	x	x	x
Other utilities	12	12	12	10	x
Construction	**63**	**63**	**65**	**52**	**47**
Manufacturing	**7,921**	**7,720**	**7,742**	**7,782**	**7,715**
Food	116	113	123	121	113
Beverage and tobacco	29	29	31	26	42
Textile	51	52	55	53	50
Wood products	100	97	94	69	62
Paper	318	316	316	404	414
Printing	36	36	36	33	27
Petroleum and coal products	150	127	141	174	131
Pharmaceutical and medicine	1,100	1,082	1,166	1,131	1,042
Other chemicals	190	181	187	202	251
Plastic products	129	127	122	110	109
Rubber products	27	29	28	25	26
Non-metallic mineral products	66	61	57	41	48
Primary metal (ferrous)	38	30	33	44	33
Primary metal (non-ferrous)	151	168	163	188	199
Fabricated metal products	209	195	201	184	184
Machinery	555	545	517	473	456
Computer and peripheral equipment	153	146	153	159	176
Communications equipment	1,345	1,322	1,316	1,437	1,620
Semiconductor and other electronic components	844	799	783	758	681
Navigational, measuring, medical and control instruments	374	405	459	359	341
Other computer and electronic products	29	28	27	21	18
Electrical equipment, appliance and components	141	133	135	141	166
Motor vehicle and parts	502	514	526	536	429
Aerospace products and parts	986	917	816	856	867
All other transportation equipment	68	62	59	44	46
Furniture and related products	28	27	28	28	28
Other manufacturing industries	188	180	168	164	154
Services	**6,307**	**6,048**	**5,884**	**5,594**	**4,876**
Wholesale trade	753	728	760	728	602
Retail trade	33	33	34	26	36
Transportation and warehousing	58	57	56	49	48
Information and cultural industries	1,534	1,494	1,413	1,215	953
Finance, insurance and real estate	345	329	334	305	229
Architectural, engineering and related services	391	385	411	444	436
Computer system design and related services	1,221	1,160	1,082	1,102	1,072
Management, scientific and technical consulting services	71	66	68	64	73
Scientific research and development	1,211	1,144	1,105	1,110	865
Health care and social assistance	422	387	376	331	344
All other services	266	263	246	220	219

Note: Components may not add to totals due to rounding.

Table 1.19 Capital intramural research and development (R&D) expenditures, by industry

	2007[p]	2006[p]	2005[p]	2004[r]	2003[r]
	millions of dollars				
Total	**927**	**997**	**1,110**	**1,059**	**977**
Agriculture, forestry, fishing and hunting	**x**	**x**	**x**	**4**	**4**
Agriculture	x	x	x	x	3
Forestry and logging	0[s]	0[s]	0[s]	x	0[s]
Fishing, hunting and trapping	0[s]	0[s]	0[s]	0[s]	1
Mining and oil and gas extraction	**70**	**124**	**104**	**x**	**72**
Oil and gas extraction	66	119	101	x	68
Mining	4	5	3	3	4
Utilities	**x**	**x**	**x**	**x**	**x**
Electric power	x	x	x	x	x
Other utilities	0[s]	0[s]	0[s]	2	x
Construction	**1**	**1**	**1**	**1**	**x**
Manufacturing	**395**	**375**	**482**	**395**	**425**
Food	4	4	5	7	6
Beverage and tobacco	0[s]	0[s]	0[s]	1	1
Textile	2	2	2	2	2
Wood products	2	2	2	8	4
Paper	3	3	6	10	6
Printing	0[s]	0[s]	0[s]	0[s]	0[s]
Petroleum and coal products	37	27	x	15	8
Pharmaceutical and medicine	45	48	54	57	69
Other chemicals	7	7	8	14	20
Plastic products	6	4	5	2	10
Rubber products	x	0[s]	0[s]	1	0[s]
Non-metallic mineral products	0[s]	1	0[s]	0[s]	1
Primary metal (ferrous)	3	x	3	2	3
Primary metal (non-ferrous)	19	25	80	29	x
Fabricated metal products	4	6	5	6	3
Machinery	6	7	9	12	17
Computer and peripheral equipment	6	5	6	6	17
Communications equipment	88	70	70	73	78
Semiconductor and other electronic components	73	59	49	50	61
Navigational, measuring, medical and control instruments	11	11	10	7	10
Other computer and electronic products	1	1	1	x	x
Electrical equipment, appliance and components	4	3	5	5	9
Motor vehicle and parts	22	20	29	39	25
Aerospace products and parts	35	45	x	x	24
All other transportation equipment	x	x	x	1	0[s]
Furniture and related products	0[s]	0[s]	0[s]	0[s]	0[s]
Other manufacturing industries	14	13	x	15	16
Services	**360**	**397**	**403**	**451**	**466**
Wholesale trade	27	28	30	45	48
Retail trade	1	1	1	1	1
Transportation and warehousing	1	1	1	1	1
Information and cultural industries	137	159	132	131	171
Finance, insurance and real estate	11	13	20	13	6
Architectural, engineering and related services	41	35	38	63	64
Computer system design and related services	44	51	52	51	48
Management, scientific and technical consulting services	5	3	3	2	6
Scientific research and development	56	69	78	100	72
Health care and social assistance	22	21	28	32	37
All other services	16	15	22	12	12

Note: Components may not add to totals due to rounding.

Table 1.20 Current intramural research and development (R&D) expenditures, by industry and by type of expenditure, 2005

	Wages and salaries	Other costs	**Total**
	millions of dollars		
Total	**8,313**	**5,932**	**14,246**
Agriculture, forestry, fishing and hunting	**58**	**x**	**x**
Agriculture	42	x	**x**
Forestry and logging	13	6	**18**
Fishing, hunting and trapping	3	8	**12**
Mining and oil and gas extraction	**68**	**237**	**305**
Oil and gas extraction	47	213	**260**
Mining	22	24	**46**
Utilities	**79**	**x**	**x**
Electric power	70	x	**x**
Other utilities	9	3	**12**
Construction	**44**	**21**	**65**
Manufacturing	**4,320**	**3,421**	**7,742**
Food	83	41	**123**
Beverage and tobacco	18	13	**31**
Textile	36	20	**55**
Wood products	49	45	**94**
Paper	98	218	**316**
Printing	31	5	**36**
Petroleum and coal products	32	109	**141**
Pharmaceutical and medicine	414	753	**1,166**
Other chemicals	105	82	**187**
Plastic products	85	37	**122**
Rubber products	17	11	**28**
Non-metallic mineral products	32	25	**57**
Primary metal (ferrous)	19	15	**33**
Primary metal (non-ferrous)	97	66	**163**
Fabricated metal products	157	44	**201**
Machinery	367	150	**517**
Computer and peripheral equipment	106	47	**153**
Communications equipment	832	484	**1,316**
Semiconductor and other electronic components	510	273	**783**
Navigational, measuring, medical and control instruments	309	150	**459**
Other computer and electronic products	23	4	**27**
Electrical equipment, appliance and components	94	41	**135**
Motor vehicle and parts	273	253	**526**
Aerospace products and parts	363	454	**816**
All other transportation equipment	36	23	**59**
Furniture and related products	24	4	**28**
Other manufacturing industries	113	56	**168**
Services	**3,744**	**2,140**	**5,884**
Wholesale trade	414	346	**760**
Retail trade	29	4	**34**
Transportation and warehousing	x	x	**56**
Information and cultural industries	773	640	**1,413**
Finance, insurance and real estate	x	x	**334**
Architectural, engineering and related services	344	67	**411**
Computer system design and related services	899	182	**1,082**
Management, scientific and technical consulting services	58	10	**68**
Scientific research and development	581	524	**1,105**
Health care and social assistance	191	185	**376**
All other services	186	59	**246**

Note: Components may not add to totals due to rounding.

Table 1.21 Current intramural research and development (R&D) expenditures of performing company revenues, by industry and by country of control, 2005

	Canada	Foreign	**Total**
	percent		
Total	**2.0**	**1.4**	**1.7**
Agriculture, forestry, fishing and hunting	**1.7**	**5.9**	**2.2**
Agriculture	1.4	8.8	**2.1**
Forestry and logging	1.6	0.0	**1.6**
Fishing, hunting and trapping	x	x	**5.0**
Mining and oil and gas extraction	**0.6**	**0.4**	**0.5**
Oil and gas extraction	0.8	0.4	**0.5**
Mining	x	x	**0.4**
Utilities	**0.4**	**0.1**	**0.4**
Electric power	x	x	**0.4**
Other utilities	x	x	**0.1**
Construction	**x**	**x**	**1.3**
Manufacturing	**2.2**	**1.1**	**1.6**
Food	0.4	0.1	**0.3**
Beverage and tobacco	x	x	**0.3**
Textile	1.9	1.5	**1.8**
Wood products	0.8	0.2	**0.8**
Paper	1.1	0.4	**0.9**
Printing	1.1	0.6	**1.0**
Petroleum and coal products	x	x	**0.2**
Pharmaceutical and medicine	12.5	8.7	**9.6**
Other chemicals	1.2	0.3	**0.4**
Plastic products	1.1	0.7	**1.0**
Rubber products	1.3	0.5	**0.7**
Non-metallic mineral products	1.2	0.6	**0.8**
Primary metal (ferrous)	0.4	0.4	**0.4**
Primary metal (non-ferrous)	0.7	0.8	**0.8**
Fabricated metal products	1.4	0.6	**1.3**
Machinery	3.6	2.1	**3.2**
Computer and peripheral equipment	5.6	5.6	**5.6**
Communications equipment	27.8	5.8	**18.6**
Semiconductor and other electronic components	x	x	**8.5**
Navigational, measuring, medical and control instruments	11.3	7.9	**9.9**
Other computer and electronic products	x	x	**11.3**
Electrical equipment, appliance and components	3.2	1.2	**1.8**
Motor vehicle and parts	1.3	0.5	**0.6**
Aerospace products and parts	x	x	**5.8**
All other transportation equipment	1.2	1.5	**1.4**
Furniture and related products	x	x	**0.7**
Other manufacturing industries	2.9	1.2	**2.7**
Services	**2.3**	**3.6**	**2.6**
Wholesale trade	1.0	1.7	**1.4**
Retail trade	x	x	**0.7**
Transportation and warehousing	x	x	**0.3**
Information and cultural industries	5.1	19.9	**5.9**
Finance, insurance and real estate	0.4	0.2	**0.4**
Architectural, engineering and related services	x	x	**6.4**
Computer system design and related services	9.7	22.1	**11.8**
Management, scientific and technical consulting services	13.4	0.0	**13.4**
Scientific research and development	30.1	36.9	**31.5**
Health care and social assistance	x	x	**34.1**
All other services	1.7	1.2	**1.6**

Table 1.22 Current intramural research and development (R&D) expenditures of performing company revenues, by country of control

	2005[p]	2004[r]	2003[r]
	percent		
Total	**1.7**	**1.9**	**1.8**
Canada	2.0	2.2	1.9
United States	1.5	1.7	1.7
Other	1.2	1.4	1.5

Table 1.23 Total intramural research and development (R&D) expenditures, by country of control

	2005[p]	2004[r]	2003[r]
	millions of dollars		
Total	**15,356**	**14,947**	**14,039**
Canada	10,127	9,946	9,563
United States	3,501	3,329	3,086
Other	1,728	1,672	1,390

Note: Components may not add to totals due to rounding.

Table 1.24 Total intramural research and development (R&D) expenditures of Canadian-controlled firms of all intramural R&D expenditures, by industry

	2005[p]	2004[r]	2003[r]
	percent		
Total	**66**	**67**	**68**
Agriculture, forestry, fishing and hunting	**74**	**x**	**x**
Agriculture	x	x	x
Forestry and logging	100	100	100
Fishing, hunting and trapping	x	x	100
Mining and oil and gas extraction	**60**	**60**	**68**
Oil and gas extraction	57	59	68
Mining	78	64	68
Utilities	**x**	**x**	**100**
Electric power	x	x	100
Other utilities	x	100	100
Construction	**x**	**x**	**x**
Manufacturing	**61**	**62**	**63**
Food	81	81	85
Beverage and tobacco	89	x	x
Textile	70	67	72
Wood products	97	98	x
Paper	84	76	63
Printing	91	94	x
Petroleum and coal products	x	x	32
Pharmaceutical and medicine	31	31	29
Other chemicals	44	53	48
Plastic products	80	81	88
Rubber products	47	43	41
Non-metallic mineral products	51	64	x
Primary metal (ferrous)	64	78	88
Primary metal (non-ferrous)	86	85	88
Fabricated metal products	94	93	94
Machinery	85	83	82
Computer and peripheral equipment	33	36	41
Communications equipment	87	88	87
Semiconductor and other electronic components	x	x	x
Navigational, measuring, medical and control instruments	67	83	86
Other computer and electronic products	x	100	x
Electrical equipment, appliance and components	54	53	56
Motor vehicle and parts	24	30	38
Aerospace products and parts	x	30	x
All other transportation equipment	36	42	x
Furniture and related products	x	x	x
Other manufacturing industries	96	94	93
Services	**71**	**71**	**74**
Wholesale trade	37	33	40
Retail trade	x	x	x
Transportation and warehousing	x	x	x
Information and cultural industries	83	77	80
Finance, insurance and real estate	94	97	98
Architectural, engineering and related services	x	x	x
Computer system design and related services	68	80	85
Management, scientific and technical consulting services	100	x	x
Scientific research and development	75	73	76
Health care and social assistance	x	x	x
All other services	82	86	88

Note: Components may not add to totals due to rounding.

Table 1.25 Sources of funds for intramural research and development (R&D)

	Business enterprises			Federal sources		Provincial sources	Other Canadian sources	Foreign sources	**Total**
	Canadian performing companies	Related companies	R&D contracts for other companies	Grants	Contracts				
	millions of dollars								
2005	11,959	412	141	283	34	94	24	2,407	**15,356**
2004	11,739	344	147	227	43	62	18	2,367	**14,947**
2003	11,063	379	153	256	44	76	17	2,051	**14,039**
2002	10,757	426	170	231	69	53	17	1,819	**13,541**
2001	10,439	301	177	345	112	51	14	2,826	**14,266**
2000	8,131	269	181	165	74	45	8	3,522	**12,395**
1999	6,968	201	213	241	68	57	8	2,642	**10,399**
1998	6,396	294	167	179	84	56	8	2,499	**9,682**
1997	6,124	268	156	253	103	77	8	1,750	**8,739**
1996	5,450	297	186	185	107	102	8	1,662	**7,997**
1995	5,383	286	259	259	152	87	10	1,555	**7,991**
1994	4,922	337	266	267	200	99	10	1,466	**7,567**
1993	4,073	347	242	266	250	105	7	1,134	**6,424**
1992	3,639	266	188	261	271	86	12	1,019	**5,742**
1991	3,388	275	162	204	212	114	11	988	**5,355**
1990	3,280	304	167	215	176	93	13	923	**5,169**
1989	2,981	325	164	239	177	69	6	819	**4,779**
1988	2,855	285	123	272	181	63	5	840	**4,623**
1987	2,714	255	125	287	155	60	9	734	**4,340**
1986	2,610	257	112	251	160	63	18	551	**4,022**
1985	2,323	241	97	215	168	60	12	518	**3,633**
1984	1,829	212	71	183	152	52	7	516	**3,022**
1983	1,608	158	76	175	106	46	3	431	**2,602**
1982	1,698	142	69	177	89	44	4	266	**2,489**
1981	1,543	123	70	132	58	37	3	158	**2,124**

Note: Components may not add to totals due to rounding.

Table 1.26 Sources of funds for intramural research and development (R&D), by industry, 2005

	Canadian performing companies	Federal government and other Canadian sources	Foreign sources	**Total**
	millions of dollars			
Total	**11,959**	**989**	**2,407**	**15,356**
Agriculture, forestry, fishing and hunting	**62**	**x**	**x**	**x**
Agriculture	x	x	x	**78**
Forestry and logging	x	x	0	**19**
Fishing, hunting and trapping	10	1	0	**12**
Mining and oil and gas extraction	**356**	**x**	**x**	**409**
Oil and gas extraction	x	x	x	**360**
Mining	x	x	x	**49**
Utilities	**234**	**x**	**x**	**261**
Electric power	223	x	x	**249**
Other utilities	11	0[s]	0	**12**
Construction	**64**	**x**	**0**	**x**
Manufacturing	**6,799**	**478**	**947**	**8,224**
Food	126	2	0	**128**
Beverage and tobacco	31	0[s]	0	**31**
Textile	56	1	0	**58**
Wood products	x	x	0	**96**
Paper	x	x	x	**322**
Printing	x	x	x	**36**
Petroleum and coal products	x	x	x	**181**
Pharmaceutical and medicine	731	113	376	**1,221**
Other chemicals	146	15	35	**196**
Plastic products	126	x	x	**126**
Rubber products	x	x	x	**28**
Non-metallic mineral products	56	0[s]	1	**57**
Primary metal (ferrous)	x	x	0	**36**
Primary metal (non-ferrous)	x	x	x	**243**
Fabricated metal products	203	3	0	**206**
Machinery	505	13	8	**526**
Computer and peripheral equipment	125	1	33	**159**
Communications equipment	1,317	14	55	**1,386**
Semiconductor and other electronic components	562	x	x	**832**
Navigational, measuring, medical and control instruments	338	41	90	**469**
Other computer and electronic products	x	x	0	**29**
Electrical equipment, appliance and components	128	8	3	**140**
Motor vehicle and parts	529	x	x	**555**
Aerospace products and parts	x	x	x	**863**
All other transportation equipment	x	x	x	**61**
Furniture and related products	28	0[s]	0	**29**
Other manufacturing industries	177	x	x	**211**
Services	**4,444**	**407**	**1,436**	**6,287**
Wholesale trade	498	43	248	**790**
Retail trade	x	x	x	**35**
Transportation and warehousing	54	x	x	**56**
Information and cultural industries	1,174	33	338	**1,545**
Finance, insurance and real estate	x	x	x	**354**
Architectural, engineering and related services	374	56	18	**449**
Computer system design and related services	835	56	242	**1,134**
Management, scientific and technical consulting services	51	x	x	**70**
Scientific research and development	685	91	406	**1,183**
Health care and social assistance	163	74	166	**404**
All other services	230	28	9	**267**

Note: Components may not add to totals due to rounding.

Table 1.27 Sources of funds for intramural research and development (R&D), by country-of-control of performer, 2005

	Canadian performing companies	Federal government	Provincial government	Other Canadian sources	Foreign sources	**Total**
	millions of dollars					
Total	**11,959**	**317**	**94**	**578**	**2,407**	**15,356**
Canada	8,766	179	53	412	717	**10,127**
United States	2,079	x	x	141	1,130	**3,501**
Other	1,114	x	x	24	560	**1,728**

Note: Components may not add to totals due to rounding.

Table 1.28 Total intramural research and development (R&D) expenditures, by province

	2005[p]	2004[r]	2003[r]
	millions of dollars		
Total	**15,356**	**14,947**	**14,039**
Newfoundland and Labrador	86	29	31
Prince Edward Island	8	7	7
Nova Scotia	94	89	79
New Brunswick	83	79	64
Quebec	4,183	4,301	4,202
Ontario	8,030	7,717	7,384
Manitoba	196	178	150
Saskatchewan	150	112	88
Alberta	1,073	1,030	861
British Columbia	1,450	1,399	1,173
Yukon Territory, Northwest Territories and Nunavut	3	5	1

Note: Components may not add to totals due to rounding.

Table 1.29 Current intramural research and development (R&D) expenditures, by province

	2005[p]	2004[r]	2003[r]
	millions of dollars		
Total	**14,246**	**13,888**	**13,062**
Newfoundland and Labrador	x	29	30
Prince Edward Island	x	x	x
Nova Scotia	x	86	75
New Brunswick	x	74	62
Quebec	3,944	3,997	3,916
Ontario	7,582	7,321	6,897
Manitoba	189	168	144
Saskatchewan	124	x	82
Alberta	830	808	764
British Columbia	1,362	1,303	1,086
Yukon Territory, Northwest Territories and Nunavut	x	x	x

Note: Components may not add to totals due to rounding.

Table 1.30 Total intramural research and development (R&D) expenditures by province, by industry, 2005

	Atlantic Canada	Quebec	Ontario	Manitoba
	millions of dollars			
Total	**271**	**4,183**	**8,030**	**196**
Agriculture, forestry, fishing and hunting	**x**	**37**	**33**	**x**
Agriculture	x	26	32	x
Forestry and logging	x	x	x	0
Fishing, hunting and trapping	x	x	x	0
Mining and oil and gas extraction	**x**	**x**	**19**	**x**
Oil and gas extraction	0	x	x	x
Mining	x	x	x	0
Utilities	**x**	**x**	**13**	**x**
Electric power	x	x	x	x
Other utilities	x	3	x	0
Construction	**1**	**27**	**29**	**x**
Manufacturing	**164**	**2,262**	**4,873**	**114**
Food	9	51	52	3
Beverage and tobacco	x	x	15	x
Textile	x	35	22	x
Wood products	x	38	8	x
Paper	7	171	73	x
Printing	0	21	14	1
Petroleum and coal products	x	5	x	0
Pharmaceutical and medicine	25	434	643	x
Other chemicals	x	37	96	3
Plastic products	x	34	83	4
Rubber products	x	8	19	x
Non-metallic mineral products	1	14	39	0[s]
Primary metal (ferrous)	0	10	19	x
Primary metal (non-ferrous)	x	110	x	x
Fabricated metal products	4	60	119	7
Machinery	7	111	344	14
Computer and peripheral equipment	x	x	60	x
Communications equipment	x	121	1,187	0[s]
Semiconductor and other electronic components	x	87	652	x
Navigational, measuring, medical and control	x	160	267	8
Other computer and electronic products	x	7	18	0
Electrical equipment, appliance and components	5	40	72	1
Motor vehicle and parts	0[s]	27	502	8
Aerospace products and parts	x	x	324	x
All other transportation equipment	x	31	27	1
Furniture and related products	x	14	14	0[s]
Other manufacturing industries	x	87	103	0[s]
Services	**97**	**1,742**	**3,062**	**77**
Wholesale trade	x	212	385	16
Retail trade	x	11	16	2
Transportation and warehousing	x	30	8	x
Information and cultural industries	30	226	928	3
Finance, insurance and real estate	0[s]	40	281	x
Architectural, engineering and related services	8	214	115	3
Computer system design and related services	25	266	666	7
Management, scientific and technical consulting services	x	15	31	x
Scientific research and development	11	329	513	20
Health care and social assistance	0[s]	317	20	x
All other services	8	80	100	2

Note: Components may not add to totals due to rounding.

Table 1.30 Total intramural research and development (R&D) expenditures by province, by industry, 2005 (continued)

	Saskatchewan	Alberta	British Columbia	**Total[1]**
	millions of dollars			
Total	**150**	**1,073**	**1,450**	**15,356**
Total Agriculture, forestry, fishing and hunting	**x**	**x**	**22**	**109**
Agriculture	x	x	7	**78**
Forestry and logging	0	x	7	**19**
Fishing, hunting and trapping	0	0	9	**12**
Total Mining and oil and gas extraction	**x**	**310**	**25**	**409**
Oil and gas extraction	x	x	x	**360**
Mining	x	x	x	**49**
Total Utilities	**x**	**x**	**x**	**261**
Electric power	x	x	x	**249**
Other utilities	x	x	x	**12**
Construction	**x**	**x**	**x**	**66**
Total Manufacturing	**51**	**329**	**430**	**8,224**
Food	2	3	7	**128**
Beverage and tobacco	0	x	x	**31**
Textile	x	x	1	**58**
Wood products	x	11	30	**96**
Paper	x	11	49	**322**
Printing	0	0[s]	1	**36**
Petroleum and coal products	x	114	x	**x**
Pharmaceutical and medicine	x	23	50	**1,221**
Other chemicals	x	46	3	**196**
Plastic products	x	3	2	**126**
Rubber products	x	x	x	**28**
Non-metallic mineral products	0	1	1	**57**
Primary metal (ferrous)	x	x	x	**36**
Primary metal (non-ferrous)	0	x	x	**243**
Fabricated metal products	1	10	5	**206**
Machinery	12	12	27	**526**
Computer and peripheral equipment	0	x	x	**159**
Communications equipment	x	x	12	**1,386**
Semiconductor and other electronic components	x	x	x	**832**
Navigational, measuring, medical and control	1	9	22	**469**
Other computer and electronic products	0	x	x	**29**
Electrical equipment, appliance and components	x	x	19	**140**
Motor vehicle and parts	x	1	x	**555**
Aerospace products and parts	x	x	1	**x**
All other transportation equipment	0	0	1	**x**
Furniture and related products	0	x	0[s]	**29**
Other manufacturing industries	0[s]	3	9	**x**
Total Services	**34**	**309**	**966**	**6,287**
Wholesale trade	10	38	120	**790**
Retail trade	x	1	3	**35**
Transportation and warehousing	x	9	3	**56**
Information and cultural industries	2	24	331	**1,545**
Finance, insurance and real estate	0	4	x	**354**
Architectural, engineering and related services	8	47	54	**449**
Computer system design and related services	3	85	82	**1,134**
Management, scientific and technical consulting services	x	6	15	**70**
Scientific research and development	x	50	258	**1,183**
Health care and social assistance	x	1	x	**404**
All other services	4	44	28	**267**

1. Includes Yukon Territory, Northwest Territories and Nunavut.

Note: Components may not add to totals due to rounding.

2. R&D personnel

Due to standard financial accounting practices, it is generally easier for respondents to collect precise expenditure data than personnel data, necessitating some estimation of the latter.

By industry of employer

- Examining table 2.7 at the end of the chapter reveals that one-half of all Canadian R&D personnel are employed by seven major industries. In order of magnitude, these are computer system design and related services; information and cultural industries; scientific research and development; communications equipment; machinery; wholesale trade and semiconductor and other electronic components.

- Historical trends for a select group of industries are presented below in table 2.1.

Table 2.1 Total research and development (R&D) personnel, by selected industries

	2005[p]	2004[r]	2003[r]	2002[r]	2001[r]
	number				
Total, all industries	**137,686**	**133,788**	**126,431**	**118,397**	**115,696**
	percent				
Information and cultural industries	9	8	8	7	5
Communications equipment	7	7	8	10	13
Pharmaceutical and medicine	4	4	4	4	4
Scientific research and development	7	7	7	6	5
Computer system design and related services	12	13	13	13	15
Aerospace products and parts	3	3	4	4	4
Semiconductor and other electronic components	4	4	4	5	5
Subtotal: Selected industries	46	46	48	49	51
Other industries	53	54	52	51	49

Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

By occupational category

- The proportion of R&D personnel who are "Professionals" i.e. scientists and engineers, or senior R&D administrators, has declined somewhat from 63% to 60% over 2001 to 2005, while the role of supporting staff has increased. This second group includes technicians and technologists, and other personnel directly engaged in the R&D program such as machinists and electricians involved in the construction of prototypes, and clerks, typists, accountants and storekeepers engaged in the administration or clerical support of R&D units (table 2.2).

- Table 2.3 breaks down the educational level of professional R&D personnel. There is a recent trend towards higher levels of education. Comparing 2001 with 2005, the proportion of professional personnel with a bachelor's degree as their highest level-of-education has fallen from 82% to 75%. Meanwhile, the proportion with a master's has risen by six percentage points, from 12% to 18% and the proportion with a doctorate has risen by one percentage point to 7%.

- Chart 2.1 illustrates the occupational and degree-level breakdowns for 2005.

Table 2.2 Personnel engaged in research and development (R&D), by occupational category

	2005[p]	2004[r]	2003[r]	2002[r]	2001[r]
	number				
Total	**137,686**	**133,788**	**126,431**	**118,397**	**115,696**
Professionals	81,955	78,785	75,855	73,219	73,117
Technicians	39,491	38,482	34,570	31,591	29,661
Other	16,240	16,521	16,006	13,587	12,918

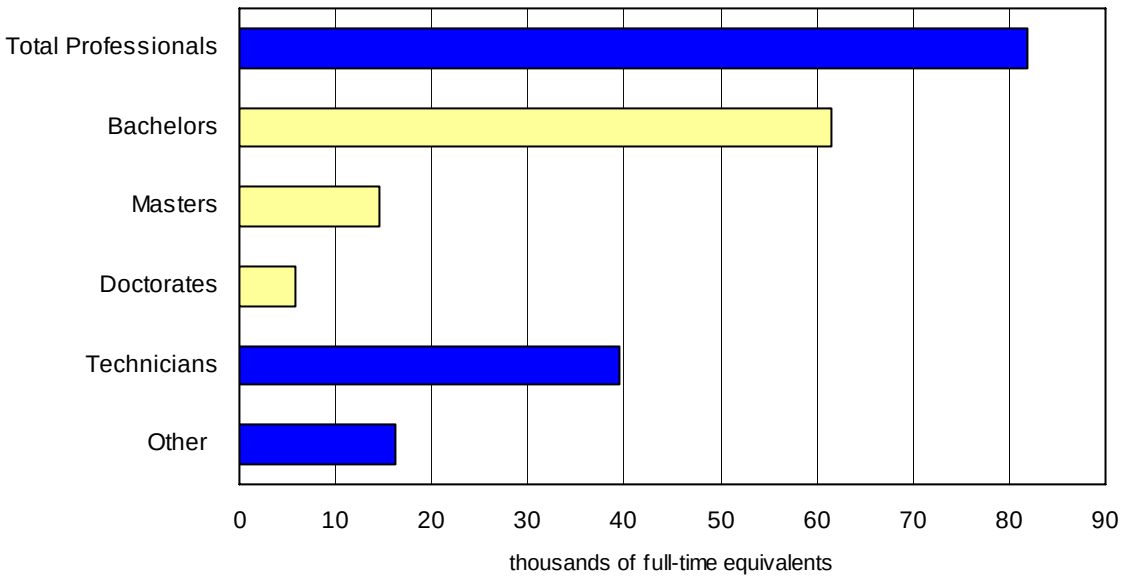
Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

Table 2.3 Professional personnel engaged in research and development (R&D), by degree level

	Bachelors	Masters	Doctorates	**Total**
	number			
2005[p]	61,623	14,515	5,817	**81,955**
2004[r]	59,262	13,852	5,671	**78,785**
2003[r]	57,857	12,415	5,583	**75,855**
2002[r]	58,898	9,698	4,623	**73,219**
2001[r]	60,276	8,618	4,223	**73,117**

Notes: Data is estimated for all performers not surveyed directly, i.e. performers whose data was obtained through the Canada Revenue Agency's SR&ED program (see Appendix B, Survey Methodology). Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

Chart 2.1 Research and development (R&D) personnel, by occupational category and by degree level, 2005



By province

- Table 2.4 gives a provincial distribution of personnel engaged in R&D. Quebec and Ontario account for 81% of total R&D personnel, mirroring the high expenditure levels reported for these two provinces in table 1.13. British Columbia has 10% of total R&D personnel, while Alberta follows with 5%, leaving 4% for the remaining provinces and territories.

- Almost one-half of all Canadian R&D personnel are located in the province of Ontario. As shown in table 2.5, the dominant position of this province is particularly apparent in the communication equipment industry: 79% of this industry's R&D personnel are located there. The province of Quebec on the other hand, is predominant in the aerospace products and parts with 67% of that industry's R&D personnel.

Table 2.4 Provincial distribution of research and development (R&D) personnel, by occupational category, 2005

	Professionals	Other personnel	**Total**
	number		
Total	**81,955**	**55,731**	**137,686**
Newfoundland and Labrador	253	243	**496**
Prince Edward Island	78	52	**130**
Nova Scotia	718	661	**1,379**
New Brunswick	470	466	**936**
Quebec	24,248	20,957	**45,205**
Ontario	41,393	24,674	**66,067**
Manitoba	960	1,105	**2,065**
Saskatchewan	548	610	**1,158**
Alberta	4,065	2,523	**6,588**
British Columbia	9,210	4,434	**13,644**
Yukon Territory, Northwest Territories and Nunavut	12	6	**18**

Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

Table 2.5 Distribution of research and development (R&D) personnel for Quebec and Ontario, by selected industries, 2005

	Quebec	Ontario	Other provinces	**Canada**
	number			
Total	**45,205**	**66,067**	**26,414**	**137,686**
Information and cultural industries	3,125	4,681	3,957	**11,763**
Communications equipment	1,341	7,747	674	**9,762**
Pharmaceutical and medicine	1,953	3,095	758	**5,806**
Scientific research and development	3,698	3,484	2,632	**9,814**
Computer system design and related services	4,594	8,535	3,571	**16,700**
Aerospace products and parts	2,990	1,379	110	**4,479**
Semiconductor and other electronic components	1,129	4,236	723	**6,088**
Other industries	26,375	32,910	13,989	**73,274**

Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

Supplementary tables

- Tables 2.6 to 2.8 present additional R&D personnel data.

Table 2.6 Personnel engaged in research and development (R&D), by industry group and by region, 2005

	Quebec	Ontario	Alberta	British Columbia	Other provinces	**Total**
	number					
Total	**45,205**	**66,067**	**6,588**	**13,644**	**6,182**	**137,686**
Agriculture, forestry, fishing and hunting	595	424	47	250	144	**1,460**
Mining and oil and gas extraction	120	155	743	78	41	**1,137**
Utilities	658	154	117	55	30	**1,014**
Construction	575	438	59	64	45	**1,181**
Manufacturing	21,647	38,364	1,754	3,963	2,650	**68,378**
Services	21,610	26,532	3,868	9,234	3,272	**64,516**

Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

Table 2.7 Personnel engaged in research and development (R&D), by industry and by occupational category, 2005

	Professionals	Technicians	Other	**Total**
	number			
Total	**81,955**	**39,491**	**16,240**	**137,686**
Agriculture, forestry, fishing and hunting	**560**	**555**	**345**	**1,460**
Agriculture	398	438	291	**1,127**
Forestry and logging	117	75	30	**222**
Fishing, hunting and trapping	45	42	24	**111**
Mining and oil and gas extraction	**650**	**359**	**128**	**1,137**
Oil and gas extraction	449	222	88	**759**
Mining	201	137	40	**378**
Utilities	**579**	**269**	**166**	**1,014**
Electric power	445	x	x	**759**
Other utilities	134	x	x	**255**
Construction	**508**	**491**	**182**	**1,181**
Manufacturing	**38,877**	**20,372**	**9,129**	**68,378**
Food	862	700	425	**1,987**
Beverage and tobacco	240	108	41	**389**
Textile	296	336	233	**865**
Wood products	413	377	186	**976**
Paper	595	592	450	**1,637**
Printing	266	390	88	**744**
Petroleum and coal products	181	103	17	**301**
Pharmaceutical and medicine	3,067	1,990	749	**5,806**
Other chemicals	1,059	819	231	**2,109**
Plastic products	825	779	363	**1,967**
Rubber products	204	156	52	**412**
Non-metallic mineral products	317	274	107	**698**
Primary metal (ferrous)	154	112	44	**310**
Primary metal (non-ferrous)	660	388	203	**1,251**
Fabricated metal products	1,380	1,873	535	**3,788**
Machinery	3,404	3,083	855	**7,342**
Computer and peripheral equipment	991	329	94	**1,414**
Communications equipment	8,284	802	676	**9,762**
Semiconductor and other electronic components	4,811	968	309	**6,088**
Navigational, measuring, medical and control instruments	3,765	1,269	265	**5,299**
Other computer and electronic products	308	159	29	**496**
Electrical equipment, appliance and components	1,174	660	232	**2,066**
Motor vehicle and parts	1,908	1,445	935	**4,288**
Aerospace products and parts	2,157	918	1,404	**4,479**
All other transportation equipment	316	286	179	**781**
Furniture and related products	213	285	91	**589**
Other manufacturing industries	1,027	1,171	336	**2,534**
Services	**40,781**	**17,445**	**6,290**	**64,516**
Wholesale trade	4,107	2,005	875	**6,987**
Retail trade	385	268	71	**724**
Transportation and warehousing	342	250	159	**751**
Information and cultural industries	7,746	2,263	1,754	**11,763**
Finance, insurance and real estate	1,595	1,177	149	**2,921**
Architectural, engineering and related services	4,117	1,350	443	**5,910**
Computer system design and related services	11,651	4,168	881	**16,700**
Management, scientific and technical consulting services	934	417	50	**1,401**
Scientific research and development	6,378	2,613	823	**9,814**
Health care and social assistance	1,509	1,516	722	**3,747**
All other services	2,017	1,418	363	**3,798**

Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

Table 2.8 Professional personnel engaged in research and development (R&D), by industry and by degree level, 2005

	Bachelors	Masters	Doctorates	**Total**
	number			
Total	**61,623**	**14,515**	**5,817**	**81,955**
Agriculture, forestry, fishing and hunting	**493**	**39**	**28**	**560**
Agriculture	x	x	x	**398**
Forestry and logging	x	x	x	**117**
Fishing, hunting and trapping	x	x	0	**45**
Mining and oil and gas extraction	**444**	**122**	**84**	**650**
Oil and gas extraction	328	79	42	**449**
Mining	116	43	42	**201**
Utilities	**309**	**147**	**123**	**579**
Electric power	x	x	123	**445**
Other utilities	x	x	0	**134**
Construction	**453**	**31**	**24**	**508**
Manufacturing	**29,053**	**7,108**	**2,716**	**38,877**
Food	774	60	28	**862**
Beverage and tobacco	194	33	13	**240**
Textile	279	12	5	**296**
Wood products	302	60	51	**413**
Paper	365	121	109	**595**
Printing	234	22	10	**266**
Petroleum and coal products	x	17	x	**181**
Pharmaceutical and medicine	1,726	749	592	**3,067**
Other chemicals	850	123	86	**1,059**
Plastic products	714	84	27	**825**
Rubber products	157	35	12	**204**
Non-metallic mineral products	251	x	x	**317**
Primary metal (ferrous)	118	21	15	**154**
Primary metal (non-ferrous)	423	151	86	**660**
Fabricated metal products	1,256	91	33	**1,380**
Machinery	2,829	452	123	**3,404**
Computer and peripheral equipment	787	121	83	**991**
Communications equipment	6,070	1,736	478	**8,284**
Semiconductor and other electronic components	3,348	1,188	275	**4,811**
Navigational, measuring, medical and control instruments	2,822	722	221	**3,765**
Other computer and electronic products	214	69	25	**308**
Electrical equipment, appliance and components	884	231	59	**1,174**
Motor vehicle and parts	1,546	262	100	**1,908**
Aerospace products and parts	1,518	521	118	**2,157**
All other transportation equipment	208	82	26	**316**
Furniture and related products	x	x	x	**213**
Other manufacturing industries	864	84	79	**1,027**
Services	**30,871**	**7,068**	**2,842**	**40,781**
Wholesale trade	3,184	606	317	**4,107**
Retail trade	x	x	x	**385**
Transportation and warehousing	x	x	x	**342**
Information and cultural industries	5,318	1,946	482	**7,746**
Finance, insurance and real estate	1,169	354	72	**1,595**
Architectural, engineering and related services	3,340	530	247	**4,117**
Computer system design and related services	9,736	1,524	391	**11,651**
Management, scientific and technical consulting services	834	74	26	**934**
Scientific research and development	4,088	1,377	913	**6,378**
Health care and social assistance	888	374	247	**1,509**
All other services	1,736	165	116	**2,017**

Notes: Components may not add to totals due to rounding. Personnel counts are reported as full-time equivalent.

3. Payments for technological services

- The technological balance of payments (TBP) may be described as the summary of all transactions relating to the purchase and sale of technological services, information and rights which are recorded in a country's balance of payments. It is an indicator of the flow of proprietary technology into or from a country. Unfortunately, the operations associated with the transfer are not always recorded in the balance of payments statistics and the indicator can only be approximate.

- The statistics in tables 3.1 and 3.2 are acquired through the survey of industrial R&D rather than from balance of payments surveys. The payments and receipts for technology, other than R&D, are therefore incomplete, since data from firms not included in the R&D survey are not available.

- In the survey of industrial R&D, respondents spending at least $1 million on R&D are reminded that payments should be recorded as R&D performed by others if they pay while the R&D is being carried out. The normal case is a levy to support a central R&D facility located abroad or a Canadian parent's support of the R&D of a foreign subsidiary. Payments for other technology may include reimbursement for R&D carried out in the past.

- For any industrialized country, there will be technology inflows and outflows. Some, such as the United States, have a net outflow of technology and hence receipts exceed payments.[1] Other countries import more technology than they export. Since the early 1980's, more money has been provided by foreigners for R&D performed by Canadian firms than has been paid out. In 2004, Canada continued to show a net outflow of technology ($1,318 million).

- Table 3.2 shows that there are differences in the balance of technological services by industry. For 2005, industries such as chemical products, petroleum and coal products and mining and oil and gas extraction were all net importers of technology. On the other hand, industries such as computer and peripheral equipment and communications equipment were net exporters, or had a net outflow of technology for the same year. The larger dollar amounts found in the latter industries help to contribute to the overall net outflow of technology for Canada.

1. Bureau of Economic Analysis, U.S. International Services: Cross-Border Trade, Table 7: Business, professional and technical services, 1986-2004, http://www.bea.gov/bea/di/1001serv/intlserv.htm. Accessed March 2007.

Table 3.1 Foreign payments made and received for technological services

	Payments		Receipts		Balance		Total
	R&D	Other	R&D	Other	R&D	Other	
	millions of dollars						
2005[p]	1,186	311	2,407	408	1,221	97	**1,318**
2004[r]	1,151	358	2,367	412	1,215	54	**1,270**
2003[r]	1,174	402	2,052	432	877	31	**908**
2002[r]	1,101	626	1,819	435	717	- 191	**526**
2001	1,309	315	2,826	390	1,517	75	**1,592**
2000	1,374	523	3,522	339	2,148	- 184	**1,965**
1999	1,490	523	2,642	320	1,152	- 202	**950**
1998	1,045	694	2,499	296	1,453	- 398	**1,056**
1997	912	698	1,750	184	837	- 514	**323**

Note: Data is only for firms engaged in R&D over $1 million.

Table 3.2 Foreign payments made and received for technological services (R&D and other), by selected industries, 2005

	Payments	Receipts	Balance
	millions of dollars		
Total	**x**	**x**	**1,318**
Mining and oil and gas extraction	**x**	**x**	**-26**
Manufacturing	**1,068**	**1,104**	**37**
Petroleum and coal products	46	17	-29
Chemical products	73	42	-31
Computer and peripheral equipment	9	33	25
Communications equipment	51	70	19
All other manufacturing industries	889	942	54
Other industries	**401**	**1,708**	**1,307**

Note: Data is only for firms engaged in R&D over $1 million.

4. Energy R&D expenditures

- The community of energy R&D performers is quite small. These companies spent $891 million, or 5.8% of all industrial R&D, on energy research and development in 2005. In addition, these same companies performed $793 million in non-energy areas for total expenditures of $1,685 million, or about 11% of total R&D in 2005 (table 4.1).

- In table 4.2, one observes that 83% of energy R&D is funded by the performing companies themselves.

- The greatest proportion of energy R&D concerned fossil fuels, representing more than half of all intramural energy R&D expenditures in 2005 (table 4.2).

Table 4.1 Research and development (R&D) expenditures of energy R&D performers, by major industry group, 2005

	Energy R&D performers			Non-energy R&D performers	**Total**
	Energy R&D expenditures	Other R&D expenditures	**Total**		
	millions of dollars				
Total	**891**	**793**	**1,685**	**13,671**	**15,356**
Mining and oil and gas extraction	264	7	**271**	138	**409**
Manufacturing	317	722	**1,039**	7,185	**8,224**
Other	310	64	**374**	6,349	**6,723**

Note: Components may not add to totals due to rounding.

Table 4.2 Energy research and development (R&D) expenditures, by area of technology and by source of funds, 2005

Area of technology	Intramural R&D expenditures				Payments outside Canada	**Total**
	Self-funded	Government funded	Other sources	**Total**		
	millions of dollars					
Total	**769**	**x**	**91**	**x**	**x**	**932**
Renewable resources	43	x	x	**x**	x	**64**
Transportation and transmission	x	0[s]	x	**x**	x	**79**
Conservation	121	x	15	**x**	x	**143**
Fossil fuels	453	x	x	**x**	x	**517**
Nuclear	x	x	x	**x**	x	**43**
Other cross-cutting techniques or research	50	x	3	**x**	x	**86**

Note: Components may not add to totals due to rounding.

5. R&D expenditures on therapeutic health products

- Table 5.1 provides a breakdown of R&D expenditures on health therapeutics, by the type of organization performing the R&D. Reflective of their substantial numbers, brand name pharmaceutical companies and biotechnology or biopharmaceutical companies dominate expenditures in the field.

- Table 5.2 provides a breakdown of R&D on therapeutic health products, by therapeutic class, for both 2004 and 2005. Anti-infective for systemic use is the most substantial therapeutic class, with about 15% of the total being spent on this class in 2005. This area of research encompasses those therapeutics capable of killing or inhibiting the growth or spread of infectious agents throughout the body, thus including treatments such as vaccines, antibacterials and antivirals. Other prominent classes include nervous system, cardiovascular system, and antineoplastic and immunomodulating agents. This final class incorporates both agents acting to prevent, inhibit or cease the development of tumours and those that modify the body's immune response or functioning.

Table 5.1 Research and development (R&D) expenditures on therapeutic health products, by type of organization

	2007[p]	2006[p]	2005[p]	2004[r]
	millions of dollars			
Total	**883**	**848**	**782**	**608**
Brand name pharmaceutical company	466	467	433	318
Generic pharmaceutical company	x	x	x	x
Contract research organization	74	72	69	59
Biotechnology or biopharmaceutical company	229	198	175	136
Other	x	x	x	x

Note: Components may not add to totals due to rounding.

Table 5.2 Research and development (R&D) expenditures on therapeutic health products, by therapeutic class

	2005[p]	2004[r]
	millions of dollars	
Total	**782**	**608**
Alimentary tract and metabolism	79	47
Blood and blood forming organs	37	29
Cardiovascular system	90	68
Dermatological	19	14
Genito-urinary systems and sex hormones	17	13
Systemic hormonal preparation excluding sex hormones and insulin	12	11
Anti-infective for systemic use	118	122
Antineoplastic and immunomodulating agents	85	73
Musculo-skeletal systems	81	20
Nervous system	90	82
Antiparasitic products, insecticides and repellents	x	x
Respiratory system	49	34
Sensory organs	x	x
Various others	94	92

Note: Components may not add to totals due to rounding.

Appendix A

Table A.1 Research and development (R&D) performers, by industry and by country of control, 2004

	Country of control			
	Canada	United States	Foreign	**Total**
	number			
Total	**16,530**	**401**	**291**	**17,222**
Agriculture, forestry, fishing and hunting	**612**	**2**	**4**	**618**
Agriculture	495	2	3	**500**
Forestry and logging	69	0	0	**69**
Fishing, hunting and trapping	48	0	1	**49**
Mining and oil and gas extraction	**110**	**12**	**6**	**128**
Oil and gas extraction	65	8	1	**74**
Mining	45	4	5	**54**
Utilities	**86**	**0**	**2**	**88**
Electric power	14	0	2	**16**
Other utilities	72	0	0	**72**
Construction	**475**	**0**	**2**	**477**
Manufacturing	**7,274**	**258**	**183**	**7,715**
Food	553	17	10	**580**
Beverage and tobacco	39	0	1	**40**
Textile	160	11	5	**176**
Wood products	271	3	4	**278**
Paper	118	12	8	**138**
Printing	218	2	2	**222**
Petroleum and coal products	35	5	4	**44**
Pharmaceutical and medicine	99	14	13	**126**
Other chemicals	360	24	21	**405**
Plastic products	441	18	10	**469**
Rubber products	51	5	4	**60**
Non-metallic mineral products	168	2	10	**180**
Primary metal (ferrous)	55	4	7	**66**
Primary metal (non-ferrous)	65	3	7	**75**
Fabricated metal products	1,080	16	6	**1,102**
Machinery	1,306	19	19	**1,344**
Computer and peripheral equipment	74	8	1	**83**
Communications equipment	147	12	6	**165**
Semiconductor and other electronic components	171	8	1	**180**
Navigational, measuring, medical and control instruments	280	11	7	**298**
Other computer and electronic products	50	0	0	**50**
Electrical equipment, appliance and components	23 1	20	12	**263**
Motor vehicle and parts	222	19	16	**257**
Aerospace products and parts	69	7	4	**80**
All other transportation equipment	94	4	1	**99**
Furniture and related products	256	3	0	**259**
Other manufacturing industries	661	11	4	**676**
Services	**7,973**	**129**	**94**	**8,196**
Wholesale trade	1,309	34	40	**1,383**
Retail trade	294	0	1	**295**
Transportation and warehousing	107	2	0	**109**
Information and cultural industries	541	16	10	**567**
Finance, insurance and real estate	215	5	5	**225**
Architectural, engineering and related services	866	6	9	**881**
Computer system design and related services	2,156	33	14	**2,203**
Management, scientific and technical consulting services	420	2	0	**422**
Scientific research and development	815	21	7	**843**
Health care and social assistance	131	2	2	**135**
All other services	1,119	8	6	**1,133**

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002

NAICS Code	Industry	Performers
	Total, all industries	**17,222**
	Agriculture, Forestry, Fishing and Hunting	**618**
	Agriculture	**500**
111110	Soybean Farming	1
111120	Oilseed (except Soybean) Farming	0
111130	Dry Pea and Bean Farming	2
111140	Wheat Farming	6
111150	Corn Farming	1
111160	Rice Farming	0
111190	Other Grain Farming	8
111211	Potato Farming	15
111219	Other Vegetable (except Potato) and Melon Farming	51
111310	Orange Groves	0
111320	Citrus (except Orange) Groves	0
111330	Non-Citrus Fruit and Tree Nut Farming	35
111411	Mushroom Production	9
111419	Other Food Crops Grown Under Cover	33
111421	Nursery and Tree Production	31
111422	Floriculture Production	80
111910	Tobacco Farming	12
111920	Cotton Farming	0
111930	Sugar-Cane Farming	0
111940	Hay Farming	2
111993	Fruit and Vegetable Combination Farming	8
111999	All Other Miscellaneous Crop Farming	34
112110	Beef Cattle Ranching and Farming, including Feedlots	10
112120	Dairy Cattle and Milk Production	18
112210	Hog and Pig Farming	32
112310	Chicken Egg Production	3
112320	Broiler and Other Meat-Type Chicken Production	10
112330	Turkey Production	1
112340	Poultry Hatcheries	0
112391	Combination Poultry and Egg Production	1
112399	All Other Poultry Production	6
112410	Sheep Farming	2
112420	Goat Farming	1
112910	Apiculture	2
112920	Horse and Other Equine Production	1
112930	Fur-Bearing Animal and Rabbit Production	0
112991	Livestock Combination Farming	23
112999	All Other Miscellaneous Animal Production	1
115110	Support Activities for Crop Production	32
115210	Support Activities for Animal Production	11
	Forestry and Logging	**69**
113110	Timber Tract Operations	1
113210	Forest Nurseries and Gathering of Forest Products	5
113311	Logging (except Contract)	12
113312	Contract Logging	22
115310	Support Activities for Forestry	29

NAICS Code	Industry	Performers
	Agriculture, forestry, fishing and hunting (continued)	
	Fishing, Hunting and Trapping	**49**
112510	Animal Aquaculture	34
114113	Salt Water Fishing	13
114114	Inland Fishing	2
114210	Hunting and Trapping	0
	Mining and Oil and Gas Extraction	**128**
	Oil and Gas Extraction	**74**
211113	Conventional Oil and Gas Extraction	22
211114	Non-Conventional Oil Extraction	3
213111	Oil and Gas Contract Drilling	8
213118	Services to Oil and Gas Extraction	41
	Mining	**54**
212114	Bituminous Coal Mining	0
212115	Subbituminous Coal Mining	0
212116	Lignite Coal Mining	0
212210	Iron Ore Mining	3
212220	Gold and Silver Ore Mining	6
212231	Lead-Zinc Ore Mining	0
212232	Nickel-Copper Ore Mining	1
212233	Copper-Zinc Ore Mining	3
212291	Uranium Ore Mining	0
212299	All Other Metal Ore Mining	1
212314	Granite Mining and Quarrying	2
212315	Limestone Mining and Quarrying	3
212316	Marble Mining and Quarrying	2
212317	Sandstone Mining and Quarrying	0
212323	Sand and Gravel Mining and Quarrying	4
212326	Shale, Clay and Refractory Mineral Mining and Quarrying	0
212392	Diamond Mines	0
212393	Salt Mines	0
212394	Asbestos Mining	0
212395	Gypsum Mining	0
212396	Potash Mining	3
212397	Peat Extraction	6
212398	All Other Non-Metallic Mineral Mining and Quarrying	5
213117	Contract Drilling (except Oil and Gas)	3
213119	Other Support Activities for Mining	12

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Utilities	**88**		**Construction** (continued)	
	Electric Power	**16**	238330	Flooring Contractors	9
221111	Hydro-Electric Power Generation	8	238340	Tile and Terrazzo Contractors	2
221112	Fossil-Fuel Electric Power Generation	3	238350	Finish Carpentry Contractors	21
221113	Nuclear Electric Power Generation	1	238390	Other Building Finishing Contractors	9
221119	Other Electric Power Generation	1	238910	Site Preparation Contractors	23
221121	Electric Bulk Power Transmission and Control	0	238990	All Other Specialty Trade Contractors	14
221122	Electric Power Distribution	3			
	Other Utilities	**72**			
221210	Natural Gas Distribution	2		**Manufacturing**	**7,715**
221310	Water Supply and Irrigation Systems	14			
221320	Sewage Treatment Facilities	2		**Food**	**580**
221330	Steam and Air-Conditioning Supply	0	311111	Dog and Cat Food Manufacturing	6
562110	Waste Collection	10	311119	Other Animal Food Manufacturing	45
562210	Waste Treatment and Disposal	16	311211	Flour Milling	11
562910	Remediation Services	18	311214	Rice Milling and Malt Manufacturing	4
562920	Material Recovery Facilities	3	311221	Wet Corn Milling	1
562990	All Other Waste Management Services	7	311224	Oilseed Processing	7
			311225	Fat and Oil Refining and Blending	1
			311230	Breakfast Cereal Manufacturing	4
			311310	Sugar Manufacturing	5
	Construction	**477**	311320	Chocolate and Confectionery Manufacturing from Cacao Beans	3
236110	Residential Building Construction	56	311330	Confectionery Manufacturing from Purchased Chocolate	8
236210	Industrial Building and Structure Construction	16	311340	Non-Chocolate Confectionery Manufacturing	12
236220	Commercial and Institutional Building Construction	16	311410	Frozen Food Manufacturing	22
237110	Water and Sewer Line and Related Structures Construction	10	311420	Fruit and Vegetable Canning, Pickling and Drying	48
237120	Oil and Gas Pipeline and Related Structures Construction	4	311511	Fluid Milk Manufacturing	18
237130	Power and Communication Line and Related Structures Construction	4	311515	Butter, Cheese, and Dry and Condensed Dairy Products Manufacturing	53
237210	Land Subdivision	7	311520	Ice Cream and Frozen Dessert Manufacturing	4
237310	Highway, Street and Bridge Construction	19	311611	Animal (except Poultry) Slaughtering	13
237990	Other Heavy and Civil Engineering Construction	10	311614	Rendering and Meat Processing from Carcasses	34
238110	Poured Concrete Foundation and Structure Contractors	8	311615	Poultry Processing	16
238120	Structural Steel and Precast Concrete Contractors	12	311710	Seafood Product Preparation and Packaging	43
238130	Framing Contractors	5	311811	Retail Bakeries	14
238140	Masonry Contractors	12	311814	Commercial Bakeries and Frozen Bakery Product Manufacturing	69
238150	Glass and Glazing Contractors	11	311821	Cookie and Cracker Manufacturing	13
238160	Roofing Contractors	5	311822	Flour Mixes and Dough Manufacturing from Purchased Flour	12
238170	Siding Contractors	5	311823	Dry Pasta Manufacturing	6
238190	Other Foundation, Structure and Building Exterior Contractors	3	311830	Tortilla Manufacturing	1
238210	Electrical Contractors	69	311911	Roasted Nut and Peanut Butter Manufacturing	1
238220	Plumbing, Heating and Air-Conditioning Contractors	82	311919	Other Snack Food Manufacturing	10
238291	Elevator and Escalator Installation Contractors	5	311920	Coffee and Tea Manufacturing	15
238299	All Other Building Equipment Contractors	27	311930	Flavouring Syrup and Concentrate Manufacturing	4
238310	Drywall and Insulation Contractors	3	311940	Seasoning and Dressing Manufacturing	24
238320	Painting and Wall Covering Contractors	10	311990	All Other Food Manufacturing	53

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers
	Manufacturing (continued)	
	Beverages and Tobacco	**40**
312110	Soft Drink and Ice Manufacturing	5
312120	Breweries	13
312130	Wineries	17
312140	Distilleries	3
312210	Tobacco Stemming and Redrying	0
312220	Tobacco Product Manufacturing	2
	Textile	**176**
313110	Fibre, Yarn and Thread Mills	11
313210	Broad-Woven Fabric Mills	18
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	11
313230	Nonwoven Fabric Mills	9
313240	Knit Fabric Mills	37
313310	Textile and Fabric Finishing	27
313320	Fabric Coating	6
314110	Carpet and Rug Mills	8
314120	Curtain and Linen Mills	10
314910	Textile Bag and Canvas Mills	18
314990	All Other Textile Product Mills	21
	Wood Products	**278**
321111	Sawmills (except Shingle and Shake Mills)	55
321112	Shingle and Shake Mills	8
321114	Wood Preservation	10
321211	Hardwood Veneer and Plywood Mills	8
321212	Softwood Veneer and Plywood Mills	6
321215	Structural Wood Product Manufacturing	17
321216	Particle Board and Fibreboard Mills	6
321217	Waferboard Mills	2
321911	Wood Window and Door Manufacturing	42
321919	Other Millwork	66
321920	Wood Container and Pallet Manufacturing	19
321991	Manufactured (Mobile) Home Manufacturing	1
321992	Prefabricated Wood Building Manufacturing	15
321999	All Other Miscellaneous Wood Product Manufacturing	23
	Paper	**138**
322111	Mechanical Pulp Mills	3
322112	Chemical Pulp Mills	9
322121	Paper (except Newsprint) Mills	17
322122	Newsprint Mills	8
322130	Paperboard Mills	8
322211	Corrugated and Solid Fibre Box Manufacturing	17
322212	Folding Paperboard Box Manufacturing	11
322219	Other Paperboard Container Manufacturing	8
322220	Paper Bag and Coated and Treated Paper Manufacturing	30
322230	Stationery Product Manufacturing	5
322291	Sanitary Paper Product Manufacturing	8
322299	All Other Converted Paper Product Manufacturing	14
	Printing	**222**
323113	Commercial Screen Printing	20
323114	Quick Printing	3
323115	Digital Printing	6
323116	Manifold Business Forms Printing	17
323119	Other Printing	140
323120	Support Activities for Printing	36
	Petroleum and Coal Products	**44**
324110	Petroleum Refineries	12
324121	Asphalt Paving Mixture and Block Manufacturing	10
324122	Asphalt Shingle and Coating Material Manufacturing	4
324190	Other Petroleum and Coal Products Manufacturing	18
	Pharmaceutical and Medicine	**126**
325410	Pharmaceutical and Medicine Manufacturing	126
	Other Chemical	**405**
325110	Petrochemical Manufacturing	3
325120	Industrial Gas Manufacturing	4
325130	Synthetic Dye and Pigment Manufacturing	9
325181	Alkali and Chlorine Manufacturing	0
325189	All Other Basic Inorganic Chemical Manufacturing	19
325190	Other Basic Organic Chemical Manufacturing	15
325210	Resin and Synthetic Rubber Manufacturing	27
325220	Artificial and Synthetic Fibres and Filaments Manufacturing	10
325313	Chemical Fertilizer (except Potash) Manufacturing	12
325314	Mixed Fertilizer Manufacturing	10
325320	Pesticide and Other Agricultural Chemical Manufacturing	8
325510	Paint and Coating Manufacturing	64
325520	Adhesive Manufacturing	26
325610	Soap and Cleaning Compound Manufacturing	56
325620	Toilet Preparation Manufacturing	38
325910	Printing Ink Manufacturing	15
325920	Explosives Manufacturing	2
325991	Custom Compounding of Purchased Resins	9
325999	All Other Miscellaneous Chemical Product Manufacturing	78

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Manufacturing (continued)			**Manufacturing** (continued)	
	Plastic Product	**469**		**Primary Metal (Non-Ferrous)**	**75**
326111	Unsupported Plastic bag Manufacturing	29	331313	Primary Production of Alumina and Aluminium	6
326114	Unsupported Plastic Film and Sheet Manufacturing	32	331317	Aluminium Rolling, Drawing, Extruding and Alloying	16
326121	Unsupported Plastic Profile Shape Manufacturing	25	331410	Non-Ferrous Metal (except Aluminium) Smelting and Refining	9
326122	Plastic Pipe and Pipe Fitting Manufacturing	8	331420	Copper Rolling, Drawing, Extruding and Alloying	6
326130	Laminated Plastic Plate, Sheet and Shape Manufacturing	10	331490	Non-Ferrous Metal (except Copper and Aluminium) Rolling, Drawing, Extruding and Alloying	8
326140	Polystyrene Foam Product Manufacturing	14	331523	Non-Ferrous Die-Casting Foundries	12
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	18	331529	Non-Ferrous Foundries (except Die-Casting)	18
326160	Plastic Bottle Manufacturing	14			
326191	Plastic Plumbing Fixture Manufacturing	20		**Fabricated Metal Product**	**1,102**
326193	Motor Vehicle Plastic Parts Manufacturing	55	332113	Forging	31
326198	All Other Plastic Product Manufacturing	244	332118	Stamping	51
			332210	Cutlery and Hand Tool Manufacturing	49
	Rubber Product	**60**	332311	Prefabricated Metal Building and Component Manufacturing	17
326210	Tire Manufacturing	4	332314	Concrete Reinforcing Bar Manufacturing	2
326220	Rubber and Plastic Hose and Belting Manufacturing	11	332319	Other Plate Work and Fabricated Structural Product Manufacturing	78
326290	Other Rubber Product Manufacturing	45	332321	Metal Window and Door Manufacturing	68
			332329	Other Ornamental and Architectural Metal Products Manufacturing	69
	Non-Metallic Mineral Products	**180**	332410	Power Boiler and Heat Exchanger Manufacturing	14
327110	Pottery, Ceramics and Plumbing Fixture Manufacturing	7	332420	Metal Tank (Heavy Gauge) Manufacturing	29
327120	Clay Building Material and Refractory Manufacturing	10	332431	Metal Can Manufacturing	2
327214	Glass Manufacturing	14	332439	Other Metal Container Manufacturing	13
327215	Glass Product Manufacturing from Purchased Glass	25	332510	Hardware Manufacturing	26
327310	Cement Manufacturing	1	332611	Spring (Heavy Gauge) Manufacturing	7
327320	Ready-Mix Concrete Manufacturing	14	332619	Other Fabricated Wire Product Manufacturing	24
327330	Concrete Pipe, Brick and Block Manufacturing	22	332710	Machine Shops	376
327390	Other Concrete Product Manufacturing	29	332720	Turned Product and Screw, Nut and Bolt Manufacturing	28
327410	Lime Manufacturing	0	332810	Coating, Engraving, Heat Treating and Allied Activities	95
327420	Gypsum Product Manufacturing	6	332910	Metal Valve Manufacturing	27
327910	Abrasive Product Manufacturing	10	332991	Ball and Roller Bearing Manufacturing	8
327990	All Other Non-Metallic Mineral Product Manufacturing	42	332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	88
	Primary Metal (Ferrous)	**66**		**Machinery**	**1,344**
331110	Iron and Steel Mills and Ferro-Alloy Manufacturing	11	333110	Agricultural Implement Manufacturing	98
331210	Iron and Steel Pipes and Tubes Manufacturing from Purchased Steel	16	333120	Construction Machinery Manufacturing	41
331221	Cold-Rolled Steel Shape Manufacturing	2	333130	Mining and Oil and Gas Field Machinery Manufacturing	45
331222	Steel Wire Drawing	5	333210	Sawmill and Woodworking Machinery Manufacturing	33
331511	Iron Foundries	18	333220	Rubber and Plastics Industry Machinery Manufacturing	25
331514	Steel Foundries	14	333291	Paper Industry Machinery Manufacturing	18
			333299	All Other Industrial Machinery Manufacturing	110

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers
	Manufacturing (continued)	
	Machinery (continued)	
333310	Commercial and Service Industry Machinery Manufacturing	116
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing	37
333416	Heating Equipment and Commercial Refrigeration Equipment Manufacturing	71
333511	Industrial Mould Manufacturing	136
333519	Other Metalworking Machinery Manufacturing	263
333611	Turbine and Turbine Generator Set Unit Manufacturing	16
333619	Other Engine and Power Transmission Equipment Manufacturing	21
333910	Pump and Compressor Manufacturing	28
333920	Material Handling Equipment Manufacturing	116
333990	All Other General-Purpose Machinery Manufacturing	170
	Computer and Peripheral Equipment	**83**
334110	Computer and Peripheral Equipment Manufacturing	83
	Communications Equipment	**165**
334210	Telephone Apparatus Manufacturing	37
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	82
334290	Other Communications Equipment Manufacturing	46
	Semiconductor and Other Electronic Component	**180**
334410	Semiconductor and Other Electronic Component Manufacturing	180
	Navigational, Measuring, Medical and Control Instruments	**298**
334511	Navigational and Guidance Instruments Manufacturing	44
334512	Measuring, Medical and Controlling Devices Manufacturing	254
	Other Computer and Electronic Product	**50**
334310	Audio and Video Equipment Manufacturing	34
334610	Manufacturing and Reproducing Magnetic and Optical Media	16
	Electrical Equipment, Appliance and Component	**263**
335110	Electric Lamp Bulb and Parts Manufacturing	2
335120	Lighting Fixture Manufacturing	41
335210	Small Electrical Appliance Manufacturing	19
335223	Major Kitchen Appliance Manufacturing	14
335229	Other Major Appliance Manufacturing	5
	Manufacturing (continued)	
	Electrical Equipment, Appliance and Component (continued)	
335311	Power, Distribution and Specialty Transformers Manufacturing	28
335312	Motor and Generator Manufacturing	14
335315	Switchgear and Switchboard, and Relay and Industrial Control Apparatus Manufacturing	49
335910	Battery Manufacturing	7
335920	Communication and Energy Wire and Cable Manufacturing	22
335930	Wiring Device Manufacturing	17
335990	All Other Electrical Equipment and Component Manufacturing	45
	Motor Vehicle and Parts	**257**
336110	Automobile and Light-Duty Motor Vehicle Manufacturing	8
336120	Heavy-Duty Truck Manufacturing	11
336211	Motor Vehicle Body Manufacturing	32
336212	Truck Trailer Manufacturing	24
336215	Motor Home, Travel Trailer and Camper Manufacturing	12
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	18
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	27
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	8
336340	Motor Vehicle Brake System Manufacturing	15
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	11
336360	Motor Vehicle Seating and Interior Trim Manufacturing	13
336370	Motor Vehicle Metal Stamping	25
336390	Other Motor Vehicle Parts Manufacturing	53
	Aerospace Product and Parts	**80**
336410	Aerospace Product and Parts Manufacturing	80
	All Other Transportation Equipment	**99**
336510	Railroad Rolling Stock Manufacturing	6
336611	Ship Building and Repairing	5
336612	Boat Building	46
336990	Other Transportation Equipment Manufacturing	42
	Furniture and Related Product	**259**
337110	Wood Kitchen Cabinet and Counter Top Manufacturing	44
337121	Upholstered Household Furniture Manufacturing	13
337123	Other Wood Household Furniture Manufacturing	62
337126	Household Furniture (except Wood and Upholstered) Manufacturing	12

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Manufacturing (continued)			**Services**	**8,196**
	Furniture and Related Product (continued)			**Wholesale Trade**	**1,383**
337127	Institutional Furniture Manufacturing	28	411110	Live Animal Wholesaler-Distributors	7
337213	Wood Office Furniture, including Custom Architectural Woodwork, Manufacturing	24	411120	Oilseed and Grain Wholesaler-Distributors	9
337214	Office Furniture (except Wood) Manufacturing	20	411130	Nursery Stock and Plant Wholesaler-Distributors	14
337215	Showcase, Partition, Shelving and Locker Manufacturing	42	411190	Other Farm Product Wholesaler-Distributors	2
337910	Mattress Manufacturing	8	412110	Petroleum Product Wholesaler-Distributors	8
337920	Blind and Shade Manufacturing	6	413110	General-Line Food Wholesaler-Distributors	11
			413120	Dairy and Milk Products Wholesaler-Distributors	6
	Other Manufacturing Industries	**676**	413130	Poultry and Egg Wholesaler-Distributors	2
315110	Hosiery and Sock Mills	9	413140	Fish and Seafood Product Wholesaler-Distributors	8
315190	Other Clothing Knitting Mills	26	413150	Fresh Fruit and Vegetable Wholesaler-Distributors	26
315210	Cut and Sew Clothing Contracting	23	413160	Red Meat and Meat Product Wholesaler-Distributors	18
315221	Men's and Boys' Cut and Sew Underwear and Nightwear Manufacturing	2	413190	Other Specialty-Line Food Wholesaler-Distributors	66
315222	Men's and Boys' Cut and Sew Suit, Coat and Overcoat Manufacturing	7	413210	Non-Alcoholic Beverage Wholesaler-Distributors	4
315226	Men's and Boys' Cut and Sew Shirt Manufacturing	3	413220	Alcoholic Beverage Wholesaler-Distributors	1
315227	Men's and Boys' Cut and Sew Trouser, Slack and Jean Manufacturing	7	413310	Cigarette and Tobacco Product Wholesaler-Distributors	0
315229	Other Men's and Boys' Cut and Sew Clothing Manufacturing	12	414110	Clothing and Clothing Accessories Wholesaler-Distributors	25
315231	Women's and Girls' Cut and Sew Lingerie, Loungewear and Nightwear Manufacturing	15	414120	Footwear Wholesaler-Distributors	2
315232	Women's and Girls' Cut and Sew Blouse and Shirt Manufacturing	3	414130	Piece Goods, Notions and Other Dry Goods Wholesaler-Distributors	22
315233	Women's and Girls' Cut and Sew Dress Manufacturing	12	414210	Home Entertainment Equipment Wholesaler-Distributors	7
315234	Women's and Girls' Cut and Sew Suit, Coat, Tailored Jacket and Skirt Manufacturing	10	414220	Household Appliance Wholesaler-Distributors	5
315239	Other Women's and Girls' Cut and Sew Clothing Manufacturing	21	414310	China, Glassware, Crockery and Pottery Wholesaler-Distributors	3
315291	Infants' Cut and Sew Clothing Manufacturing	0	414320	Floor Covering Wholesaler-Distributors	2
315292	Fur and Leather Clothing Manufacturing	16	414330	Linen, Drapery and Other Textile Furnishings Wholesaler-Distributors	0
315299	All Other Cut and Sew Clothing Manufacturing	0	414390	Other Home Furnishings Wholesaler-Distributors	9
315990	Clothing Accessories and Other Clothing Manufacturing	21	414410	Jewellery and Watch Wholesaler-Distributors	1
316110	Leather and Hide Tanning and Finishing	7	414420	Book, Periodical and Newspaper Wholesaler-Distributors	1
316210	Footwear Manufacturing	20	414430	Photographic Equipment and Supplies Wholesaler-Distributors	3
316990	Other Leather and Allied Product Manufacturing	12	414440	Sound Recording Wholesalers	0
339110	Medical Equipment and Supplies Manufacturing	135	414450	Video Cassette Wholesalers	0
339910	Jewellery and Silverware Manufacturing	25	414460	Toy and Hobby Goods Wholesaler-Distributors	6
339920	Sporting and Athletic Goods Manufacturing	75	414470	Amusement and Sporting Goods Wholesaler-Distributors	16
339930	Doll, Toy and Game Manufacturing	16	414510	Pharmaceuticals and Pharmacy Supplies Wholesaler-Distributors	48
339940	Office Supplies (except Paper) Manufacturing	13	414520	Toiletries, Cosmetics and Sundries Wholesaler-Distributors	27
339950	Sign Manufacturing	24	415110	New and Used Automobile and Light-Duty Truck Wholesaler-Distributors	1
339990	All Other Miscellaneous Manufacturing	162	415120	Truck, Truck Tractor and Bus Wholesaler-Distributors	5

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)			**Services** (continued)	
	Wholesale Trade (continued)			**Wholesale Trade** (continued)	
415190	Recreational and Other Motor Vehicles Wholesaler-Distributors	4	418930	Second-Hand Goods (except Machinery and Automotive) Wholesaler-Distributors	1
415210	Tire Wholesaler-Distributors	2	418990	All Other Wholesaler-Distributors	86
415290	Other New Motor Vehicle Parts and Accessories Wholesaler-Distributors	27	419110	Farm Product Agents and Brokers	2
415310	Used Motor Vehicle Parts and Accessories Wholesaler-Distributors	1	419120	Petroleum Product Agents and Brokers	17
416110	Electrical Wiring and Construction Supplies Wholesaler-Distributors	32	419130	Food, Beverage and Tobacco Agents and Brokers	5
416120	Plumbing, Heating and Air-Conditioning Equipment and Supplies Wholesaler-Distributors	44	419140	Personal and Household Goods Agents and Brokers	6
416210	Metal Service Centres	22	419150	Motor Vehicle and Parts Agents and Brokers	1
416310	General-Line Building Supplies Wholesaler-Distributors	5	419160	Building Material and Supplies Agents and Brokers	6
416320	Lumber, Plywood and Millwork Wholesaler-Distributors	20	419170	Machinery, Equipment and Supplies Agents and Brokers	19
416330	Hardware Wholesaler-Distributors	17	419190	Other Wholesale Agents and Brokers	29
416340	Paint, Glass and Wallpaper Wholesaler-Distributors	8			
416390	Other Specialty-Line Building Supplies Wholesaler-Distributors	26		**Retail Trade**	**295**
417110	Farm, Lawn and Garden Machinery and Equipment Wholesaler-Distributors	29	441110	New Car Dealers	0
417210	Construction and Forestry Machinery, Equipment and Supplies Wholesaler-Distributors	19	441120	Used Car Dealers	3
417220	Mining and Oil and Gas Well Machinery, Equipment and Supplies Wholesaler-Distributors	16	441210	Recreational Vehicle Dealers	0
417230	Industrial Machinery, Equipment and Supplies Wholesaler-Distributors	126	441220	Motorcycle, Boat and Other Motor Vehicle Dealers	10
417310	Computer, Computer Peripheral and Pre-Packaged Software Wholesaler-Distributors	107	441310	Automotive Parts and Accessories Stores	7
417320	Electronic Components, Navigational and Communications Equipment and Supplies Wholesaler-Distributors	62	441320	Tire Dealers	0
417910	Office and Store Machinery and Equipment Wholesaler-Distributors	26	442110	Furniture Stores	2
417920	Service Establishment Machinery, Equipment and Supplies Wholesaler-Distributors	15	442210	Floor Covering Stores	1
417930	Professional Machinery, Equipment and Supplies Wholesaler-Distributors	60	442291	Window Treatment Stores	1
417990	All Other Machinery, Equipment and Supplies Wholesaler-Distributors	26	442292	Print and Picture Frame Stores	1
418110	Recyclable Metal Wholesaler-Distributors	11	442298	All Other Home Furnishings Stores	2
418120	Recyclable Paper and Paperboard Wholesaler-Distributors	2	443110	Appliance, Television and Other Electronics Stores	16
418190	Other Recyclable Material Wholesaler-Distributors	31	443120	Computer and Software Stores	54
418210	Stationery and Office Supplies Wholesaler-Distributors	3	443130	Camera and Photographic Supplies Stores	2
418220	Other Paper and Disposable Plastic Product Wholesaler-Distributors	8	444110	Home Centres	2
418310	Agricultural Feed Wholesaler-Distributors	16	444120	Paint and Wallpaper Stores	3
418320	Seed Wholesaler-Distributors	14	444130	Hardware Stores	5
418390	Agricultural Chemical and Other Farm Supplies Wholesaler-Distributors	17	444190	Other Building Material Dealers	13
418410	Chemical (except Agricultural) and Allied Product Wholesaler-Distributors	45	444210	Outdoor Power Equipment Stores	1
418910	Log and Wood Chip Wholesaler-Distributors	2	444220	Nursery and Garden Centres	10
418920	Mineral, Ore and Precious Metal Wholesaler-Distributors	3	445110	Supermarkets and Other Grocery (except Convenience) Stores	3

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)			**Services** (continued)	
	Retail Trade (continued)			**Retail Trade** (continued)	
445120	Convenience Stores	3	454110	Electronic Shopping and Mail-Order Houses	20
445210	Meat Markets	11	454210	Vending Machine Operators	4
445220	Fish and Seafood Markets	3	454310	Fuel Dealers	1
445230	Fruit and Vegetable Markets	0	454390	Other Direct Selling Establishments	5
445291	Baked Goods Stores	12			
445292	Confectionery and Nut Stores	2		**Transportation and Warehousing**	**109**
445299	All Other Specialty Food Stores	5	481110	Scheduled Air Transportation	2
445310	Beer, Wine and Liquor Stores	0	481214	Non-Scheduled Chartered Air Transportation	4
446110	Pharmacies and Drug Stores	10	481215	Non-Scheduled Specialty Flying Services	5
446120	Cosmetics, Beauty Supplies and Perfume Stores	4	482112	Short-Haul Freight Rail Transportation	0
446130	Optical Goods Stores	2	482113	Mainline Freight Rail Transportation	2
446191	Food (Health) Supplement Stores	5	482114	Passenger Rail Transportation	0
446199	All Other Health and Personal Care Stores	5	483115	Deep Sea, Coastal and Great Lakes Water Transportation (except by Ferries)	1
447110	Gasoline Stations with Convenience Stores	1	483116	Deep Sea, Coastal and Great Lakes Water Transportation by Ferries	0
447190	Other Gasoline Stations	3	483213	Inland Water Transportation (except by Ferries)	0
448110	Men's Clothing Stores	2	483214	Inland Water Transportation by Ferries	0
448120	Women's Clothing Stores	4	484110	General Freight Trucking, Local	8
448130	Children's and Infants' Clothing Stores	1	484121	General Freight Trucking, Long Distance, Truck-Load	4
448140	Family Clothing Stores	2	484122	General Freight Trucking, Long Distance, Less Than Truck-Load	2
448150	Clothing Accessories Stores	0	484210	Used Household and Office Goods Moving	0
448191	Fur Stores	0	484221	Bulk Liquids Trucking, Local	1
448199	All Other Clothing Stores	3	484222	Dry Bulk Materials Trucking, Local	6
448210	Shoe Stores	3	484223	Forest Products Trucking, Local	2
448310	Jewellery Stores	2	484229	Other Specialized Freight (except Used Goods) Trucking, Local	0
448320	Luggage and Leather Goods Stores	0	484231	Bulk Liquids Trucking, Long Distance	1
451110	Sporting Goods Stores	9	484232	Dry Bulk Materials Trucking, Long Distance	3
451120	Hobby, Toy and Game Stores	4	484233	Forest Products Trucking, Long Distance	0
451130	Sewing, Needlework and Piece Goods Stores	1	484239	Other Specialized Freight (except Used Goods) Trucking, Long Distance	4
451140	Musical Instrument and Supplies Stores	0	485110	Urban Transit Systems	0
451210	Book Stores and News Dealers	1	485210	Interurban and Rural Bus Transportation	0
451220	Pre-Recorded Tape, Compact Disc and Record Stores	1	485310	Taxi Service	0
452110	Department Stores	0	485320	Limousine Service	0
452910	Warehouse Clubs and Superstores	0	485410	School and Employee Bus Transportation	0
452991	Home and Auto Supplies Stores	0	485510	Charter Bus Industry	0
452999	All Other Miscellaneous General Merchandise Stores	6	485990	Other Transit and Ground Passenger Transportation	0
453110	Florists	1	486110	Pipeline Transportation of Crude Oil	0
453210	Office Supplies and Stationery Stores	0	486210	Pipeline Transportation of Natural Gas	3
453220	Gift, Novelty and Souvenir Stores	3	486910	Pipeline Transportation of Refined Petroleum Products	0
453310	Used Merchandise Stores	0	486990	All Other Pipeline Transportation	0
453910	Pet and Pet Supplies Stores	2	487110	Scenic and Sightseeing Transportation, Land	0
453920	Art Dealers	0	487210	Scenic and Sightseeing Transportation, Water	2
453930	Manufactured (Mobile) Home Dealers	1	487990	Scenic and Sightseeing Transportation, Other	1
453992	Beer and Wine-Making Supplies Stores	4	488111	Air Traffic Control	0
453999	All Other Miscellaneous Store Retailers (except Beer and Wine-Making Supplies Stores)	13	488119	Other Airport Operations	1

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)			**Services** (continued)	
	Transportation and Warehousing (continued)			**Information and Cultural Industries** (continued)	
488190	Other Support Activities for Air Transportation	14	517510	Cable and Other Program Distribution	2
488210	Support Activities for Rail Transportation	3	517910	Other Telecommunications	18
488310	Port and Harbour Operations	2	518111	Internet Service Providers	28
488320	Marine Cargo Handling	1	518112	Web Search Portals	5
488331	Marine Salvage Services	1	518210	Data Processing, Hosting, and Related Services	49
488332	Ship Piloting Services	0	519110	News Syndicates	3
488339	Other Navigational Services to Shipping	0	519121	Libraries	1
488390	Other Support Activities for Water Transportation	2	519122	Archives	1
488410	Motor Vehicle Towing	2	519190	All Other Information Services	15
488490	Other Support Activities for Road Transportation	5			
488511	Marine Shipping Agencies	0		**Finance, Insurance and Real Estate**	**225**
488519	Other Freight Transportation Arrangement	9	521110	Monetary Authorities - Central Bank	0
488990	Other Support Activities for Transportation	2	522111	Personal and Commercial Banking Industry	6
491110	Postal Service	0	522112	Corporate and Institutional Banking Industry	0
492110	Couriers	2	522130	Local Credit Unions	0
492210	Local Messengers and Local Delivery	0	522190	Other Depository Credit Intermediation	0
493110	General Warehousing and Storage	6	522210	Credit Card Issuing	0
493120	Refrigerated Warehousing and Storage	2	522220	Sales Financing	2
493130	Farm Product Warehousing and Storage	4	522291	Consumer Lending	0
493190	Other Warehousing and Storage	2	522299	All Other Non-Depository Credit Intermediation	10
			522310	Mortgage and Non-mortgage Loan Brokers	1
	Information and Cultural Industries	**567**	522321	Central Credit Unions	2
511110	Newspaper Publishers	3	522329	Other Financial Transactions Processing and Clearing House Activities	7
511120	Periodical Publishers	5	522390	Other Activities Related to Credit Intermediation	0
511130	Book Publishers	10	523110	Investment Banking and Securities Dealing	3
511140	Database and Directory Publishers	8	523120	Securities Brokerage	4
511190	Other Publishers	4	523130	Commodity Contracts Dealing	2
511210	Software Publishers	298	523140	Commodity Contracts Brokerage	0
512110	Motion Picture and Video Production	31	523210	Securities and Commodity Exchanges	1
512120	Motion Picture and Video Distribution	2	523910	Miscellaneous Intermediation	10
512130	Motion Picture and Video Exhibition	1	523920	Portfolio Management	39
512190	Post-Production and Other Motion Picture and Video Industries	9	523930	Investment Advice	5
512210	Record Production	1	523990	All Other Financial Investment Activities	5
512220	Integrated Record Production/Distribution	0	524111	Direct Individual Life, Health and Medical Insurance Carriers	7
512230	Music Publishers	0	524112	Direct Group Life, Health and Medical Insurance Carriers	3
512240	Sound Recording Studios	4	524121	Direct General Property and Casualty Insurance Carriers	3
512290	Other Sound Recording Industries	0	524122	Direct, Private, Automobile Insurance Carriers	1
515110	Radio Broadcasting	2	524123	Direct, Public, Automobile Insurance Carriers	0
515120	Television Broadcasting	1	524124	Direct Property Insurance Carriers	0
515210	Pay and Specialty Television	0	524125	Direct Liability Insurance Carriers	0
516110	Internet Publishing and Broadcasting	12	524129	Other Direct Insurance (except Life, Health and Medical) Carriers	2
517110	Wired Telecommunications Carriers	26	524131	Life Reinsurance Carriers	1
517210	Wireless Telecommunications Carriers (except Satellite)	13	524132	Accident and Sickness Reinsurance Carriers	0
517310	Telecommunications Resellers	9	524133	Automobile Reinsurance Carriers	0
517410	Satellite Telecommunications	6	524134	Property Reinsurance Carriers	1

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)			**Services** (continued)	
	Finance, Insurance and Real Estate (continued)			**Architectural, Engineering and Related Services**	**881**
524135	Liability Reinsurance Carriers	0	541310	Architectural Services	14
524139	General and Other Reinsurance Carriers	0	541320	Landscape Architectural Services	2
524210	Insurance Agencies and Brokerages	7	541330	Engineering Services	686
524291	Claims Adjusters	3	541340	Drafting Services	9
524299	All Other Insurance Related Activities	2	541350	Building Inspection Services	4
526111	Trusteed Pension Funds	0	541360	Geophysical Surveying and Mapping Services	31
526112	Non-Trusteed Pension Funds	0	541370	Surveying and Mapping (except Geophysical) Services	34
526911	Equity Funds - Canadian	0	541380	Testing Laboratories	101
526912	Equity Funds - Foreign	0			
526913	Mortgage Funds	0		**Computer System Design and Related**	**2,203**
526914	Money Market Funds	0	541510	Computer Systems Design and Related Services	2,203
526915	Bond and Income / Dividend Funds - Canadian	0			
526916	Bond and Income / Dividend Funds - Foreign	0		**Management, Scientific and Technical Consulting**	**422**
526917	Balanced Funds / Asset Allocation Funds	0	541611	Administrative Management and General Management Consulting Services	163
526919	Other Open-Ended Funds	1	541612	Human Resource and Executive Search Consulting Services	13
526920	Mortgage Investment Funds	1	541619	Other Management Consulting Services	54
526930	Segregated (except Pension) Funds	0	541620	Environmental Consulting Services	62
526981	Securitization Vehicles	0	541690	Other Scientific and Technical Consulting Services	130
526989	All Other Miscellaneous Funds and Financial Vehicles	0			
531111	Lessors of Residential Buildings and Dwellings (except Social Housing Projects)	0		**Scientific Research and Development**	**843**
531112	Lessors of Social Housing Projects	0	541710	Research and Development in the Physical, Engineering and Life Sciences	799
531120	Lessors of Non-Residential Buildings (except Mini-Warehouses)	9	541720	Research and Development in the Social Sciences and Humanities	44
531130	Self-Storage Mini-Warehouses	0			
531190	Lessors of Other Real Estate Property	1		**Health Care and Social Assistance**	**135**
531210	Offices of Real Estate Agents and Brokers	5	621110	Offices of Physicians	17
531310	Real Estate Property Managers	8	621210	Offices of Dentists	4
531320	Offices of Real Estate Appraisers	1	621310	Offices of Chiropractors	5
531390	Other Activities Related to Real Estate	0	621320	Offices of Optometrists	3
532111	Passenger Car Rental	1	621330	Offices of Mental Health Practitioners (except Physicians)	6
532112	Passenger Car Leasing	1	621340	Offices of Physical, Occupational, and Speech Therapists and Audiologists	3
532120	Truck, Utility Trailer and RV (Recreational Vehicle) Rental and Leasing	0	621390	Offices of All Other Health Practitioners	4
532210	Consumer Electronics and Appliance Rental	1	621410	Family Planning Centres	3
532220	Formal Wear and Costume Rental	0	621420	Out-Patient Mental Health and Substance Abuse Centres	1
532230	Video Tape and Disc Rental	1	621494	Community Health Centres	3
532290	Other Consumer Goods Rental	4	621499	All Other Out-Patient Care Centres	2
532310	General Rental Centres	1	621510	Medical and Diagnostic Laboratories	70
532410	Construction, Transportation, Mining, and Forestry Machinery and Equipment Rental and Leasing	21	621610	Home Health Care Services	1
532420	Office Machinery and Equipment Rental and Leasing	1	621911	Ambulance (except Air Ambulance) Services	0
532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing	23	621912	Air Ambulance Services	0
533110	Lessors of Non-Financial Intangible Assets (Except Copyrighted Works)	18	621990	All Other Ambulatory Health Care Services	3

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)			**Services** (continued)	
	Health Care and Social Assistance (continued)			**All Other Services** (continued)	
622111	General (except Paediatric) Hospitals	0	551113	Holding Companies	146
622112	Paediatric Hospitals	0	551114	Head Offices	0
622210	Psychiatric and Substance Abuse Hospitals	0	561110	Office Administrative Services	45
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals	2	561210	Facilities Support Services	0
623110	Nursing Care Facilities	0	561310	Employment Placement Agencies	4
623210	Residential Developmental Handicap Facilities	0	561320	Temporary Help Services	7
623221	Residential Substance Abuse Facilities	0	561330	Employee Leasing Services	1
623222	Homes for the Psychiatrically Disabled	0	561410	Document Preparation Services	10
623310	Community Care Facilities for the Elderly	0	561420	Telephone Call Centres	11
623991	Transition Homes for Women	0	561430	Business Service Centres	7
623992	Homes for Emotionally Disturbed Children	0	561440	Collection Agencies	1
623993	Homes for the Physically Handicapped or Disabled	0	561450	Credit Bureaus	1
623999	All Other Residential Care Facilities	0	561490	Other Business Support Services	2
624110	Child and Youth Services	0	561510	Travel Agencies	4
624120	Services for the Elderly and Persons with Disabilities	2	561520	Tour Operators	3
624190	Other Individual and Family Services	3	561590	Other Travel Arrangement and Reservation Services	4
624210	Community Food Services	0	561611	Investigation Services	2
624220	Community Housing Services	0	561612	Security Guard and Patrol Services	2
624230	Emergency and Other Relief Services	0	561613	Armoured Car Services	1
624310	Vocational Rehabilitation Services	2	561621	Security Systems Services (except Locksmiths)	37
624410	Child Day-Care Services	1	561622	Locksmiths	2
			561710	Exterminating and Pest Control Services	2
	All Other Services	**1,133**	561721	Window Cleaning Services	0
541110	Offices of Lawyers	3	561722	Janitorial Services (except Window Cleaning)	8
541120	Offices of Notaries	0	561730	Landscaping Services	16
541190	Other Legal Services	6	561740	Carpet and Upholstery Cleaning Services	1
541212	Offices of Accountants	9	561791	Duct and Chimney Cleaning Services	2
541213	Tax Preparation Services	1	561799	All Other Services to Buildings and Dwellings	2
541215	Bookkeeping, Payroll and Related Services	11	561910	Packaging and Labelling Services	21
541410	Interior Design Services	3	561920	Convention and Trade Show Organizers	3
541420	Industrial Design Services	65	561990	All Other Support Services	63
541430	Graphic Design Services	28	611110	Elementary and Secondary Schools	0
541490	Other Specialized Design Services	12	611210	Community Colleges and C.E.G.E.P.s	2
541810	Advertising Agencies	35	611310	Universities	0
541820	Public Relations Services	1	611410	Business and Secretarial Schools	0
541830	Media Buying Agencies	0	611420	Computer Training	14
541840	Media Representatives	6	611430	Professional and Management Development Training	4
541850	Display Advertising	9	611510	Technical and Trade Schools	4
541860	Direct Mail Advertising	7	611610	Fine Arts Schools	1
541870	Advertising Material Distribution Services	2	611620	Athletic Instruction	3
541891	Specialty Advertising Distributors	3	611630	Language Schools	2
541899	All Other Services Related to Advertising	9	611690	All Other Schools and Instruction	13
541910	Marketing Research and Public Opinion Polling	25	611710	Educational Support Services	6
541920	Photographic Services	11	711111	Theatre (except Musical) Companies	1
541930	Translation and Interpretation Services	2	711112	Musical Theatre and Opera Companies	0
541940	Veterinary Services	7	711120	Dance Companies	0
541990	All Other Professional, Scientific and Technical Services	43	711130	Musical Groups and Artists	0

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)			**Services** (continued)	
	All Other Services (continued)			**All Other Services** (continued)	
711190	Other Performing Arts Companies	0	722320	Caterers	6
711211	Sports Teams and Clubs	0	722330	Mobile Food Services	0
711213	Horse Race Tracks	0	722410	Drinking Places (Alcoholic Beverages)	1
711218	Other Spectator Sports	1	811111	General Automotive Repair	20
711311	Live Theatres and Other Performing Arts Presenters with Facilities	1	811112	Automotive Exhaust System Repair	1
711319	Sports Stadiums and Other Presenters with Facilities	1	811119	Other Automotive Mechanical and Electrical Repair and Maintenance	10
711321	Performing Arts Promoters (Presenters) without Facilities	1	811121	Automotive Body, Paint and Interior Repair and Maintenance	17
711322	Festivals without Facilities	0	811122	Automotive Glass Replacement Shops	0
711329	Sports Presenters and Other Presenters without Facilities	2	811192	Car Washes	3
711410	Agents and Managers for Artists, Athletes, Entertainers and Other Public Figures	0	811199	All Other Automotive Repair and Maintenance	1
711510	Independent Artists, Writers and Performers	9	811210	Electronic and Precision Equipment Repair and Maintenance	44
712111	Non-Commercial Art Museums and Galleries	0	811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	152
712119	Museums (except Art Museums and Galleries)	0	811411	Home and Garden Equipment Repair and Maintenance	8
712120	Historic and Heritage Sites	0	811412	Appliance Repair and Maintenance	5
712130	Zoos and Botanical Gardens	1	811420	Reupholstery and Furniture Repair	8
712190	Other Heritage Institutions	1	811430	Footwear and Leather Goods Repair	0
713110	Amusement and Theme Parks	3	811490	Other Personal and Household Goods Repair and Maintenance	11
713120	Amusement Arcades	0	812114	Barber Shops	0
713210	Casinos (except Casino Hotels)	0	812115	Beauty Salons	5
713291	Lotteries	0	812116	Unisex Hair Salons	1
713299	All Other Gambling Industries	1	812190	Other Personal Care Services	4
713910	Golf Courses and Country Clubs	0	812210	Funeral Homes	0
713920	Skiing Facilities	4	812220	Cemeteries and Crematoria	0
713930	Marinas	1	812310	Coin-Operated Laundries and Dry Cleaners	0
713940	Fitness and Recreational Sports Centres	1	812320	Dry Cleaning and Laundry Services (except Coin-Operated)	4
713950	Bowling Centres	0	812330	Linen and Uniform Supply	0
713990	All Other Amusement and Recreation Industries	6	812910	Pet Care (except Veterinary) Services	0
721111	Hotels	0	812921	Photo Finishing Laboratories (except One-Hour)	4
721112	Motor Hotels	0	812922	One-Hour Photo Finishing	0
721113	Resorts	1	812930	Parking Lots and Garages	0
721114	Motels	1	812990	All Other Personal Services	0
721120	Casino Hotels	0	813110	Religious Organizations	0
721191	Bed and Breakfast	0	813210	Grant-Making and Giving Services	0
721192	Housekeeping Cottages and Cabins	0	813310	Social Advocacy Organizations	2
721198	All Other Traveller Accommodation	0	813410	Civic and Social Organizations	4
721211	RV (Recreational Vehicle) Parks and Campgrounds	1	813910	Business Associations	7
721212	Hunting and Fishing Camps	0	813920	Professional Organizations	2
721213	Recreational (except Hunting and Fishing) and Vacation Camps	0	813930	Labour Organizations	0
721310	Rooming and Boarding Houses	0	813940	Political Organizations	0
722110	Full-Service Restaurants	5	813990	Other Membership Organizations	1
722210	Limited-Service Eating Places	15	814110	Private Households	0
722310	Food Service Contractors	0	911110	Defence Services	0

Table A.2 Research and development (R&D) performers 2004, by the North American industry classification system (NAICS) 2002 (continued)

NAICS Code	Industry	Performers	NAICS Code	Industry	Performers
	Services (continued)				
	All Other Services (continued)				
911210	Federal Courts of Law	0			
911220	Federal Correctional Services	0			
911230	Federal Police Services	0			
911240	Federal Regulatory Services	0			
911290	Other Federal Protective Services	0			
911310	Federal Labour and Employment Services	0			
911320	Immigration Services	0			
911390	Other Federal Labour, Employment and Immigration Services	0			
911410	Foreign Affairs	0			
911420	International Assistance	0			
911910	Other Federal Government Public Administration	0			
912110	Provincial Courts of Law	0			
912120	Provincial Correctional Services	0			
912130	Provincial Police Services	0			
912140	Provincial Fire-Fighting Services	0			
912150	Provincial Regulatory Services	0			
912190	Other Provincial Protective Services	0			
912210	Provincial Labour and Employment Services	0			
912910	Other Provincial and Territorial Public Administration	0			
913110	Municipal Courts of Law	0			
913120	Municipal Correctional Services	0			
913130	Municipal Police Services	0			
913140	Municipal Fire-Fighting Services	0			
913150	Municipal Regulatory Services	0			
913190	Other Municipal Protective Services	0			
913910	Other Local, Municipal and Regional Public Administration	0			
914110	Aboriginal Public Administration	0			
919110	International and Other Extra-Territorial Public Administration	0			

Appendix B

Analysis

Analysis

The number of R&D performers is multiplying as the tables in this short article attest, but industrial R&D performers remain concentrated geographically in Ontario and Quebec and industrially in the services sector, most particularly in computer system design and related services.

In 2007, the North American Industrial Classification System was revised, this revision will lead to changes to industrial groupings published for R&D performance. Prior to undertaking any changes, work is underway to illuminate where R&D performance is occurring at present. Many elements must be considered before proposing any changes to the industrial structure upon which the R&D spending data are published and these include:

- Confidentiality (for key indicators)
- Adherence to standards
- Geographical distribution
- Relationship between large and small performers
- Continuity

Currently, industrial R&D spending data are published for 46 industry groups (see table B.1). These groups have been in existence for publication purposes since 1991 (presenting 1989 survey data) based on the 1980 Standard Industrial Classification (SIC) system, the conversion to NAICS occurred for publication purposes in 2002 for 2000 survey data. Table B.4 clearly indicates that the number of performers in all industrial groups has taken off in recent years. In fact the number of R&D performers in the industrial groups has been increasing at faster rate than the number of firms with at least one employee in the industrial groups (Table B.1). The comparison group of firms of at least one employee was chosen due to the requirement that R&D performers must have at least one R&D employee.

Counts of R&D performers are only available up until the year before the survey reference year. The most recent survey reference year is 2005 with 2004 the year for which the counts are considered near final. The reason for this data discrepancy is the design of the Research and Development in Canadian Industry (RDCI) survey. The RDCI is comprised of two components, firms that in 2005 spent at least $1 million on R&D which are surveyed (questionnaire population) and those spending less than $1 million on R&D for which R&D spending comes from the Scientific Research and Experimental Development tax credit file. While estimated under coverage for R&D spending is projected, it is not possible to accurately predict the actual firms undertaking R&D and therefore counts of firms are not available.

The current industrial classification system used to publish R&D spending data has some weaknesses. For instance, due to confidentiality it is not possible to publish some key variables for all 46 industries (see table 1.17) and some major industrial sectors cannot be published either. Suppression due to confidentiality is not isolated to industrial distribution, but also impacts the R&D spending data for provinces.

The geographical distribution of the counts of performers clearly indicates that the majority of R&D performers are located in two provinces: Ontario and Quebec. Some provinces and territories have very few performers which inhibit the publication detailed industrial R&D spending. To try to overcome this restriction, provinces are often grouped and presented as regions or only included in the Canada total. This of course is frustrating for the provincial users of R&D spending information and if possible, new industrial groups may assist in presenting a clearer picture of R&D spending in the provinces. It may also become necessary to group territorial R&D spending with British Columbia's spending.

Industrial groupings must also reflect a relationship between survey respondents (questionnaire population) who provide planned and forecast R&D expenditure data that are essential to publishing the industrial R&D intentions. Publishing alternatives are possible, for instance industrial distribution for the planned and forecast data could be made available for a restricted number of industries with a more detailed industrial grouping available for the survey year's data. Another measure would be to have graduated survey population thresholds to ensure that about 10% of each industrial group published is part of the questionnaire population. Such measures need to be reviewed in light of impact upon geographical distribution, adherence to standards and the impact on continuity of the data series.

For the 2006 RDCI survey year, the cut-off for inclusion in the survey was raised to spending of at least $1.5 million on R&D. Before any adjustments are made to the industrial distribution including publication on the 2007 NAICS, we need to have at least one year's data using this revised threshold available for analysis.

Table B.1 Enterprises with one or more employee, by industry, with percentage change from 1999 to 2004 and percentage distribution, 2004

	1999	2000	2001	2002
	number			
Total	**948,266**	**967,853**	**970,261**	**966,766**
Agriculture, forestry, fishing and hunting	**62,172**	**63,623**	**62,661**	**60,777**
Agriculture	43,691	45,465	44,883	43,498
Forestry and logging	12,243	11,730	11,300	10,906
Fishing, hunting and trapping	6,238	6,428	6,478	6,373
Mining and oil and gas extraction	**6,699**	**6,710**	**7,005**	**7,045**
Oil and gas extraction	4,748	4,924	5,282	5,487
Mining	1,951	1,786	1,723	1,558
Utilities	**3,233**	**3,334**	**3,244**	**3,227**
Electric power	454	503	445	436
Other utilities	2,779	2,831	2,799	2,791
Construction	**104,628**	**107,374**	**108,433**	**108,627**
Manufacturing	**63,612**	**60,859**	**59,249**	**57,708**
Food	7,994	6,645	6,287	6,021
Beverage and tobacco	685	620	584	577
Textile	2,149	2,009	1,884	1,774
Wood products	4,555	4,385	4,270	4,168
Paper	746	709	695	679
Printing	5,494	5,356	5,149	5,012
Petroleum and coal products	267	227	202	191
Pharmaceutical and medicine	308	295	266	266
Other chemicals	1,687	1,645	1,612	1,555
Plastic products	2,005	1,988	1,943	1,908
Rubber products	377	342	332	327
Non-metallic mineral products	2,265	2,123	2,045	1,987
Primary metal (ferrous)	345	334	326	333
Primary metal (non-ferrous)	335	318	323	317
Fabricated metal products	8,515	8,513	8,472	8,361
Machinery	5,820	5,535	5,370	5,274
Computer and peripheral equipment	334	330	321	279
Communications equipment	316	306	304	287
Semiconductor and other electronic components	570	544	518	490
Navigational, measuring, medical and control instruments	961	944	916	854
Other computer and electronic products	265	245	235	210
Electrical equipment, appliance and components	1,330	1,254	1,195	1,150
Motor vehicle and parts	1,426	1,394	1,342	1,345
Aerospace products and parts	316	317	292	285
All other transportation equipment	772	750	740	694
Furniture and related products	4,258	4,327	4,363	4,380
Other manufacturing industries	9,517	9,404	9,263	8,984
Services	**707,922**	**725,953**	**729,669**	**729,382**
Wholesale trade	54,717	55,053	54,684	54,451
Retail trade	111,430	112,156	110,670	109,648
Transportation and warehousing	41,331	43,073	42,913	42,689
Information and cultural industries	11,026	11,935	11,947	11,600
Finance, insurance and real estate	65,157	65,520	65,616	65,746
Architectural, engineering and related services	17,206	17,746	17,682	17,435
Computer system design and related services	17,077	19,365	20,665	20,754
Management, scientific and technical consulting services	20,661	23,351	25,336	26,471
Scientific research and development	1,809	2,016	2,196	2,241
Health care and social assistance	74,269	75,782	76,675	77,074
All other services	293,239	299,956	301,285	301,273

Note: Components may not add to totals due to rounding.
Source: Statistics Canada, Business Register, enterprises with one or more employees, December 1999-2003 and September 2004.

Table B.1 Enterprises with one or more employee, by industry, 1999 to 2004 with percentage change from 1999 to 2004 and percentage distribution 2004 (continued)

	2003	2004	Change from 1999 to 2004	2004 Distribution
	number		percent	
Total	**962,987**	**953,448**	**0.5**	**100**
Agriculture, forestry, fishing and hunting	**58,896**	**57,550**	**-7.4**	**6**
Agriculture	42,150	41,231	-5.6	4
Forestry and logging	10,399	10,034	-18.0	1
Fishing, hunting and trapping	6,347	6,285	0.8	1
Mining and oil and gas extraction	**7,059**	**7,291**	**8.8**	**1**
Oil and gas extraction	5,639	5,880	23.8	1
Mining	1,420	1,411	-27.7	0
Utilities	**3,215**	**3,178**	**-1.7**	**0**
Electric power	430	429	-5.5	0
Other utilities	2,785	2,749	-1.1	0
Construction	**110,070**	**110,096**	**5.2**	**12**
Manufacturing	**56,331**	**54,925**	**-13.7**	**6**
Food	5,815	5,605	-29.9	1
Beverage and tobacco	573	571	-16.6	0
Textile	1,712	1,635	-23.9	0
Wood products	3,907	3,786	-16.9	0
Paper	670	642	-13.9	0
Printing	4,851	4,719	-14.1	0
Petroleum and coal products	161	127	-52.4	0
Pharmaceutical and medicine	262	266	-13.6	0
Other chemicals	1,573	1,543	-8.5	0
Plastic products	1,888	1,856	-7.4	0
Rubber products	319	307	-18.6	0
Non-metallic mineral products	1,946	1,931	-14.7	0
Primary metal (ferrous)	290	280	-18.8	0
Primary metal (non-ferrous)	298	298	-11.0	0
Fabricated metal products	8,224	8,024	-5.8	1
Machinery	5,172	5,088	-12.6	1
Computer and peripheral equipment	258	258	-22.8	0
Communications equipment	282	292	-7.6	0
Semiconductor and other electronic components	483	476	-16.5	0
Navigational, measuring, medical and control instruments	825	817	-15.0	0
Other computer and electronic products	211	193	-27.2	0
Electrical equipment, appliance and components	1,100	1,080	-18.8	0
Motor vehicle and parts	1,325	1,316	-7.7	0
Aerospace products and parts	224	220	-30.4	0
All other transportation equipment	656	650	-15.8	0
Furniture and related products	4,382	4,317	1.4	0
Other manufacturing industries	8,924	8,628	-9.3	1
Services	**727,416**	**720,408**	**1.8**	**76**
Wholesale trade	53,663	51,676	-5.6	5
Retail trade	108,105	107,262	-3.7	11
Transportation and warehousing	42,601	42,394	2.6	4
Information and cultural industries	11,451	11,251	2.0	1
Finance, insurance and real estate	64,889	63,955	-1.8	7
Architectural, engineering and related services	17,271	17,190	-0.1	2
Computer system design and related services	20,822	20,666	21.0	2
Management, scientific and technical consulting services	27,036	26,986	30.6	3
Scientific research and development	2,276	2,267	25.3	0
Health care and social assistance	78,127	77,975	5.0	8
All other services	301,175	298,786	1.9	31

Note: Components may not add to totals due to rounding.

Source: Statistics Canada, Business Register, enterprises with one or more employees, December 1999-2003 and September 2004.

Table B.2 Research and development (R&D) performers by province, 1999 to 2004

	1999	2000	2001	2002	2003	2004	Absolute change from 2004 to 1999	Change from 1999 to 2004
	number							percent
Canada - total	**9,967**	**10,849**	**12,087**	**13,363**	**15,729**	**17,222**	**7,255**	**72.8**
Total - Multi-province	10,296	11,210	12,435	13,699	16,051	17,557	7,261	70.5
Newfoundland and Labrador	112	86	66	82	104	111	-1	-0.9
Prince Edward Island	24	27	26	28	34	37	13	54.2
Nova Scotia	210	228	214	218	227	230	20	9.5
New Brunswick	158	161	167	173	200	195	37	23.4
Quebec	4,162	4,594	5,101	5,665	6,446	7,026	2,864	68.8
Ontario	3,496	3,812	4,396	4,928	5,938	6,623	3,127	89.4
Manitoba	235	269	276	320	368	389	154	65.5
Saskatchewan	164	163	167	176	190	203	39	23.8
Alberta	765	808	854	833	999	1,093	328	42.9
British Columbia	964	1,058	1,163	1,271	1,537	1,641	677	70.2
Yukon Territory, Northwest Territories, and Nunavut	6	4	5	5	8	9	3	50.0

Table B.3 Distribution of research and development (R&D) performers by province in percentages, 1999 to 2004

	1999	2000	2001	2002	2003	2004
	percent					
Total - Multi-province	**100**	**100**	**100**	**100**	**100**	**100**
Newfoundland and Labrador	1	1	1	1	1	1
Prince Edward Island	0	0	0	0	0	0
Nova Scotia	2	2	2	2	1	1
New Brunswick	2	1	1	1	1	1
Quebec	40	41	41	41	40	40
Ontario	34	34	35	36	37	38
Manitoba	2	2	2	2	2	2
Saskatchewan	2	1	1	1	1	1
Alberta	7	7	7	6	6	6
British Columbia	9	9	9	9	10	9
Yukon Territory, Northwest Territories, and Nunavut	0	0	0	0	0	0

Note: Components may not add to totals due to rounding.

Table B.4 Research and development (R&D) performers, by industry groups showing percentage change from 1999 to 2004 and percentage distribution, 2004

	1999	2000	2001	2002	2003	2004
	number					
Total	**9,967**	**10,849**	**12,087**	**13,363**	**15,729**	**17,222**
Agriculture, forestry, fishing and hunting	**257**	**272**	**334**	**406**	**528**	**618**
Agriculture	179	199	259	319	429	500
Forestry and logging	35	29	38	48	48	69
Fishing, hunting and trapping	43	44	37	39	51	49
Mining and oil and gas extraction	**105**	**100**	**113**	**108**	**133**	**128**
Oil and gas extraction	47	44	56	57	72	74
Mining	58	56	57	51	61	54
Utilities	**53**	**62**	**69**	**61**	**75**	**88**
Electric power	12	10	12	14	12	16
Other utilities	41	52	57	47	63	72
Construction	**228**	**260**	**307**	**369**	**436**	**477**
Manufacturing	**4,640**	**4,887**	**5,246**	**5,876**	**6,979**	**7,715**
Food	256	290	320	416	522	580
Beverage and tobacco	17	27	31	31	34	40
Textile	131	147	136	150	176	176
Wood products	161	158	179	213	258	278
Paper	106	114	114	108	134	138
Printing	67	80	91	118	175	222
Petroleum and coal products	25	27	30	30	34	44
Pharmaceutical and medicine	87	96	100	107	114	126
Other chemicals	314	349	341	341	385	405
Plastic products	254	273	320	342	428	469
Rubber products	63	60	62	55	57	60
Non-metallic mineral products	118	126	131	134	165	180
Primary metal (ferrous)	56	53	51	56	67	66
Primary metal (non-ferrous)	55	51	54	62	75	75
Fabricated metal products	499	528	640	760	958	1,102
Machinery	854	887	942	1,074	1,213	1,344
Computer and peripheral equipment	109	93	88	88	81	83
Communications equipment	122	121	123	138	148	165
Semiconductor and other electronic components	131	145	144	153	162	180
Navigational, measuring, medical and control instruments	269	266	269	269	293	298
Other computer and electronic products	37	36	42	37	46	50
Electrical equipment, appliance and components	197	211	217	231	238	263
Motor vehicle and parts	170	175	188	197	237	257
Aerospace products and parts	68	70	76	75	77	80
All other transportation equipment	51	64	66	72	93	99
Furniture and related products	99	97	133	175	230	259
Other manufacturing industries	324	343	358	444	579	676
Services	**4,684**	**5,268**	**6,018**	**6,543**	**7,578**	**8,196**
Wholesale trade	774	833	922	1,023	1,205	1,383
Retail trade	163	190	223	247	287	295
Transportation and warehousing	55	60	71	96	110	109
Information and cultural industries	332	380	445	481	551	567
Finance, insurance and real estate	118	132	144	152	199	225
Architectural, engineering and related services	660	651	664	673	802	881
Computer system design and related services	1,277	1,473	1,754	1,874	2,111	2,203
Management, scientific and technical consulting services	231	285	349	418	431	422
Scientific research and development	407	498	591	609	719	843
Health care and social assistance	87	100	97	109	128	135
All other services	580	666	758	861	1035	1133

Note: Components may not add to totals due to rounding.

Table B.4 Research and development (R&D) performers, by industry groups showing percentage change from 1999 to 2004 and percentage distribution 2004 (continued)

	Change from 1999 to 2004	Distribution 2004	Distribution 1999	Absolute change from 2004 to 1999
	percent			number
Total	**72.8**	**100**	**100**	**7,255**
Agriculture, forestry, fishing and hunting	**140.5**	**4**	**3**	**361**
Agriculture	179.3	3	2	321
Forestry and logging	97.1	0	0	34
Fishing, hunting and trapping	14.0	0	0	6
Mining and oil and gas extraction	**21.9**	**1**	**1**	**23**
Oil and gas extraction	57.4	0	0	27
Mining	-6.9	0	1	-4
Utilities	**66.0**	**1**	**1**	**35**
Electric power	33.3	0	0	4
Other utilities	75.6	0	0	31
Construction	**109.2**	**3**	**2**	**249**
Manufacturing	**66.3**	**45**	**47**	**3,075**
Food	126.6	3	3	324
Beverage and tobacco	135.3	0	0	23
Textile	34.4	1	1	45
Wood products	72.7	2	2	117
Paper	30.2	1	1	32
Printing	231.3	1	1	155
Petroleum and coal products	76.0	0	0	19
Pharmaceutical and medicine	44.8	1	1	39
Other chemicals	29.0	2	3	91
Plastic products	84.6	3	3	215
Rubber products	-4.8	0	1	-3
Non-metallic mineral products	52.5	1	1	62
Primary metal (ferrous)	17.9	0	1	10
Primary metal (non-ferrous)	36.4	0	1	20
Fabricated metal products	120.8	6	5	603
Machinery	57.4	8	9	490
Computer and peripheral equipment	-23.9	0	1	-26
Communications equipment	35.2	1	1	43
Semiconductor and other electronic components	37.4	1	1	49
Navigational, measuring, medical and control instruments	10.8	2	3	29
Other computer and electronic products	35.1	0	0	13
Electrical equipment, appliance and components	33.5	2	2	66
Motor vehicle and parts	51.2	1	2	87
Aerospace products and parts	17.6	0	1	12
All other transportation equipment	94.1	1	1	48
Furniture and related products	161.6	2	1	160
Other manufacturing industries	108.6	4	3	352
Services	**75.0**	**48**	**47**	**3,512**
Wholesale trade	78.7	8	8	609
Retail trade	81.0	2	2	132
Transportation and warehousing	98.2	1	1	54
Information and cultural industries	70.8	3	3	235
Finance, insurance and real estate	90.7	1	1	107
Architectural, engineering and related services	33.5	5	7	221
Computer system design and related services	72.5	13	13	926
Management, scientific and technical consulting services	82.7	2	2	191
Scientific research and development	107.1	5	4	436
Health care and social assistance	55.2	1	1	48
All other services	95.3	7	6	553

Note: Components may not add to totals due to rounding.

Table B.5 Research and development (R&D) performers, by industry groups showing questionnaire population and distribution

	1999			2004		
	R&D performers	Questionnaire		R&D performers	Questionnaire	
	number	number	percent	number	number	percent
Total	**9,967**	**981**	**10**	**17,222**	**1,442**	**8**
Agriculture, forestry, fishing and hunting	**257**	**14**	**5**	**618**	**14**	**2**
Agriculture	179	8	4	500	10	2
Forestry and logging	35	5	14	69	3	4
Fishing, hunting and trapping	43	1	2	49	1	2
Mining and oil and gas extraction	**105**	**27**	**26**	**128**	**32**	**25**
Oil and gas extraction	47	18	38	74	18	24
Mining	58	9	16	54	14	26
Utilities	**53**	**9**	**17**	**88**	**11**	**13**
Electric power	12	8	67	16	10	63
Other utilities	41	1	2	72	1	1
Construction	**228**	**7**	**3**	**477**	**8**	**2**
Manufacturing	**4,640**	**494**	**11**	**7,715**	**634**	**8**
Food	256	19	7	580	22	4
Beverage and tobacco	17	4	24	40	5	13
Textile	131	8	6	176	13	7
Wood products	161	10	6	278	8	3
Paper	106	20	19	138	28	20
Printing	67	1	1	222	6	3
Petroleum and coal products	25	5	20	44	10	23
Pharmaceutical and medicine	87	37	43	126	45	36
Other chemicals	314	34	11	405	41	10
Plastic products	254	18	7	469	25	5
Rubber products	63	6	10	60	5	8
Non-metallic mineral products	118	4	3	180	4	2
Primary metal (ferrous)	56	6	11	66	9	14
Primary metal (non-ferrous)	55	8	15	75	14	19
Fabricated metal products	499	16	3	1,102	26	2
Machinery	854	58	7	1,344	84	6
Computer and peripheral equipment	109	27	25	83	19	23
Communications equipment	122	35	29	165	53	32
Semiconductor and other electronic components	131	34	26	180	38	21
Navigational, measuring, medical and control instruments	269	43	16	298	50	17
Other computer and electronic products	37	3	8	50	4	8
Electrical equipment, appliance and components	197	38	19	263	34	13
Motor vehicle and parts	170	26	15	257	45	18
Aerospace products and parts	68	16	24	80	19	24
All other transportation equipment	51	5	10	99	8	8
Furniture and related products	99	1	1	259	2	1
Other manufacturing industries	324	12	4	676	17	3

Note: Questionnaire sample does not represent the number of respondents due to non-response.

Table B.5 Research and development (R&D) performers, by industry groups showing questionnaire population and distribution (continued)

	1999			2004		
	R&D performers	Questionnaire		R&D performers	Questionnaire	
	number	number	percent	number	number	percent
Services	**4,684**	**430**	**9**	**8,196**	**743**	**9**
Wholesale trade	774	73	9	1,383	83	6
Retail trade	163	3	2	295	2	1
Transportation and warehousing	55	6	11	109	5	5
Information and cultural industries	332	55	17	567	94	17
Finance, insurance and real estate	118	15	13	225	24	11
Architectural, engineering and related services	660	52	8	881	69	8
Computer system design and related services	1,277	103	8	2,203	193	9
Management, scientific and technical consulting services	231	8	3	422	13	3
Scientific research and development	407	61	15	843	197	23
Health care and social assistance	87	19	22	135	26	19
All other services	580	35	6	1,133	37	3

Note: Questionnaire sample does not represent the number of respondents due to non-response.

Table B.6 Research and development (R&D) performers as a percentage of enterprises with one or more employees, 1999 to 2004

	1999	2000	2001	2002	2003	2004
	percent					
Total	**1.1**	**1.1**	**1.2**	**1.4**	**1.6**	**1.8**
Agriculture, forestry, fishing and hunting	**0.4**	**0.4**	**0.5**	**0.7**	**0.9**	**1.1**
Agriculture	0.4	0.5	0.6	0.7	1.0	1.2
Forestry and logging	0.3	0.2	0.3	0.4	0.5	0.7
Fishing, hunting and trapping	0.7	0.7	0.6	0.6	0.8	0.8
Mining and oil and gas extraction	**1.6**	**1.5**	**1.6**	**1.5**	**1.9**	**1.8**
Oil and gas extraction	1.0	0.9	1.1	1.0	1.3	1.3
Mining	3.0	3.1	3.3	3.3	4.3	3.8
Utilities	**1.6**	**1.9**	**2.1**	**1.9**	**2.3**	**2.8**
Electric power	2.6	2.0	2.7	3.2	2.8	3.7
Other utilities	1.5	1.8	2.0	1.7	2.3	2.6
Construction	**0.2**	**0.2**	**0.3**	**0.3**	**0.4**	**0.4**
Manufacturing	**7.3**	**8.0**	**8.9**	**10.2**	**12.4**	**14.0**
Food	3.2	4.4	5.1	6.9	9.0	10.3
Beverage and tobacco	2.5	4.4	5.3	5.4	5.9	7.0
Textile	6.1	7.3	7.2	8.5	10.3	10.8
Wood products	3.5	3.6	4.2	5.1	6.6	7.3
Paper	14.2	16.1	16.4	15.9	20.0	21.5
Printing	1.2	1.5	1.8	2.4	3.6	4.7
Petroleum and coal products	9.4	11.9	14.9	15.7	21.1	34.6
Pharmaceutical and medicine	28.2	32.5	37.6	40.2	43.5	47.4
Other chemicals	18.6	21.2	21.2	21.9	24.5	26.2
Plastic products	12.7	13.7	16.5	17.9	22.7	25.3
Rubber products	16.7	17.5	18.7	16.8	17.9	19.5
Non-metallic mineral products	5.2	5.9	6.4	6.7	8.5	9.3
Primary metal (ferrous)	16.2	15.9	15.6	16.8	23.1	23.6
Primary metal (non-ferrous)	16.4	16.0	16.7	19.6	25.2	25.2
Fabricated metal products	5.9	6.2	7.6	9.1	11.6	13.7
Machinery	14.7	16.0	17.5	20.4	23.5	26.4
Computer and peripheral equipment	32.6	28.2	27.4	31.5	31.4	32.2
Communications equipment	38.6	39.5	40.5	48.1	52.5	56.5
Semiconductor and other electronic components	23.0	26.7	27.8	31.2	33.5	37.8
Navigational, measuring, medical and control instruments	28.0	28.2	29.4	31.5	35.5	36.5
Other computer and electronic products	14.0	14.7	17.9	17.6	21.8	25.9
Electrical equipment, appliance and components	14.8	16.8	18.2	20.1	21.6	24.4
Motor vehicle and parts	11.9	12.6	14.0	14.6	17.9	19.5
Aerospace products and parts	21.5	22.1	26.0	26.3	34.4	36.4
All other transportation equipment	6.6	8.5	8.9	10.4	14.2	15.2
Furniture and related products	2.3	2.2	3.0	4.0	5.2	6.0
Other manufacturing industries	3.4	3.6	3.9	4.9	6.5	7.8
Services	**0.7**	**0.7**	**0.8**	**0.9**	**1.0**	**1.1**
Wholesale trade	1.4	1.5	1.7	1.9	2.2	2.7
Retail trade	0.1	0.2	0.2	0.2	0.3	0.3
Transportation and warehousing	0.1	0.1	0.2	0.2	0.3	0.3
Information and cultural industries	3.0	3.2	3.7	4.1	4.8	5.0
Finance, insurance and real estate	0.2	0.2	0.2	0.2	0.3	0.4
Architectural, engineering and related services	3.8	3.7	3.8	3.9	4.6	5.1
Computer system design and related services	7.5	7.6	8.5	9.0	10.1	10.7
Management, scientific and technical consulting services	1.1	1.2	1.4	1.6	1.6	1.6
Scientific research and development	22.5	24.7	26.9	27.2	31.6	37.2
Health care and social assistance	0.1	0.1	0.1	0.1	0.2	0.2
All other services	0.2	0.2	0.3	0.3	0.3	0.4

Note: Components may not add to totals due to rounding.

Appendix C

Survey methodology and reliability of the data

Survey methodology

The survey's history

Data on R&D in the business enterprise sector, covering commercially oriented enterprises (privately or publicly owned), industrial non-profit organizations and trade associations, have been collected since 1955. Until 1969, the survey was biennial. From 1970 to 1981, all known performers or funders of industrial R&D were surveyed for odd-numbered years and a sample, including the leading performers, were surveyed for even-numbered years. From 1982 to 1991, a full survey was conducted annually.

Because of reductions in the science and technology program, only the top 100 R&D performers (accounting for 64% of all industrial R&D) were surveyed for the 1992 and 1994 reference years. However, as a result of a cost-sharing agreement with the province of Quebec, the 1992 and 1994 industrial R&D survey results also included small firms having R&D activities in the province of Quebec.

Prior to 1997, Statistics Canada surveyed all firms that performed or funded R&D in Canada. Virtually all of these firms also provided information to Canada Revenu Agency (CRA) in order to claim tax benefits under the Scientific Research and Experimental Development (SR&ED) program. In an effort to reduce respondent burden, Statistics Canada stopped surveying the small performers and funders (those with less than $1 million of R&D in Canada) and instead, imputes their R&D data using CRA administrative data from the SR&ED program.

When first implemented, this initiative resulted in an understatement of the total value of intramural expenditure and of the total number of R&D personnel. Under the current tax regulations, firms must file their application to the SR&ED program within 18 months of expenditure. Once claims are submitted, they are processed and forwarded to Statistics Canada. As a result, data may not arrive for up to two years after the incurrence of expenditures. To remedy the situation, an estimation system was subsequently put into place to impute values for outstanding administrative data. This estimation system confirms the company is active using Statistics Canada's extensive Business Register, and then applies an estimate based on industry trends.

Recent developments in R&D spending are important economic signals, desired promptly by a variety of users. Because the small estimation of outstanding CRA data does not seriously influence overall trends, the R&D data are published as soon as possible after the survey is conducted, and revised in subsequent publications.

Recent changes to survey methodology

In the 2005 collection year, changes were made to the survey methodology to improve the quality of R&D performers' revenue data. Revenue figures for the SR&ED tax filers were adjusted to reflect corporate income tax data for the corresponding filer. To provide a time series, data were revised as far back as possible. It is believed the revisions have substantially improved the quality of the revenue variable. Within the publication, the revisions have had impact on the ratios of research and development expenditures to revenues, revenue size groups and total revenues by survey year.

The 2005 survey

The 2005 survey collected data on four years. The four years were: 2004 for which the data are expected to be final; 2005, for which the data are expected to be close to final, 2006 for which the data are planned expenditures, and 2007 for which the data are a forecast of spending intentions.

Data from the surveyed firms in 2005 represent approximately 81% of the total expenditures. Estimates are not available for administrative data for 2006 and 2007. Therefore, based on the percentage increase or decrease by industry reported by the surveyed firms, forecasts are made for planned expenditures and spending intentions based on the administrative data.

The 2005 survey was mailed out in September 2006. All companies believed to be performing or funding one million dollars or more in R&D were sent a questionnaire. The mailing list of companies was made up of firms which had reported R&D in the previous survey, of firms claiming an R&D income tax incentive for 2005, of firms reported by government respondents as R&D contractors or grantees for 2005 to 2006, of firms reported by other companies as funders or performers of R&D, and of firms indicated in some other way, such as newspaper or journal articles or provincial directories. These larger performers and funders received “long forms”, covering four years, 2004, 2005, 2006 and 2007.

Data quality

One of the problems in a survey of this type is to ensure that the quality of the data is satisfactory. It cannot be expected that all firms funding R&D will be surveyed, will respond and will report correctly. There are sources of information such as federal government grant and contract lists to aid in identifying firms and editing returns. In addition, complete coverage cannot be assured. This is especially true for the smaller companies in the service industries. The term, R&D, in spite of survey guidelines, can be misinterpreted.

Different interpretations of the definition of R&D also result in discrepancies between federal government reporting of funds to industry (the business enterprise sector) for R&D and industry’s reporting of such funds. For example, a federal government department may regard a contract to industry for the building of a prototype (e.g., communications satellite) as R&D. The contractors and subcontractors, however, may only use a portion of the R&D contract and even that portion may not be reported because the contract is considered as part of the firm’s “routine” contract work. Differences may also arise for contracts awarded to industry for services or equipment required for a government in-house project which are reported by the federal sponsor as industrial R&D contracts. Therefore, the totals for R&D grants and contracts from the federal government to industry shown in this publication do not agree with those reported in *Federal Science Activities, 2007/2008*, (Catalogue no. 88-204-X).

Other notes

The business enterprise sector is the only sector in which data are not collected on R&D in the social sciences and humanities.

In this survey, the reporting unit is generally the company or enterprise. This unit has been used because a company, which may have several establishments or subsidiaries, will often have a centralized research unit. In the case of a company with decentralized research units, the reporting unit may be the division, if the accounting system enables divisions to supply the required data. This procedure creates a problem when classifying data by industry. A company can only be assigned to one industry although that company may have establishments in several industries. The assignment is based on the activity from which the firm derived the greatest portion of its income. Thus, comparisons between R&D data collected at the company level and other data collected at the establishment level, such as “census value added”, may be misleading. Since industrial R&D is highly concentrated, the use of the company/enterprise as the main reporting unit also means that classification cannot be very detailed, to avoid disclosing individual company data.

The survey response

The response for the 2005 “base year” survey is shown below.

Table C.1 Research and development (R&D) in Canadian industry , 2005 survey response

	Responded R&D	No R&D	Deleted[1]	Did not respond[2]	**Total**
	number				
Total	**15,484**	**25**	**34**	**406**	**15,949**
Long form	1,007[3]	25	34	406	**1,542**
Administrative data[4]	14,400	…	…	…	**14,400**

1. Inactive, out of business and unallocated.
2. Includes estimates made for 406 long form delinquents.
3. Includes 245 companies added from T661.
4. Data from Canada Revenue Agency, does not include records projected.

Technical notes

Statistics for even years

Data for the reference year 2005 are available for all tables with the exception of counts of companies. However, in the even years prior to 1982 and for 1992 and 1994, our estimation procedures did not permit the preparation of tables based on revenue size, employment size, sources of funds and country of control of companies.

Regional data on research and development (R&D) expenditures and personnel are only available for 1977, 1979 and 1981 to 2005.

Terminology

The following terminology is used within the publication:

Performing company: The organization which carried out the R&D and submitted the return. In the case of a consolidated return, performing company could include several companies. It also includes divisions of an enterprise which send separate returns or organizations such as industrial non-profit organizations.

Related companies: Includes parent, subsidiary and other affiliated companies. In the case where a consolidated return is submitted, “related companies” would exclude companies included in the consolidation.

Research and development (R&D) contracts for other companies: R&D contract work performed by the reporting company for other companies.

Federal grants: Federal R&D grants and the R&D portion of any other federal grants; it excludes funds or tax credits for R&D tax incentives.

Federal contracts: Federal R&D contracts and the R&D portion of any other federal contracts.

Provincial sources: Provincial R&D grants and contracts, and the R&D portion of any provincial grants and contracts; it excludes funds or tax credits for R&D tax incentives.

Other Canadian sources: Includes funds from universities and from levels of government other than federal and provincial.

Intramural expenditures: Expenditures for R&D work performed within the reporting company, including work financed by others.

Current intramural expenditures: Labour costs, fringe benefits and other current costs for R&D, including non-capital purchases of materials, supplies and equipment but excluding capital depreciation. Current intramural expenditures also include contracts for services required to carry out R&D (e.g. contracts awarded for drilling needed for heavy oil R&D).

Capital expenditures: Expenditures on fixed assets used in the R&D program, classified into land, buildings, and equipment.

Technological payments: Payments made for R&D and other technology.

Technological receipts: Payments received for R&D and other technology.

Other technology: Technology acquired through patents (sale/purchase, licensing), “know-how” (unpatented), inventions, trademarks (including franchising), patterns, design, and R&D technical assistance.

Revenues: Revenues resulting from the sale of products and services (after deducting sales and excise taxes), and other revenues such as those generated from investment and rentals.

Non-commercial firms: R&D performers without a directly affiliated Canadian commercial base. Includes industrial non-profit organizations and trade associations, R&D establishments set up by consortia, and R&D establishments set up by non-residents without associated commercial establishments and funded principally from abroad.

R&D personnel: Calculated in full-time equivalent (FTE). R&D may be carried out by persons who work solely on R&D projects or by persons who devote only part of their time to R&D, and the balance to other activities such as testing, quality control and production engineering. To arrive at the total effort devoted to R&D in terms of person-years, it is necessary to estimate the full-time equivalent of these persons working only part-time in R&D.

FTE = number of persons who work solely on R&D projects + estimate of time of persons working only part of their time on R&D.

Example calculation:

If out of five scientists engaged in R&D work, one works solely on R&D projects and the remaining four devote only one quarter of their working time to R&D, then: FTE = 1 + 1/4 + 1/4 + 1/4 + 1/4 = 2 scientists.

Federal government funds for industrial R&D: Federal support consists of grants and contracts for R&D to be performed by business enterprises. Taxes foregone as a result of income tax incentives for R&D are not considered direct government support and are not attributed to the federal government.

Industrial classification

The natural classification to use within the business enterprise sector is the North American Industry Classification System (NAICS). There are, however, problems with its use. A major problem is caused by companies with establishments in more than one industry (e.g., companies which both refine petroleum and extract oil). Another is caused by the concentration of the R&D activity among a few companies. In order to prevent disclosure of individual respondents many industries must be grouped together to provide sufficient observations for publication.

A third problem is that the classification, chosen to represent general industrial activity, may not be entirely suitable for identifying companies chosen only for their involvement in R&D.

There are some restrictions on the application of the NAICS, for example, industrial non-profit organizations will be assigned to the industry they support.

The R&D activities of other sectors such as the federal government, provincial governments, higher education, and private non-profit organizations are covered in other reports.

Definitions

Research and development

Research and development (R&D) is systematic investigation carried out in the natural and engineering sciences by means of experiment or analysis to achieve a scientific or commercial advance.

Research is original investigation undertaken on a systematic basis to gain new knowledge.

Development is the application of research findings or other scientific knowledge for the creation of new or significantly improved products or processes. If successful, development will usually result in devices or processes which represent an improvement in the “state of the art” and are likely to be patentable.

Example:

The investigation of electrical conduction in crystals was research. The application of this knowledge to the creation of a new amplifying device - the transistor - was development. The application of the device to the construction of new electrical circuits for television receivers was development. The formulation of new plastic cases for a television receiver is design, not development.

Research and development may be carried out either by a permanent R&D unit (e.g., R&D division) or by a unit generally engaged in any non-R&D activity such as engineering or production. In the first case, the R&D unit may spend part of its time on routine testing or trouble shooting or on some other activities which should not be included in R&D. In the second, only the R&D portion of such units’ total activity should be considered.

Research and development should be considered to be “Scientific Research and Experimental Development” as defined in Section 37, Regulation 2900 of the Income Tax Act; this section specifically excludes the following:

(i) market research, sales promotion,

(ii) quality control or routine analysis and testing of materials, devices or products,

(iii) research in the social sciences or the humanities,

(iv) prospecting, exploring or drilling for or producing minerals, petroleum or natural gas,

(v) the commercial production of a new or improved material, device or product or the commercial use of a new or improved process,

(vi) style changes, or routine data collection,

Note:

Although the definition of “Scientific Research and Experimental Development” is considered to be the same as R&D, certain expenditures for scientific research cannot be claimed for income tax purposes (e.g., land, building). All expenditures attributable to R&D are included in this report.

Interpretation of R&D

Generally speaking, industrial R&D is intended to result in an invention which may subsequently become a technological innovation. An essential requirement is that the outcome of the work is uncertain, i.e., that the possibility of obtaining a given technical objective cannot be known in advance on the basis of current knowledge or experience. Hence much of the work done by scientists and engineers is not R&D, since they are primarily engaged in “routine” production, engineering, quality control or testing. Although they apply scientific or engineering principles their work is not directed towards the discovery of new knowledge or the development of new products and processes. However, work elements which are not considered R&D by themselves but which directly support R&D projects, should be included with R&D in these cases. Examples of such work elements are design and engineering, shop work, computer programming, and secretarial work.

If the primary objective is to make further technical improvements to the product or process, then the work comes within the definition of R&D. If however, the product, process or approach is substantially set and the primary objective is to develop markets, to do pre-production planning or to get a production or control system working smoothly, then the activity can no longer be considered as part of R&D even though it could be regarded as an important part of the total innovation process. Thus, the design, construction and testing of prototypes, models and pilot plants are part of R&D. But, when necessary modifications have been made and testing has been satisfactorily completed, the boundary of R&D has been reached. Hence, the costs of tooling (design and try-out), construction drawings and manufacturing blueprints, and production start-up are not included in development costs.

Pilot plants may be included in development only if the main purpose is to acquire experience and compile data. As soon as they begin operating as normal production units, their costs can no longer be attributed to R&D. Similarly, once the original prototype has been found satisfactory, the cost of other “prototypes” built to meet a special need or fill a very small order are not to be considered as part of R&D.

Specific cases and their treatment

Activity	Treatment	Remarks
Economic research, market research, management studies	Exclude	All activities in the social sciences.
Quality control, routine testing, style changes, minor adaptation of a product to meet a customer's specific requirements	Exclude	Even if carried out by staff normally engaged in R&D.
Prospecting, exploratory drilling, development of mines, oil or gas wells	Exclude	Except for R&D projects concerned with new equipment or techniques in these activities, such as in-situ and tertiary recovery research.
Engineering	Exclude	Engineering unless it is in direct support of R&D.
Design and drawing	Exclude	Design and drawing unless it is in direct support of R&D.
Prototypes, pilot plants	Include	As long as the primary objective is to make further improvements.
Contracts for R&D	Include	All contracts for R&D. For contracts which include other work, report only the R&D costs.
Tooling up, trial production, trouble shooting	Exclude	Although R&D may be required as a result of these steps.
Patent and licence work	Exclude	All administrative and legal work connected with patents and licences.

Reliability of the data

All the possible sources of error are examined below.

Coverage

"Coverage errors are introduced whenever the sampling frame...does not adequately represent the target population at the time of the survey."[1]

Coverage is a minor source of error. Surveys are of all known and suspected, large R&D performers and funders i.e., those believed to have R&D expenditures of at least $1,000,000.

Administrative data are used for the small R&D performers or funders. Companies have up to 18 months after their fiscal year end to claim a tax credit for their R&D expenditures. Underreporting due to this time lag is estimated to be less than 8%, and is largely corrected by imputing estimates based on industry trends for all known performers who have not yet submitted their claim.

Response

"A response error occurs whenever a characteristic is misreported in a census or a survey." [1]

As a result of a reconciliation of federal and industrial accounts of government grants and contracts, we think that industrial R&D performance estimates may be slightly low. This is caused by the non-reporting of industrial R&D funded by contract. Such work is sometimes not distinguishable from non-R&D contract work.

The accuracy of the company's estimates of future expenditures has also been a problem in the past, particularly in the wells and petroleum products industries.

Non-response

"Non-response occurs when information required for a survey unit is missing. This could happen because the unit cannot be contacted, because the unit is unable to provide the information requested, or because the unit refuses to cooperate in the survey." [1]

Non-response is a potential problem in four areas. One is the estimate of R&D expenditures two years past the base year. If no estimate is made, editors make one - based usually on the expenditure of the preceding year or a slight increase in expenditures.

The second involves the administrative data used for the smaller R&D performers. These represent 10% of all R&D performed by businesses. Certain information is not asked of them. However, the missing data are imputed from the replies of the larger performers in the same industry.

The third concerns companies inadvertently not included in the survey. A number of sources are used to create the mailing lists and it is unlikely that major performers would be overlooked.

Failure of surveyed companies to reply is the fourth type of non-response. We believe non-response error to be minor and may result in a minor under-estimation of R&D expenditures.

1. "A compendium of methods of error evaluation in censuses and surveys." Statistics Canada, Statistical Services Field, November 1978, Catalogue No. 13-564E

Coding

"A coding operation in a survey or census is defined as the operation where data on questionnaires or source documents are transformed into a format which is suitable for input to the data capture operation. This often involves the assignment of codes for 'write-in' entries but may also be a fairly straightforward transcription operation." [1]

Uncorrected coding errors are unlikely because of the examination of numerous tables and listings prepared for data analysis before publication tables are created.

Data capture

"The data capture operation in a census or survey consists of converting the data received on questionnaires (e.g., respondent answers) to a machine readable format." [1]

All data capture for science statistics is through manual intervention: key-edit or typed entry at a computer terminal.

Significant uncorrected data capture errors are unlikely because of the examination of numerous tables and listings prepared for data analysis before publication tables are created.

Edit and imputation

"The edit procedure usually consists of: (i) checking each field of every record to ascertain whether it contains a valid code or entry; (ii) checking codes or entries in certain predetermined combinations of fields to ascertain whether codes or entries are consistent with one another... The imputation procedure consists of changing values in some of the fields in records which failed the edit rules with a view to ensuring that the resultant data records satisfy all edit rules." [1]

Although there are a number of edits, all cases of failed edit checks are corrected after consideration by editors. Automatic imputations are made only for the smaller R&D performers and funders.

Sampling

"Sampling error occurs whenever survey results are based on a sample of units from a survey frame... Obviously there is no sampling error in complete enumeration surveys." [1]

Although a complete enumeration is carried out of known and suspected R&D performers and funders, records received from the administrative data do not provide as much information as do those completing the long form. Certain data are imputed for records from the administrative file based on the patterns of long form respondents in the same industry. Thus, as a result of the 2005 survey, the 2005 business enterprise sector R&D expenditures would be based on full enumeration but about 10% of the expenditures for 2006 and 2007 would have been imputed.

1. "A compendium of methods of error evaluation in censuses and surveys." Statistics Canada, Statistical Services Field, November 1978, Catalogue No. 13-564E

Catalogued publications

Science, Technology and Innovation statistical publications

88-001-XWE Science statistics
88-003-XIE Innovation analysis bulletin
88-202-XIE Industrial research and development, intentions (with 2006 preliminary estimates and 2005 actual expenditures) (annual)
88-204-XIE Federal scientific activities (annual)
88-221-XWE Gross domestic expenditures on research and development in Canada and the provinces-National estimates 1996-2007, Provincial estimates 2001-2005
88F0006XIE Science, Innovation and Electronic Information Division, working papers