

U. S. INDUSTRIAL R&D EXPENDITURES AND R&D-TO-SALES RATIO REACH HISTORICAL HIGHS IN 2000

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This *InfoBrief* presents summary statistics from the 2000 cycle of the National Science Foundation's (NSF's) annual Survey of Industrial Research and Development. The survey results show that companies¹ spent \$199.5 billion on research and development (R&D) that they performed in the United States during 2000, up 9 percent² over the 1999 figure. Company funding³ of R&D continued to increase, as it has each year since 1953, rising from \$160.2 billion in 1999 to \$180.4 billion in 2000—a 13 percent increase. Federal funding of industrial R&D was \$19.1 billion in 2000 compared with \$22.5 billion in 1999. After adjusting for inflation, total industrial R&D rose 7 percent, company-funded R&D rose 10 percent, and federally funded R&D fell 17 percent. Summary statistics from the 1999 and 2000 surveys are compared in table 1.

¹In this *InfoBrief*, and in NSF industrial R&D statistics, *company* is defined as a business organization of one or more establishments under common ownership or control.

²Estimates of industrial R&D activity produced from the Survey of Industrial Research and Development are developed from a statistical sample selected each year. Sampling may have an effect on year-to-year changes in the estimates. See the Notes on Statistical and Survey Methodology at the end of this *InfoBrief* for more information.

³*Company funding* refers to funds provided by all sources except the Federal Government for industrial R&D performed within the company's domestic facilities. The funds are predominantly the company's own but also include funds from such outside organizations as other companies, research institutions, universities and colleges, nonprofit organizations, and state governments.

R&D Funds by Sector

Manufacturing industries performed \$110.8 billion, or 61 percent, of company-funded industrial R&D in the United States during 2000. The amounts of company-funded R&D reported by top R&D-performing manufacturing industries are indicated below.

Company and other funding of industrial R&D increased 13 percent to \$180.4 billion in 2000; Federal funding fell 15 percent to \$19.1 billion.

- motor vehicles, trailers, and parts, \$18.3 billion
- pharmaceuticals and medicines, \$12.8 billion
- semiconductor and other electronic components, \$12.8 billion
- communications equipment, \$11.2 billion
- navigational, measuring, electromedical, and control instruments, \$10.1 billion

Companies classified in the nonmanufacturing industries performed \$69.7 billion, or 39 percent, of company-funded industrial R&D in the United States during 2000. The amounts of company-funded R&D reported by top R&D-performing nonmanufacturing industries are indicated below.



Table 1. Funds expended for industrial R&D performance, by source of funds, industrial sector and size of company, and sales and employment of R&D-performing companies: 1999 and 2000

Source of R&D funds, sales, employment, industrial sector, and size of company	1999	2000	Percent change 1999-2000	1999	2000	Percent change 1999-2000
	In millions of current dollars			In millions of constant (1996) dollars		
Total industrial R&D performance	182,711	199,539	9.2	174,592	186,415	6.8
By performing sector:						
Manufacturing industries.....	116,921	124,078	6.1	111,726	115,917	3.8
Nonmanufacturing industries.....	65,790	75,461	14.7	62,867	70,498	12.1
By source of funds and performing sector:						
Company and other non-Federal.....	160,176	180,421	12.6	153,059	168,555	10.1
Manufacturing industries.....	99,865	110,750	10.9	95,428	103,466	8.4
Nonmanufacturing industries.....	60,311	69,671	15.5	57,631	65,089	12.9
Federal.....	22,535	19,118	-15.2	21,534	17,861	-17.1
Manufacturing industries.....	17,055	13,328	-21.9	16,297	12,451	-23.6
Nonmanufacturing industries.....	5,479	5,790	5.7	5,236	5,409	3.3
By size of company:						
5 to 24 employees.....	7,004	6,862	-2.0	6,693	6,411	-4.2
25 to 49 employees.....	4,750	5,008	5.4	4,539	4,679	3.1
50 to 99 employees.....	7,225	7,259	0.5	6,904	6,782	-1.8
100 to 249 employees.....	7,213	9,020	25.1	6,892	8,427	22.3
250 to 499 employees.....	7,892	7,479	-5.2	7,541	6,987	-7.3
500 to 999 employees.....	7,032	9,074	29.0	6,720	8,477	26.2
1,000 to 4,999 employees.....	24,840	30,636	23.3	23,736	28,621	20.6
5,000 to 9,999 employees.....	16,376	16,768	2.4	15,648	15,665	0.1
10,000 to 24,999 employees.....	24,922	28,653	15.0	23,815	26,768	12.4
25,000 or more employees.....	75,457	78,779	4.4	72,104	73,598	2.1
Domestic net sales of U.S.						
R&D-performing companies ¹	4,925,124	5,249,573	6.6	4,706,282	4,904,310	4.2
Manufacturing industries.....	3,126,793	3,405,208	8.9	2,987,858	3,181,248	6.5
Nonmanufacturing industries.....	1,798,331	1,844,364	2.6	1,718,424	1,723,061	0.3
	Thousands of employees					
Domestic employment of U.S.						
R&D-performing companies ²	18,221	17,663	-3.1	NA	NA	NA
Manufacturing industries.....	10,930	11,010	0.7	NA	NA	NA
Nonmanufacturing industries.....	7,291	6,652	-8.8	NA	NA	NA
Full-time equivalent (FTE) R&D scientists and engineers in						
R&D-performing companies ³	1,034	1,041	0.7	NA	NA	NA
Manufacturing industries.....	597	609	2.0	NA	NA	NA
Nonmanufacturing industries.....	437	433	-0.9	NA	NA	NA

¹ The dollar values for goods sold or services rendered by R&D-performing companies to customers outside the company, including the Federal Government, less such items as returns, allowances, freight charges, and excise taxes. Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.

² The number of people employed in the United States by R&D-performing companies in all activities during the pay period that includes March 12, the date most employers use when paying first-quarter employment taxes to the Internal Revenue Service.

³ The number of people domestically employed by R&D-performing companies who were engaged in scientific or engineering work at a level that required knowledge, gained either formally or by experience, of engineering or of the physical, biological, mathematical, statistical, or computer sciences equivalent to at least that acquired through completion of a 4-year college program with a major in one of those fields. The survey statistics show full-time-equivalent (FTE) employment of persons employed by the company during the January following the survey year who were assigned full time to R&D, plus a prorated number of employees who worked part time on R&D.

KEY: NA = Not applicable

NOTES: Detail may not add to totals because of rounding. 1996 gross domestic product (GDP) implicit price deflators were used to convert current to constant dollars. Statistics for 1999 have been revised since they were originally published.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Industrial Research and Development.

- wholesale and retail trade, \$25.0 billion
- software publishing, \$12.6 billion
- scientific R&D services, \$9.7 billion
- computer systems design and related services, \$4.9 billion
- finance, insurance, and real estate, \$4.0 billion

Sales and Employment of R&D-Performing Industries

Domestic net sales of companies that performed R&D in the United States rose 7 percent, from \$4.9 trillion in 1999 to \$5.2 trillion in 2000.⁴ Manufacturers' sales rose 9 percent, from \$3.1 trillion in 1999 to \$3.4 trillion in 2000; companies in nonmanufacturing industries reported sales of about \$1.8 trillion in both years. The R&D-to-sales ratio for all R&D-performing companies was an historical high of 3.8 percent in 2000;⁵ 3.6 percent for manufacturers and 4.1 percent for companies in nonmanufacturing industries.

Domestic employment by companies that performed R&D in the United States fell 3 percent, from 18.2 million in 1999 to 17.7 million in 2000.⁶ The number of people who were employed by manufacturing companies remained essentially unchanged, 10.9 million in 1999 and 11.0 million in 2000, while companies in nonmanufacturing industries reported employment of 7.3 million in 1999 and 6.7 million in 2000. Although total employment decreased, the number of full-time equivalent (FTE) scientists and engineers who performed industrial R&D⁷ remained virtually unchanged, about 1.0 million in both years. Manufacturers employed 0.6 million FTE R&D scientists and engineers and companies in nonmanufacturing industries employed 0.4 million.

R&D Funds Per R&D Scientist or Engineer

The average amount of R&D funds spent per FTE R&D scientist or engineer in manufacturing industries rose 11 percent, from \$186,000 during 1999 to \$206,000

during 2000, while the amount spent per FTE R&D scientist or engineer in nonmanufacturing industries rose 2 percent, from \$170,000 to \$174,000.⁸ The top performing industries of company-funded industrial R&D are listed below in descending order with the average amount of R&D funds spent per FTE R&D scientist and engineer indicated for each.⁹

- wholesale and retail trade, \$227,668
- semiconductor and other electronic components, \$219,592
- software publishing, \$158,554
- communications equipment, \$187,953
- navigational, measuring, electromedical, and control instruments, \$213,061
- scientific R&D services, \$246,174.

Notes on Statistical and Survey Methodology

Statistics produced from the Survey of Industrial Research and Development are developed from a sample. A particular year's statistical sample is only one of the many random samples that could be selected for that year. Estimates derived from the many random samples vary and the coefficient of variation (CV) is a measure of that variation.¹⁰ The 1999 and 2000 survey samples were designed to produce CVs targeted at 2 percent for industries in which there was a large amount of R&D expenditures and 5 percent for industries in which there was a moderate amount.¹¹ In addition to

⁸The average amount is calculated by dividing all costs associated with the performance of industrial R&D by the number of FTE R&D scientists and engineers employed. Component costs, with 1999-to-2000 percentage increases indicated in parentheses, are: salaries, wages, and fringe benefits paid to R&D scientists and engineers (2.8%); materials and supplies used for R&D (8.4%); depreciation on capital equipment and facilities used for R&D (14.8%); and other R&D costs (16.4%). These data are not adjusted for inflation.

⁹This list contains estimates for the top six performing industries or industry groups for which statistics are available.

¹⁰The CV is a percentage that can be added to and subtracted from the published estimate to allow the user to construct an interval that is associated with the confidence that the interval includes the actual value.

¹¹It is unlikely that year-to-year percentage changes larger than twice the target CVs were produced by sampling error, but sampling error could have increased or decreased the magnitude of the percentage changes discussed in this *InfoBrief*.

⁴Domestic net sales is defined in table 1, footnote 1.

⁵This statement is based on statistics produced from the Survey of Industrial Research and Development since 1953, the first year for which statistics were prepared.

⁶Domestic employment is defined in table 1, footnote 2.

⁷FTE employment is defined in table 1, footnote 3.

sampling error, year-to-year changes may have been influenced by companies with large R&D expenditures that changed industry classifications because of payroll composition, mergers, or acquisitions, or companies that changed size classifications.

Statistics resulting from the 2000 cycle of the survey benefit from recent enhancements in the conduct of the Survey of Industrial Research and Development. These enhancements include refocusing the sampling strategy to produce better quality statistics for the industries that perform the greatest amounts of R&D while deemphasizing industries that perform little or no R&D (for more information see the technical notes in *Research and Development in Industry: 1998* (NSF 01-305) at <http://www.nsf.gov/sbe/srs/nsf01305/start.htm>); implementation of the North American Industrial Classification System (NAICS) (see *Research and Development in Industry: 1999* (NSF 02-312) at <http://www.nsf.gov/sbe/srs/nsf02312/start.htm>); and an increase in the number of size-of-business categories used to classify survey statistics (see *SRS Data Brief: "U.S. Industrial R&D Performers Report Increased R&D in 1999; New Industry Coding and Size Classifications for NSF Survey"* (NSF 01-326) at <http://www.nsf.gov/sbe/srs/databrf/nsf01326/db01326.htm>).

Statistical Reports

This *InfoBrief* provides statistics and information from the 2000 Survey of Industrial Research and Develop-

ment. Six early release tables are available at <http://www.nsf.gov/sbe/srs/srs02403/start.htm>. The annual report, *Research and Development in Industry: 2000*, will be published later this year on the NSF web site at <http://www.nsf.gov/sbe/srs/indus/start.htm>. This will be the first report in the *Research and Development in Industry* series that will be published only in electronic format; subsequent reports also will be published only in electronic format. The annual report will contain the full set of 47 tables available from the 2000 survey and will present R&D statistics by industry, size of company, source of funds, character of R&D, R&D as a percentage of net sales, and R&D funded to outside organizations and performed outside the United States. The report also will provide historical trends in R&D, sales and total employment of R&D-performing companies, employment of R&D scientists and engineers, statistics by state, and technical information on the survey sample, processing, and the North American Industrial Classification System.

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