

U.S. INDUSTRY SUSTAINS R&D EXPENDITURES DURING 2001 DESPITE DECLINE IN PERFORMERS' AGGREGATE SALES

by Raymond M. Wolfe

The National Science Foundation's (NSF's) annual Survey of Industrial Research and Development shows that companies¹ spent \$198.5 billion on research and development (R&D) that they performed in the United States during 2001. Company funding² of R&D for 2001 was \$181.6 billion, about the same level as it was for 2000 (\$180.4 billion).³ Federal funding of industrial R&D reported by performers was \$16.9 billion in 2001. It should be noted that the 2001 estimates are not directly comparable with 2000 estimates because data for industry-administered Federally Funded Research and Development Centers (FFRDCs) were not collected

¹ In 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. Estimates of industrial R&D activity produced from the Survey of Industrial Research and Development are developed from data collected from a sample of companies selected each year.

² *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.

³ This lack of growth in current-dollar expenditures, which represented a decline in constant-dollar expenditures, reflects a major change for company-funded R&D. Since the inception of the survey, in 1953, current-dollar company-funded R&D had increased each year and constant-dollar growth had declined only five times (in 1970, 1971, 1975, 1987, and 1993). Note that sampling may have an effect on year-to-year changes in the estimates.

in the 2001 survey.⁴ Statistics from the 2000 and 2001 surveys are summarized in table 1. Information about items recently added to the survey is provided below.

Company and other non-Federal funding of industrial R&D was \$182 billion in 2001; Federal funding was \$17 billion.

R&D Funds by Sector

Manufacturing industries performed \$109.2 billion, or 60 percent, of the total company-funded industrial R&D in the United States during 2001. The amounts of company-funded R&D reported by top R&D-performing manufacturing industries were

- motor vehicles, trailers, and parts, \$16.1 billion
- communications equipment, \$15.2 billion
- semiconductor and other electronic components, \$14.2 billion
- pharmaceuticals and medicines, \$10.1 billion
- navigational, measuring, electromedical, and control instruments, \$7.6 billion

⁴ To avoid the possibility of disclosing company-specific information, data for industry-administered FFRDCs are now collected through NSF's Survey of Academic Science and Engineering R&D Expenditures, as are data from FFRDCs administered by academic institutions and nonprofit organizations. NSF estimates that industry-administered FFRDCs performed \$1.7 billion of R&D during 2000 and \$1.9 billion during 2001.



TABLE 1. Funds expended for industrial R&D performance by industrial sector, source of funds, size of company, and sales and employment of R&D-performing U.S. companies: 2000 and 2001

Selected characteristics	2000	2001 ¹	2000	2001 ¹
	Millions of current dollars		Millions of constant 1996 dollars	
Total industrial R&D performance	199,539	198,505	186,677	181,416
Performing sector				
Manufacturing industries	124,078	120,705	116,080	110,313
Nonmanufacturing industries	75,461	77,799	70,597	71,101
Source of funds and performing sector				
Company and other non-Federal	180,421	181,606	168,791	165,971
Manufacturing industries	110,750	109,221	103,611	99,818
Nonmanufacturing industries	69,671	72,384	65,180	66,152
Federal	19,118	16,899	17,886	15,444
Manufacturing industries	13,328	11,484	12,469	10,495
Nonmanufacturing industries	5,790	5,415	5,417	4,949
Size of company (number of employees)				
5–24	6,862	4,828	6,420	4,412
25–49	5,008	3,750	4,685	3,427
50–99	7,259	8,202	6,791	7,496
100–249	9,020	12,916	8,439	11,804
250–499	7,479	8,702	6,997	7,953
500–999	9,074	10,564	8,489	9,655
1,000–4,999	30,636	26,748	28,661	24,445
5,000–9,999	16,768	17,487	15,687	15,982
10,000–24,999	28,653	27,065	26,806	24,735
25,000 or more	78,779	78,244	73,701	71,508
Domestic net sales ²	5,249,573	4,835,140	4,911,192	4,418,881
Manufacturing industries	3,405,208	3,012,938	3,185,712	2,753,553
Nonmanufacturing industries	1,844,364	1,822,202	1,725,479	1,665,328
	Thousands of employees			
Domestic employment ³	17,663	16,749	na	na
Manufacturing industries	11,010	9,913	na	na
Nonmanufacturing industries	6,652	6,836	na	na
Full-time equivalent (FTE) R&D scientists and engineers ⁴	1,041	1,060	na	na
Manufacturing industries	609	616	na	na
Nonmanufacturing industries	433	444	na	na

na = not applicable.

¹ Beginning with 2001, statistics exclude data for Federally Funded Research and Development Centers. See footnote 4 in text for more information.

² 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. Excludes domestic intracompany transfers and sales by foreign subsidiaries but includes transfers to foreign subsidiaries and export sales to foreign companies.

³ 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.

⁴ Number of people domestically employed by R&D-performing companies engaged in scientific or engineering work at a level requiring knowledge, gained formally or by experience, of engineering or 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. 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.

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.

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

Manufacturing industries performed \$11.5 billion, or 68 percent, of total Federally funded industrial R&D in the United States during 2001. The amounts of Federally funded R&D reported by selected manufacturing industries were⁵

- navigational, measuring, electromedical, and control instruments, \$5.4 billion
- aerospace products and parts, \$3.8 billion
- electrical equipment, appliances, and components, \$0.3 billion
- communications equipment, \$0.3 billion
- semiconductor and other electronic components, \$0.1 billion

Companies classified in the nonmanufacturing industries performed \$72.4 billion, or 40 percent, of company-funded industrial R&D in the United States during 2001. The amounts of company-funded R&D reported by top R&D-performing nonmanufacturing industries were⁶

- software publishing, \$13.0 billion
- scientific R&D services, \$10.9 billion
- computer systems design and related services, \$8.7 billion
- finance, insurance, and real estate, \$2.4 billion
- architectural, engineering, and related services, \$2.4 billion

⁵ The five industries listed are the top industries that performed Federally funded industrial R&D in the United States during 2001, for which statistics can be published. Federally funded R&D estimates for some industries cannot be disclosed because Title 13 of the United States Code and a pledge of confidentiality to survey respondents prohibits publication or release of data or statistics that may reveal information about individual companies. When a small number of respondents account for a large percentage of the industry estimate, some statistics must be suppressed. This is particularly true for statistics on Federally funded industrial R&D because relatively few companies perform the R&D.

⁶ Companies in the wholesale and retail trade industry classification performed \$24.3 billion of company-funded R&D during 2001; however, trade is not included in the list of top company-funded R&D performers shown. NSF strongly suspects that much of its R&D can be attributed to other activities not related to trade because of the way industry codes are assigned during statistical processing. A company's industry classification is a function of its primary activity based on payroll, which is not necessarily the primary source of its R&D activity. This has been particularly evident in recent years because of the growing tendency by some large pharmaceutical and computer manufacturers to market and sell their own products. This processing artifact is being examined and evaluated by NSF and the U.S. Census Bureau, which is the collection and tabulation agent for the survey.

Companies classified in the nonmanufacturing industries performed \$5.4 billion, or 32 percent, of Federally funded industrial R&D in the United States during 2001. The amounts of Federally funded R&D reported by selected R&D-performing nonmanufacturing industries were

- scientific R&D services, \$3.4 billion
- architectural, engineering, and related services, \$1.0 billion
- computer systems design and related services, \$0.5 billion
- other professional, scientific, and technical services, \$0.2 billion
- transportation and warehousing, \$0.1 billion

Sales and Employment of R&D-Performing Industries

Domestic net sales of companies that performed R&D in the United States was \$4.8 trillion in 2001 (see table 1 for definition of terms). Manufacturers' sales were \$3.0 trillion in 2001, and companies in nonmanufacturing industries reported sales of about \$1.8 trillion. The R&D-to-sales ratio was 4.0 percent for manufacturers and 4.3 percent for companies in nonmanufacturing industries. For all industries, the ratio was 4.1 percent for 2001, the highest ratio achieved since 1953, the first year for which statistics were prepared. However, the increase in the ratio resulted primarily from industries' declining sales,⁷ since R&D expenditures remained relatively flat.

Domestic employment by companies that performed R&D in the United States was 16.7 million in 2001. The number of people who were employed by R&D-performing manufacturing companies was 9.9 million in 2001, and companies that performed R&D in nonmanufacturing industries reported employment of 6.8 million. The number of full-time equivalent (FTE) scientists and engineers who performed industrial R&D was about 1 million. Manufacturers employed 0.6 million FTE R&D scientists and engineers, and companies in nonmanufacturing industries employed 0.4 million.

R&D Outsourcing and Technology

In NSF's continuing effort to improve and maintain the relevance of the statistics resulting from the Survey of Industrial Research and Development, several new

⁷ The deletion of the industry-administered FFRDCs from the survey had a negligible effect on the estimates for total domestic net sales.

items were added to the survey forms for 2001. These included an item that asked for the sector identification of the performer of extramural or contracted-out R&D⁸ and an item that asked how much R&D companies performed in any of the following technological areas: biotechnology, materials processing, software development, and other areas, including nanotechnology.⁹ Also, the "type of R&D" item was expanded to ask companies for the cost of fringe benefits for R&D personnel. Final, detailed statistics for the new items will be available later this year in *Research and Development in Industry: 2001* at the Internet address below and in forthcoming *InfoBriefs*.

Statistical Reports

This *InfoBrief* provides statistics and information from the 2001 Survey of Industrial Research and Development.

⁸ Preliminary statistics indicate that 192 companies reported expenditures of \$3.1 billion for the performance of R&D by other for-profit companies, 80 companies reported \$0.4 billion for the performance of R&D by universities and colleges, and 27 reported \$0.2 billion for the performance of R&D by nonprofit organizations other than universities and colleges.

⁹ Preliminary statistics indicate that 147 companies reported aggregate expenditures of \$7.4 billion for performance of biotechnology R&D, 126 companies spent \$7.7 billion for materials processing R&D, and 242 companies spent \$9.4 billion for software development R&D.

The annual report, *Research and Development in Industry: 2001*, will be published later this year on the NSF website at <http://www.nsf.gov/sbe/srs/indus/start.htm>. The annual report will contain the full set of tables available from the 2001 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, R&D funded to outside organizations and performed outside the United States, R&D outsourcing, and R&D by technology area. The report will also provide historical trends in R&D, sales and total employment of R&D-performing companies, employment of R&D scientists and engineers, and statistics by state.

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