Research and Development in Industry: 1998

Funds, 1998
Scientists and Engineers,
January 1999

Detailed Statistical Tables

Division of Science Resources Studies
Directorate for Social, Behavioral, and Economic Sciences

National Science Foundation

October 2000

Research and Development in Industry: 1998

Funds, 1998
Scientists and Engineers,
January 1999

Detailed Statistical Tables

Raymond M. Wolfe, Project Officer and Principal Author

Division of Science Resources Studies
Directorate for Social, Behavioral, and Economic Sciences

National Science Foundation October 2000

Research and Development in Industry: 1998

NSF 01-305

NATIONAL SCIENCE FOUNDATION
ARLINGTON, VA 22230

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

RETURN THIS COVER SHEET TO ROOM P35 IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL , OR IF CHANGE OF ADDRESS IS NEEDED , INDICATE CHANGE INCLUDING ZIP CODE ON THE LABEL (DO NOT REMOVE LABEL).

SPECIAL FOURTH-CLASS RATE
POSTAGE & FEES PAID
National Science Foundation
Permit No. G-69

National Science Foundation
Rita R. Colwell
Director

Directorate for Social, Behavioral, and Economic Sciences
Norman M. Bradburn
Director

Division of Science Resources Studies
Lynda T. Carlson — *Division Director*
Mary J. Frase — *Deputy Director*
Ronald S. Fecso
Chief Statistician

Research and Development Statistics Program
John E. Jankowski
Program Director

DIVISION OF SCIENCE RESOURCES STUDIES

The Division of Science Resources Studies (SRS) fulfills the legislative mandate of the National Science Foundation Act to ...

> *provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources and to provide a source of information for policy formulation by other agencies of the Federal Government...*

To carry out this mandate, SRS designs, supports, and directs periodic surveys as well as a variety of other data collections and research projects. These surveys yield the materials for SRS staff to compile, analyze, and disseminate quantitative information about domestic and international resources devoted to science, engineering, and technology.

If you have any comments or suggestions about this or any other SRS product or report, we would like to hear from you. Please direct your comments to:

National Science Foundation
Division of Science Resources Studies
4201 Wilson Blvd., Suite 965
Arlington, VA 22230
Telephone: (703) 292-8774
Fax: (703) 292-9092
email: srsweb@nsf.gov

Suggested Citation
National Science Foundation, Division of Science Resources Studies, *Research and Development in Industry: 1998*, NSF 01-305, Project Officer and Principal Author, Raymond M. Wolfe (Arlington, VA 2000).

October 2000

SRS data are available through the World Wide Web (http://www.nsf.gov/sbe/srs/stats.htm). For more information about obtaining reports, contact pubs@nsf.gov or call (301) 947-2722. For NSF's Telephonic Device for the Deaf, dial (703) 292-5090.

ACKNOWLEDGMENTS

The preparation of *Research and Development in Industry: 1998* was managed by Raymond M. Wolfe, Economist, National Science Foundation, Division of Science Resources Studies (SRS), Research and Development Statistics Program; under the direction of John E. Jankowski, Program Director; Ronald S. Fecso, Chief Statistician; Mary J. Frase, Deputy Division Director; and Lynda T. Carlson, Division Director. The U.S. Bureau of the Census designed the statistical sample and collected, processed, and tabulated the statistics in this report under Interagency Agreement SRS 99-06533. Census staff who worked on this project were William G. Bostic, Jr., Elinor J. Champion, Stacey J. Cole, Paul L. Hsen, Jolanta C. Krywonis, Gary L. Kusch, Yvette E. Moore, Charlotte M. Oliver, Annette J. Ralston, Ronald D. Scarlett, Ronald W. Taylor, and Daniel R. Tulp. Raymond M. Wolfe wrote the text, Census staff contributed descriptions of the sample and survey methodology, and Nita Congress edited the manuscript. Julia H. Harriston and Tanya R. Gore, under the direction of Anne M. Houghton, Publications Manager, Information Services Group, prepared the report for publication and handled arrangements for printing and distribution.

Contents

Page

Introduction 1

Note to Users of Historical Statistics 3

Section A. Detailed Statistical Tables 5

Section B. Technical Notes and Technical Tables 139

Section C. Survey Documents 181

INTRODUCTION

This report is the second of two publications containing results from the 1998 Survey of Industrial Research and Development. The first publication, a data brief announcing the availability of survey results, contains analytical information and highlights the increase in industrial research and development (R&D) funded from companies' own resources and the increased sales and employment of R&D-performing scientists and engineers reported by R&D-performing firms. This report contains the full set of statistics produced from the survey including statistics on R&D funding for the years 1988–98 and on R&D personnel for the period January 1989 to January 1999.

This report provides national estimates of the expenditures on R&D performed within the United States by industrial firms, whether U.S.- or foreign-owned. Among the statistics are estimates of total R&D, the portion of the total financed by the Federal Government, and the portion financed by the companies themselves or by other non-Federal sources such as state and local governments or other industrial firms under contract or subcontract. Total R&D is also separated into its character of work components (basic research, applied research, and development) and into the types of costs (wages, materials and supplies, depreciation, and other). Other statistics include R&D financed by a domestic firm but performed outside the United States, R&D contracted to organizations outside of the firm, and the funds spent to perform energy-related R&D. Also, this report provides information on R&D-performing firms including domestic net sales, number of employees, number of R&D-performing scientists and engineers, geographic location of where the R&D is performed, and R&D funds per R&D-performing scientist and engineer.

The Survey of Industrial Research and Development is an annual sample survey that intends to include or represent all for-profit R&D-performing companies, either publicly or privately held. The survey's primary focus is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected, and the resulting statistics appear in several tables while statistics on industrial funding of R&D undertaken at universities and colleges and other nonprofit organizations are not collected or included.[1] The result of collecting and publishing performer-reported statistics is that the federally funded R&D performance totals presented in this report differ from the totals reported by the Federal agencies that provide the funds and the statistics published in NSF's *Federal Funds for Research and Development* report series. One reason for these differences is that performers of R&D often expend Federal funds in a year other than the one in which the Federal Government provides authorization, obligations, or outlays. (For definitions of these terms, see section B, "Comparisons to Other Statistical Series.") During the past several years, the differences have widened between the Federal R&D funding reported by performers and that reported by funding agencies. These differences are documented and analyzed in *National Patterns of R&D Resources: 1998* (NSF 99-335).

Industry statistics in this report were developed from data collected from individual companies.[2] Since the survey is company-based rather than establishment-based, all data collected for the various components of each company (plants, divisions, or subdivisions) were tabulated in the company's major Standard Industrial Classification (SIC). The resulting industry estimates were reported using the SIC of the companies within each industry. National totals were estimated by summing the industry estimates.

Prior to the 1994 survey cycle, all companies that spent more than $1 million annually on R&D in the United States or had 1,000 or more employees received a survey questionnaire every year. Beginning with the 1994 cycle, the employee cutoff was dropped from the criteria and, beginning with the 1996 cycle, the R&D level was raised to $5 million, where it has remained for subsequent surveys. For all cycles of the survey, the remaining firms

[1]Data on R&D performed at universities and colleges are collected in the annual Survey of Research and Development Expenditures at Universities and Colleges. More information about these surveys is available from NSF's Research and Development Statistics Program in the Division of Science Resources Studies.

[2]In the Survey of Industrial Research and Development and in the publications presenting statistics resulting from the survey, the terms "firm," "company," and "enterprise" are used interchangeably. "Industry" refers to the activity or group of activities included in the 2- or 3-digit standard industrial classifications (SICs) or groups of SICs used to array statistics resulting from the survey.

(i.e., those that were not considered "certainties" because of the selection criteria) were subjected to probability sampling and may or may not receive a questionnaire for a given survey year. Among the organizations purposely excluded from the survey were trade associations and not-for-profit industrial consortia. Although their primary mission is to serve industry, these associations were excluded because they are nonprofit organizations.

Respondents receive detailed definitions to help them determine which expenses to include or exclude from the R&D data they provide. Nevertheless, the statistics presented in this report are subject to response and concept errors caused by differences in the way respondents interpret the definitions of R&D activities and by variations in company accounting procedures.

The National Science Foundation Act of 1950, as amended, authorizes and directs the National Science Foundation (NSF) "...to provide a central clearinghouse for the collection, interpretation, and analysis of data on the availability of, and the current and projected need for, scientific and technical resources in the United States, and to provide a source of information for policy formulation by other agencies of the Federal Government." The Survey of Industrial Research and Development is the vehicle with which NSF carries out the industrial portion of this mandate. NSF's Division of Science Resources Studies has sponsored and managed a survey of industrial R&D since 1953. The 1953–56 surveys were conducted by the Bureau of Labor Statistics (BLS) in the U.S. Department of Labor.[3] Since 1957, the Bureau of the Census in the U.S. Department of Commerce has conducted the survey.[4] Census staff conduct the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, in some tables of this report, the symbol "(D)" is used to indicate that estimates were withheld to avoid possible disclosure of information about operations of individual companies.

The content of the survey has been expanded and refined over the years in response to an increasing need by policymakers for more detailed information on the nation's R&D effort. For example, questions on energy R&D were added in the early 1970s, following the oil shortage crisis. On the other hand, collection of certain data items has been eliminated in recent years in an attempt to alleviate some of the burden on respondents. For large firms known to perform R&D, a detailed questionnaire (Form RD-1) is used to collect data. To limit the reporting burden on small R&D performers and firms included in the sample for the first time, an abbreviated questionnaire (Form RD-1A), which collects only the most crucial data, is used.

Several changes have been made to the survey since the early 1990s that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, and 1987). In intervening years, a subset of the last sample, a panel, was used. The most recent sample before the 1992 survey was selected and first used for survey year 1987. Original estimates for 1988–91 were based on surveys of approximately 1,700 panel companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics were based on samples selected annually. Also beginning with the 1992 survey, the sample size was increased from approximately 14,000 to approximately 25,000 firms. Annual sampling and the increase in sample size were instituted for several reasons: (1) to account better for births of R&D-performing establishments in the survey universe; (2) to survey more fully and accurately R&D performed by nonmanufacturing firms, especially in the service sector; and (3) to gather more current information about potential R&D performers.

Tables containing the statistics resulting from the 1998 survey are provided in section A. Detailed information about survey methodology, comparability of the statistics, survey definitions, history of the survey, and other technical notes are provided in section B. Survey questionnaires, instructions, and other survey documents are reproduced in section C. Specific questions regarding the survey may be directed to Raymond Wolfe at (703) 292-7789, rwolfe@nsf.gov, or at the following mailing address:

Research and Development Statistics Program
Division of Science Resources Studies
National Science Foundation
4201 Wilson Boulevard, Suite 965
Arlington, VA 22230

[3]See NSF (1956) and NSF (1960).

[4]Data obtained in the earlier BLS surveys are not directly comparable with Census figures because of methodological and other differences.

NOTE TO USERS OF HISTORICAL STATISTICS

For accurate historical statistics for 1988–97, use only the detailed statistical tables in this report and not those published earlier. As a result of a new sample design, statistics for 1988–91 have been revised since their original publication. These revised statistics were first published in *Research and Development in Industry: 1992* (NSF 95-324) and better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. Also, before the 1995 survey cycle, data for previous years were reviewed for consistency with current year responses and were revised systematically during processing. This practice of routinely revising already published statistics has been discontinued. Because of these changes, this report contains the latest revised statistics from the Survey of Industrial Research and Development for 1988–98. These changes and others are discussed in section B.

SECTION A. DETAILED STATISTICAL TABLES

Page

TABLE NOTES 9

TABLES 11

TOTAL FUNDS FOR R&D

A-1. Trends in industrial R&D performance, by source of funds, in current and in constant dollars: 1953-98 11

A-2. Summary data for R&D-performing companies, by detailed industry and by size of company: 1997-98 13

A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1988-98 17

A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1998 20

A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by size of company's total R&D program: 1998 23

A-6. Number of R&D-performing companies, by industry, by size of company, and by size of company's total R&D program: 1998 26

COMPANY AND OTHER (EXCEPT FEDERAL) FUNDS FOR R&D

A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1988-98 29

A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1998 32

A-9. Company and other (except Federal) funds for industrial R&D contracted to outside organizations by R&D-performing companies, by industry and by size of company: 1991, 1993-98 35

A-10. Number of R&D-performing companies contracting company and other (except Federal) industrial R&D to outside organizations and total number of R&D-performing companies, by industry and by size of company: 1998 38

A-11. Company and other (except Federal) funds for R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and by size of company: 1988-98 41

A-12. Company and other (except Federal) industrial R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by country: 1998 45

Table *Page*

Federal Funds for R&D

A-13. Federal funds for industrial R&D performance, by industry and by size of company: 1988-98 46

A-14. Federal funds for industrial R&D performance, by industry and by size of company: 1998 49

A-15. Federal funds for industrial R&D performance, by selected agency and by selected industry for selected years: 1979-98 52

A-16. Total number of R&D-performing companies and number reporting Federal R&D funds, by industry and by size of company: 1998 54

A-17. Industry-administered federally funded R&D centers (FFRDC's)—R&D funds by character of work, full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1988-98 57

R&D Funds by Size of Company and as a Percentage of Net Sales

A-18. Total (company, Federal, and other) funds for industrial R&D performance and number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1998 58

A-19. Concentration of total, Federal, and company and other industrial R&D funds and net sales of R&D-performing companies, ranked by size of R&D program: 1988-98 59

A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997-98 60

A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and by size of company: 1988-98 66

A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and by size of company: 1988-98 69

A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of total R&D program: 1998 72

A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of company-financed R&D program: 1998 75

A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally financed R&D program: 1998 78

Funds for Basic Research, Applied Research, and Development

A-26. Total (company, Federal, and other) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-98 81

A-27. Company and other (except Federal) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-98 83

Table *Page*

A-28. Federal funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953-98 85

A-29. Funds for performance of industrial basic research, applied research, and development, by industry and by source of funds: 1998 87

A-30. Number of companies conducting industrial basic research and total number of R&D-performing companies, by industry and by size of company: 1998 90

A-31. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry and by size of company: 1988-98 and projected 1999 93

A-32. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1988-98 and projected 1999 97

A-33. Federal funds for industrial energy R&D performance, by selected industry: 1988-98 and projected 1999 98

A-34. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1988-98 and projected 1999 99

A-35. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1988-98 and projected 1999 100

Energy R&D

A-36. Federal funds for industrial energy R&D performance, by primary energy source: 1988-98 and projected 1999 101

A-37. Number of companies performing industrial energy R&D and total number of R&D-performing companies, by industry and by size of company: 1998 102

Geographic Distribution and Distribution by Type of R&D Cost

A-38. Total (company, Federal, and other) funds for industrial R&D performance by State for selected years: 1979-98 105

A-39. Total (company, Federal, and other) funds for industrial R&D performance, by State and by source of funds: 1998 107

A-40. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company, for the U. S. and top 10 R&D-performing States: 1998 109

A-41. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by type of cost: 1998 113

Table *Page*

R&D EMPLOYMENT

A-42. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and by size of company: 1988-99 116

A-43. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry, by size of company, and by source of R&D funds: January 1999 119

A-44. R&D funds per scientist or engineer in R&D-performing companies, by industry and by size of company: 1988-98 121

A-45. R&D funds per scientist or engineer in R&D-performing companies, by industry and by size of company: 1998 125

A-46. R&D funds per scientist or engineer in R&D-performing companies ranked by size of R&D program: 1988-98 128

A-47. Domestic employment of R&D-performing companies, by industry and by size of company: 1997-98 129

A-48. R&D scientists and engineers per 1,000 employees in R&D-performing companies, by industry and by size of company: 1988-98 134

A-49. R&D funds per employee in R&D-performing companies, by size of company: 1988-98 137

A-50. Distribution of total employment in R&D-performing companies ranked by size of R&D program: 1988-98 138

Table Notes

These notes pertain to the tables in this section and in section B except as noted in footnotes and other explanatory information noted at the end of specific tables.

Company Size

Companies were categorized by total number of domestic employees. The following are the six size classes used in this report:

- fewer than 500 employees;
- 500 to 999 employees;
- 1,000 to 4,999 employees;
- 5,000 to 9,999 employees;
- 10,000 to 24,999 employees; and
- 25,000 or more employees.

Current and Constant Dollars

Statistics in all tables are reported in current dollars. Constant dollars are also presented in the summary tables (A-1, A-26, A-27, and A-28). Gross domestic product (GDP) implicit price deflators were used to convert current to constant dollars.

Disclosure and Suppression of Statistics

Title 13 of the United States Code prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, the data in some table cells may have been deleted and replaced with "(D)." This occurs when a small number of companies account for a large percentage of the estimate in a particular data cell. Although publication of certain cells may be withheld, the estimates in the cells are always included in totals. The tables most often affected by this rule are those that contain data on Federal support for R&D performance.

Geographic Statistics

The statistics cover only those operations located in the 50 states and the District of Columbia. Statistics on company-sponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies are included in table A-11 but excluded from all other tables.

Imputation

Missing data were imputed for some data items. Therefore, the statistics in some table cells may be accompanied by the notation "(S)," which indicates that the imputation rate—the percentage of the statistic not reported by respondents and consequently estimated—exceeds 50 percent for that item. In such cases, the estimate may be statistically unreliable. See table B-4 for imputation rates for specific items.

Industry Classification

One Standard Industrial Classification (SIC) code was assigned to each company. A single SIC code was assigned to multi-establishment companies based on the code that represented the most dominant aggregated activity for that firm in terms of total payroll. Statistics for the following industry groupings are published in this report (SIC codes are shown in parentheses[5]):

Food, kindred, and tobacco products (20, 21)
Food and kindred products (20)
Tobacco products (21)
Textiles and apparel (22, 23)
Textile mill products (22)
Apparel (23)
Lumber, wood products, and furniture (24, 25)
Lumber and wood products, except furniture (24)
Furniture and fixtures (25)
Paper and allied products (26)
Printing, publishing, and allied industries (27)
Chemicals and allied products (28)
    Industrial chemicals (281–82, 286)
    Drugs and medicines (283)
    Other chemicals (284–85, 287–89)
Petroleum refining and extraction (13, 29)
Rubber products (30)
Leather and leather goods (31)
Stone, clay, and glass products (32)
Primary metals (33)
    Ferrous metals and products (331–32, 3398–99)
    Nonferrous metals and products (333–36)

[5]The 1987 revision of the SIC system was used for the 1998 survey.

Fabricated metal products (34)
Machinery (35)
    Office, computing, and accounting machines (357)
    Other machinery, except electrical (351–56, 358–59)
Electrical equipment (36)
    Radio and TV receiving equipment (365)
    Communication equipment (366)
    Electronic components (367)
    Other electrical equipment (361–64, 369)
Transportation equipment (37)
    Motor vehicles and motor vehicles equipment (371)
    Other transportation equipment (373–75, 379)
    Aircraft and missiles (372, 376)[6]
Professional and scientific instruments (38)
    Scientific and mechanical measuring instruments (381–82)
    Optical, surgical, photographic, and other instruments (384–87)
Miscellaneous manufacturing industries (39)
Other manufacturing industries not elsewhere classified
Transportation and utilities (40–42, 44–49)
    Communications (48)
        Telephone communications (481)
        Other communications (482–84, 489)
    Electric, gas, and sanitary services (49)
    Other transportation and utilities (40–42, 44–47)
Trade (50–59)
Finance, insurance, and real estate (60–65, 67)
Services (701, 72, 73, 75–81, 83, 84, 87, 89)
    Business services (73)
        Computer and data processing services (737)
        Other business services (731–36, 738)
    Health services (80)
        Offices and clinics of medical doctors, hospitals, medical and dental labs (801, 806, 807)
        Other health services (802–5, 808–9)
    Engineering and management services (87)
        Engineering, architectural, and surveying (871)
        Research, development, and testing (873)
        Other engineering and management services (872, 874)
    Other services (701, 72, 75–79, 81, 83, 84, 89)
Other nonmanufacturing industries—agricultural services, forestry, fishing, hunting, and mining (07–12, 14); and construction (15–17)

Percentages

Percentages were calculated on the basis of thousands of dollars and may differ from those calculated using the rounded figures shown.

Reporting Unit

The basic reporting unit was the company, firm, or enterprise that included all establishments under common ownership or control. All R&D expenditures and all scientists and engineers of each company were classified into a single SIC code and size category.

Rounding

Because of rounding, details may not add to totals.

[6]Because of the close similarity of their R&D activities, companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts.

Table A-1. Trends in industrial R&D performance, by source of funds, in current and in constant dollars: 1953–98

Year	Total R&D		Federal		Company[1]	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]					
1953	3,630	17,988	1,430	7,086	2,200	10,902
1954	4,070	19,941	1,750	8,574	2,320	11,367
1955	4,640	22,372	2,180	10,511	2,460	11,861
1956	6,605	30,764	3,328	15,501	3,277	15,263
1957	7,731	34,856	4,335	19,545	3,396	15,311
1958	8,389	36,940	4,759	20,956	3,630	15,984
1959	9,618	41,908	5,635	24,553	3,983	17,355
1960	10,509	45,161	6,081	26,132	4,428	19,029
1961	10,908	46,338	6,240	26,508	4,668	19,830
1962	11,464	48,087	6,434	26,988	5,029	21,095
1963	12,630	52,363	7,270	30,141	5,360	22,222
1964	13,512	55,196	7,720	31,536	5,792	23,660
1965	14,185	56,831	7,740	31,010	6,445	25,821
1966	15,548	60,569	8,332	32,458	7,216	28,111
1967	16,385	61,854	8,365	31,578	8,020	30,276
1968	17,429	63,057	8,560	30,970	8,869	32,088
1969	18,308	63,262	8,451	29,202	9,857	34,060
1970	18,067	59,275	7,779	25,522	10,288	33,753
1971	18,320	57,143	7,666	23,911	10,654	33,231
1972	19,552	58,504	8,017	23,989	11,535	34,515
1973	21,249	60,195	8,145	23,074	13,104	37,122
1974	22,887	59,493	8,220	21,367	14,667	38,126
1975	24,187	57,465	8,605	20,444	15,582	37,021
1976	26,997	60,599	9,561	21,461	17,436	39,138
1977	29,825	62,882	10,485	22,106	19,340	40,776
1978	33,304	65,443	11,189	21,987	22,115	43,456
1979	38,226	69,212	12,518	22,665	25,708	46,547
1980	44,505	73,769	14,029	23,254	30,476	50,515
1981	51,810	78,488	16,382	24,817	35,428	53,671
1982	58,650	83,583	18,545	26,429	40,105	57,154
1983	65,268	89,213	20,680	28,267	44,588	60,946
1984	74,800	98,525	23,396	30,817	51,404	67,708
1985	84,239	107,270	27,196	34,631	57,043	72,638
1986	87,823	108,989	27,891	34,613	59,932	74,376
1987	92,155	110,950	30,752	37,024	61,403	73,926
1988[2]	97,015	112,690	30,343	35,246	66,672	77,445
1989[2]	102,055	113,748	28,554	31,826	73,501	81,923
1990[2]	109,727	117,230	28,125	30,048	81,602	87,182
1991[2, 3]	116,952	120,173	26,372	27,098	90,580	93,074
1992[3]	119,110	119,110	24,722	24,722	94,388	94,388
1993[3]	117,400	114,380	22,809	22,222	94,591	92,158
1994[3]	119,595	113,802	22,463	21,375	97,131	92,426

See explanatory information and SOURCE at end of table.

Table A-1. Trends in industrial R&D performance, by source of funds, in current and in constant dollars: 1953–98

Year	Total R&D		Federal		Company[1]	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]					
1995[3]	132,103	122,875	23,451	21,813	108,652	101,062
1996[3]	144,667	132,080	23,653	21,595	121,015	110,486
1997[3]	157,539	141,202	23,928	21,447	133,611	119,755
1998[3]	169,180	150,115	24,164	21,441	145,016	128,674

[1] The company-funded R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

[2] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years.

NOTE: Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-2. Summary data for R&D-performing companies, by detailed industry and by size of company: 1997–98

Industry and size of company	SIC code	Research and development funds						Domestic net sales		R&D scientists and engineers		Domestic employment	
		Total		Federal		Company				January[3]		March	
		1997	1998	1997	1998	1997	1998	1997	1998	1998	1999	1997	1998
		[In millions of dollars]								[In thousands]			
Distribution by industry:													
All industries		157,539	169,180	23,928	24,164	133,611	145,016	4,573,376	4,683,335	951.5	998.0	20,221	18,289
Manufacturing[1, 2]		121,025	120,401	19,823	18,189	101,202	102,211	3,084,508	3,221,047	682.1	659.0	11,700	11,672
Food and kindred products	20	1,808	1,728	0	0	1,808	1,728	366,014	379,490	11.8	10.7	1,236	1,139
Tobacco products	21	(D)	(D)	0	0	(D)	(D)	(D)	8,595	(D)	(D)	12	15
Textile mill products	22	(D)	257	(D)	0	265	257	33,660	28,416	2.4	1.9	261	225
Apparel	23	(D)	294	(D)	(D)	242	(D)	19,187	21,191	1.7	(S) 1.1	140	136
Lumber and wood products, except furniture	24	60	280	0	5	60	275	11,955	15,846	(D)	2.8	78	96
Furniture and fixtures	25	314	(D)	0	(D)	314	289	29,100	28,142	3.2	2.8	177	183
Paper and allied products	26	(D)	(D)	(D)	(D)	1,491	1,583	135,350	153,629	(S) 11.1	(S) 12.5	554	624
Printing, publishing, and allied industries	27	367	332	0	2	367	330	48,225	47,136	2.4	3.0	321	277
Chemicals and allied products	28	(D)	21,930	(D)	(S) 483	18,693	21,448	353,639	338,214	91.2	93.5	1,043	966
Petroleum refining and extraction	13,29	(D)	1,808	(D)	6	1,651	1,802	282,965	222,246	8.0	8.0	242	303
Rubber products	30	(D)	(D)	(D)	(D)	1,406	1,694	100,785	80,249	12.0	14.0	482	549
Leather and leather products	31	42	26	(D)	0	(D)	26	(D)	4,080	0.2	(S) 0.2	52	21
Stone, clay, and glass products	32	619	727	2	101	617	625	33,440	43,041	(S) 4 .0	4.7	169	219
Primary metals	33	988	(D)	221	(D)	767	722	133,940	120,942	(S) 6.4	6.1	494	470
Fabricated metal products	34	1,818	1,643	129	43	1,689	1,599	110,588	112,944	13.2	13.2	686	730
Machinery	35	19,250	15,172	230	81	19,020	15,091	333,668	297,651	116.6	100.3	1,423	1,280
Electrical equipment	36	24,972	26,175	1,839	1,613	23,134	24,563	403,147	381,259	176.6	(S) 176	1,630	1,415
Transportation	37	31,997	29,296	12,251	10,330	19,746	18,966	517,156	776,193	(S) 144.2	137.8	1,837	2,120
Professional and scientific instruments	38	13,835	(D)	4,520	(D)	9,315	9,987	119,289	128,758	(S) 71.6	(S) 64.5	705	709
Miscellaneous manufacturing industries	39	545	(D)	0	(D)	545	893	31,066	33,027	4.6	6.2	157	195

See explanatory information and SOURCE at end of table.

Table A-2. Summary data for R&D-performing companies, by detailed industry and by size of company: 1997–98

Industry and size of company	SIC code	Research and development funds						Domestic net sales		R&D scientists and engineers		Domestic employment	
		Total		Federal		Company				January[3]		March	
		1997	1998	1997	1998	1997	1998	1997	1998	1998	1999	1997	1998
		[In millions of dollars]								[In thousands]			
Distribution by industry:													
Nonmanufacturing[2]		36,514	48,780	4,105	5,975	32,409	42,805	1,488,869	1,462,288	269.5	338.7	8,521	6,617
Agricultural services	07–09	7	(D)	0	0	7	(D)	1,522	1,413	0.1	(D)	18	15
Mining	10–14	(D)	(D)	(D)	(D)	97	73	28,958	17,612	0.7	(S) 0.6	78	62
Construction	15–17	261	(D)	1	(D)	260	443	14,511	14,684	2.6	8.8	102	103
Railroad transportation	40	(D)	9	(D)	0	5	9	25,465	28,536	0.0	0.0	132	156
Local and suburban transit and interurban highway passenger transportation	41	0	0	0	0	0	0	0	0	0.0	0.0	0	0
Motor freight transportation and warehousing	42	600	(D)	0	0	600	(D)	154,511	30,461	5.2	0.5	2,073	385
Water transportation	44	(D)	4	0	0	(D)	4	(D)	1,755	(D)	(D)	(D)	3
Transportation by air	45	(D)	(S) 75	(D)	0	55	(S) 75	11,579	(S) 12,202	0.2	0.1	136	(D)
Pipelines, except natural gas	46	0	0	0	0	0	0	0	0	0.0	0.0	0	0
Transportation services	47	9	(D)	0	0	9	(D)	(D)	(D)	(D)	(D)	(S) 4	(D)
Communications	48	(D)	(D)	(D)	(D)	1,884	1,768	278,724	204,176	(S) 8.4	(S) 14.1	1,109	801
Electric, gas, and sanitary services	49	(D)	(D)	(D)	(D)	258	182	188,859	184,188	1.1	1.0	525	416
Durable goods	50	(D)	10,422	(D)	33	6,006	10,388	118,830	163,157	36.0	60.7	386	654
Nondurable goods	51	(D)	(D)	(D)	(D)	1,712	893	95,125	30,990	8.6	5.7	232	103
Building materials, hardware, garden supply and mobile home dealers	52	5	9	0	0	5	9	(D)	16,481	0.2	0.2	(D)	86
General merchandise stores	53	0	0	0	0	0	0	0	0	0.0	0.0	0	0
Food stores	54	66	(D)	0	0	66	(D)	30,944	33,493	0.5	(S) 0.3	203	227
Automotive dealers and gasoline service stations	55	0	0	0	0	0	0	0	120	0.0	0.0	0	3

See explanatory information and SOURCE at end of table.

Table A-2. Summary data for R&D-performing companies, by detailed industry and by size of company: 1997–98

Industry and size of company	SIC code	Research and development funds						Domestic net sales		R&D scientists and engineers		Domestic employment	
		Total		Federal		Company				January[3]		March	
		1997	1998	1997	1998	1997	1998	1997	1998	1998	1999	1997	1998
		[In millions of dollars]								[In thousands]			
Distribution by industry:													
Apparel and accessory stores	56	(D)	0	0	0	(D)	0	(D)	0	0.0	0.0	(D)	0
Home furniture, furnishings and equipment stores	57	94	(D)	0	(D)	94	13	(D)	(D)	0.9	(S) 0.6	(D)	(D)
Eating and drinking places	58	139	35	0	0	139	35	58,016	51,724	0.9	0.4	651	654
Miscellaneous retail	59	83	(D)	0	(D)	83	611	9,806	12,971	0.9	0.8	82	85
Depository institutions	60	450	401	0	0	450	401	59,163	81,508	4.7	(S) 4	257	317
Nondepository credit institutions	61	(D)	(D)	0	0	(D)	(D)	6,914	(D)	(D)	(D)	17	(D)
Security and commodity brokers, dealers and exchanges, and services	62	442	699	0	0	442	699	20,713	24,977	3.0	2.6	61	60
Insurance carriers, agents, brokers and services	63,64	210	(D)	0	(D)	210	359	135,451	258,166	4.0	9.2	210	401
Real estate; holding and other investment offices	65,67	(D)	89	(D)	0	325	89	4,438	3,975	(S) 5.7	1.4	39	37
Hotels and personal services	701,72	16	(D)	0	(D)	16	78	11,091	8,721	0.2	0.1	178	100
Business services	73	12,321	16,065	400	603	11,921	15,463	109,755	148,292	113.0	139.4	1,342	1,110
Automotive and miscellaneous repair, services and parking	75,76	258	114	6	0	252	114	5,821	15,290	2.5	(S) 1.1	48	93
Motion pictures	78	99	(D)	0	0	99	(D)	(D)	(D)	1.0	(D)	53	(D)
Amusement and recreation services	79	57	(D)	0	0	57	(D)	903	(D)	0.5	(D)	5	(D)
Health services	80	(D)	1,212	(D)	33	829	1,178	13,454	13,985	6.8	4.9	113	88
Legal services	81	0	0	0	0	0	0	0	0	0.0	0.0	0	0
Social services	83	(D)	(D)	0	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-2. Summary data for R&D-performing companies, by detailed industry and by size of company: 1997–98

Industry and size of company	SIC code	Research and development funds						Domestic net sales		R&D scientists and engineers		Domestic employment	
		Total		Federal		Company				January[3]		March	
		1997	1998	1997	1998	1997	1998	1997	1998	1998	1999	1997	1998
		[In millions of dollars]								[In thousands]			
Distribution by industry:													
Museums, art galleries, and botanical and zoological gardens	84	0	0	0	0	0	0	0	0	0.0	0.0	0	0
Engineering and management services	87	9,879	13,493	3,453	4,112	6,426	9,381	56,486	64,139	60.2	74.6	344	409
Miscellaneous services	89	(D)	698	(D)	663	20	36	(D)	1,463	(S) 0.2	4.9	2	11
Distribution by size of company: [Number of employees]													
Total		157,539	169,180	23,928	24,164	133,611	145,016	4,573,376	4,683,335	951.5	997.7	20,221	18,289
Fewer than 500		24,063	30,175	2,209	3,436	21,854	26,739	383,693	366,082	201.8	230.9	1,975	2,174
500 to 999		4,966	5,495	376	363	4,590	5,132	164,954	170,667	41.3	44.5	790	800
1,000 to 4,999		19,590	21,525	540	620	19,049	20,905	730,532	702,629	137.8	139.8	2,860	2,776
5,000 to 9,999		14,266	14,053	612	536	13,655	13,517	579,895	746,481	100.6	103.3	2,254	2,057
10,000 to 24,999		21,510	24,876	913	955	20,597	23,921	839,149	896,445	116.5	122.0	3,188	2,929
25,000 or more		73,144	73,055	19,277	18,253	53,866	54,802	1,875,152	1,801,030	(S) 353.5	356.8	9,154	7,554

[1] Data for manufacturing industries are shown separately for each two-digit SIC, with the exception of SICs 13 and 29 which are combined.

[2] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. However, estimates for companies in these groups are included with their respective SIC classification for this table. For other tables, they are combined with estimates for companies in "Other manufacturing industries" and "Other nonmanufacturing industries," respectively.

[3] Data recorded in January represent employment figures for the previous year.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
All industries		97,015	102,055	109,727	116,952	119,110	117,400	119,595	132,103	144,667	157,539	169,180
Manufacturing		86,503	88,024	88,934	88,506	90,177	86,569	90,749	100,067	111,864	121,025	120,401
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	1,277	1,386	1,345	1,476	1,566	1,564	1,787	1,711
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	(D)	192	216	(D)	(D)	(D)	(D)	(D)	(D)	348	374
Paper and allied products	26	(D)	879	1,059	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	11,067	12,069	13,291	14,648	15,381	(D)	(D)	17,547	(D)	(D)	21,764
Industrial chemicals	281–82,286	4,172	4,451	5,010	5,390	5,165	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	4,906	(D)	(D)	(D)	7,944	9,146	9,633	10,215	9,773	11,589	12,571
Other chemicals	284–85,287–89	1,989	(D)	(D)	(D)	2,272	(D)	(D)	(D)	2,505	(D)	(D)
Petroleum refining and extraction	13,29	1,997	2,180	2,306	2,498	2,277	2,152	1,950	1,760	1,654	(D)	1,808
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	(D)	538	591	448	468	608	(D)
Primary metals	33	637	686	739	714	522	669	690	593	(D)	988	(D)
Ferrous metals and products	331–32,3398–99	253	(D)	(D)	(D)	(D)	289	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	384	(D)	(D)	(D)	(D)	380	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	881	904	939	974	1,017	1,158	1,111	1,023	(D)	1,798	1,595
Machinery	35	(D)	(D)	14,446	14,775	14,938	8,381	8,110	(D)	13,455	18,499	14,919
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	4,950	4,106	(D)	(D)	12,840	8,905
Other machinery, except electrical	351–56,358–59	2,682	2,729	(D)	(D)	(D)	3,431	4,004	5,041	(D)	5,659	6,014
Electrical equipment	36	14,128	13,318	13,400	13,415	13,360	13,349	15,338	18,751	22,498	24,585	25,990
Radio and TV receiving equipment	365	149	96	114	(D)	(D)	(D)	(D)	(D)	(D)	(D)	155
Communication equipment	366	8,427	7,071	5,928	4,787	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	4,133	4,025	3,914	(D)	3,567	5,311	6,032	(D)	(D)	(D)	(D)
Other electrical equipment	361–64,369	1,419	2,126	3,444	(D)	(D)	(D)	(D)	(D)	(D)	4,909	4,811

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
Transportation equipment	37	34,775	33,859	31,361	27,428	27,494	27,258	28,087	32,441	32,737	31,993	29,279
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	11,718	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	483	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	24,168	22,331	20,635	16,629	17,158	15,056	14,260	16,951	16,224	16,296	14,449
Professional and scientific instruments	38	5,530	5,992	7,055	8,705	9,542	10,119	11,441	11,976	12,149	13,458	(D)
Scientific and mechanical measuring instruments	381–82	1,959	2,366	3,346	(D)	5,156	5,681	6,952	7,146	(D)	8,135	(D)
Optical, surgical, photographic, and other instruments	384–87	3,571	3,626	3,709	(D)	4,386	4,438	4,489	4,831	(D)	5,323	6,085
Other manufacturing industries[1]	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2,798	2,795
Nonmanufacturing[2]		10,513	14,031	20,793	28,446	28,933	30,831	28,846	32,036	32,803	36,514	48,780
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	5,435	4,678	3,013	(D)
Communications	48	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	59	73	58	(D)
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	440	352	(D)	(D)
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	(D)	6,389	(D)	11,336
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Services	701,72,73,75–81,83,84,87,89	NA	NA	NA	NA	NA	NA	NA	17,876	19,022	22,400	29,281
Business services	73	NA	NA	NA	NA	NA	NA	NA	9,293	10,641	11,960	15,222
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	9,059	(D)	11,706	(D)
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	234	(D)	254	(D)
Health services	80	NA	NA	NA	NA	NA	NA	NA	756	(D)	(D)	1,207
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	(D)	(S) 715	(D)	1,096
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	49	111

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	7,662	7,318	9,290	11,835
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	2,933	1,660	2,039	2,025
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	(D)	5,484	(D)	9,169
Other engineering and management services	872, 874	NA	NA	NA	NA	NA	NA	NA	(D)	173	(D)	641
Other services	701,72,75–79, 81,83,84,89	NA	NA	NA	NA	NA	NA	NA	165	(D)	(D)	1,017
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	413	(D)	1,618	3,830
Distribution by size of company: [Number of employees]												
Total		97,015	102,055	109,727	116,952	119,110	117,400	119,595	132,103	144,667	157,539	169,180
Fewer than 500		(S)	7,809	(S)	13,172	13,557	14,620	13,966	16,662	20,249	24,063	30,175
500 to 999		1,669	1,825	2,154	8,000	7,958	3,230	3,608	4,693	4,637	4,966	5,495
1,000 to 4,999		7,622	7,881	8,411	10,453	11,886	13,334	14,617	16,960	18,273	19,590	21,525
5,000 to 9,999		5,245	5,756	6,746	8,049	8,258	9,135	8,912	9,532	11,537	14,266	14,053
10,000 to 24,999		11,506	10,450	12,486	15,770	15,744	15,421	15,972	17,071	20,164	21,510	24,876
25,000 or more		63,694	68,335	71,030	61,508	61,707	61,659	62,519	67,185	69,808	73,144	73,055

[1] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[2] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
All industries		169,180	30,175	5,495	21,525	14,053	24,876	73,055
Manufacturing		120,401	9,404	2,916	15,636	11,398	(D)	(D)
Food, kindred, and tobacco products	20,21	1,711	59	49	229	412	240	722
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	374	46	(D)	(D)	125	72	0
Paper and allied products	26	(D)	149	51	135	98	347	(D)
Chemicals and allied products	28	21,764	2,118	290	4,304	2,737	(D)	(D)
Industrial chemicals	281–82,286	(D)	1,670	194	(D)	834	(D)	(D)
Drugs and medicines	283	12,571	(D)	46	(D)	1,424	4,869	3,275
Other chemicals	284–85,287–89	(D)	(D)	50	(D)	479	(D)	(D)
Petroleum refining and extraction	13,29	1,808	32	7	75	(D)	768	(D)
Rubber products	30	(D)	230	101	411	(D)	264	(D)
Stone, clay, and glass products	32	(D)	12	12	(D)	98	(D)	0
Primary metals	33	(D)	(D)	(D)	150	(D)	(D)	(D)
Ferrous metals and products	331–32,3398–99	(D)	45	2	56	(D)	(D)	(D)
Nonferrous metals and products	333-36	(D)	(D)	(D)	94	(D)	(D)	(D)
Fabricated metal products	34	1,595	246	(D)	(D)	(D)	369	(D)
Machinery	35	14,919	1,276	594	(D)	1,497	4,528	(D)
Office, computing, and accounting machines	357	8,905	426	222	(D)	(D)	2,678	(D)
Other machinery, except electrical	351–56,358–59	6,014	850	372	(D)	(D)	1,849	(D)
Electrical equipment	36	25,990	1,735	896	3,931	(D)	(D)	14,234
Radio and TV receiving equipment	365	155	24	(D)	121	0	0	(D)
Communication equipment	366	(D)	(D)	290	(D)	(D)	0	(D)
Electronic components	367	(D)	(D)	(D)	2,209	(D)	(D)	(D)
Other electrical equipment	361–64,369	4,811	438	(D)	(D)	(D)	520	(D)

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
Transportation equipment	37	29,279	(D)	(D)	(D)	(D)	(D)	26,834
Motor vehicles and motor vehicles equipment	371	(D)	115	(D)	(D)	(D)	615	(D)
Other transportation equipment	373–75,379	(D)	89	(D)	47	(D)	0	(D)
Aircraft and missiles	372,376	14,449	(D)	(D)	(D)	(D)	(D)	13,701
Professional and scientific instruments	38	(D)	1,158	669	(D)	1,476	(D)	(D)
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	6,085	(D)	(D)	(D)	(D)	(D)	(D)
Other manufacturing industries[1]	27,31,39	2,795	2,005	(D)	212	(D)	140	77
Nonmanufacturing		48,780	20,771	2,580	(S) 5889	2,654	(D)	(D)
Transportation and utilities	40–42,44–49	(D)	68	(D)	(D)	(D)	127	(D)
Communications	48	(D)	49	(D)	(D)	0	(D)	(D)
Telephone communications	481	(D)	32	0	0	0	(D)	(D)
Other communications	482–484,489	(D)	18	(D)	(D)	0	0	(D)
Electric, gas, and sanitary services	49	(D)	4	(D)	59	(D)	76	(D)
Other transportation and utilities	40–42,44–47	(D)	15	3	(D)	(D)	(D)	(D)
Trade	50–59	11,336	(D)	(D)	1,241	1,054	(D)	(D)
Finance, insurance, and real estate	60–65,67	(D)	132	27	289	253	(D)	(D)
Services	701,72,73,75–81,83,84,87,89	29,281	14,641	2,235	4,064	(D)	(D)	(D)
Business services	73	15,222	5,068	(D)	3,340	(D)	(D)	(D)
Computer and data processing services	737	(D)	(D)	(D)	3,281	(D)	(D)	(D)
Other business services	731-736,738	(D)	(D)	(D)	59	(D)	(D)	36

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
Health services	80	1,207	(D)	(D)	(D)	(D)	(D)	0
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	1,096	(D)	(D)	(D)	0	(D)	0
Other health services	802–805,808–809	111	78	0	(D)	(D)	0	0
Engineering and management services	87	11,835	8,185	1,082	(D)	(D)	(D)	(D)
Engineering, architectural, and surveying	871	2,025	1,047	(D)	(D)	(D)	(D)	(D)
Research, development, and testing	873	9,169	6,767	(D)	(D)	0	0	(D)
Other engineering and management services	872,874	641	371	161	(D)	(D)	(D)	6
Other services	701,72,75–79,81, 83,84,89	1,017	(D)	(D)	(D)	(D)	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,830	(D)	7	(D)	(D)	(D)	(D)

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by size of total R&D program: 1998

Industry and size of company	SIC code	Total	Size of total R&D program: Less than $200,000	$200,000 to $999,999	$ 1 million to $9.9 million	$ 10 million to $99.9 million	$100 million or more
		[In millions of dollars]					
Distribution by industry:							
All industries		169,180	1,408	4,586	17,334	33,110	112,742
Manufacturing		120,401	769	1,954	6,990	19,059	91,628
Food, kindred, and tobacco products	20,21	1,711	10	54	218	857	571
Textiles and apparel	22,23	(D)	1	27	129	(S) 212	(D)
Lumber, wood products, and furniture	24,25	374	14	22	91	247	0
Paper and allied products	26	(D)	9	(D)	266	494	(D)
Chemicals and allied products	28	21,764	16	131	405	4,566	16,646
Industrial chemicals	281–82,286	(D)	(D)	0	188	2,801	3,925
Drugs and medicines	283	12,571	0	69	38	960	11,504
Other chemicals	284–85,287–89	(D)	(D)	62	179	805	1,217
Petroleum refining and extraction	13,29	1,808	3	29	49	284	1,443
Rubber products	30	(D)	(D)	162	309	652	668
Stone, clay, and glass products	32	(D)	10	(D)	45	239	(D)
Primary metals	33	(D)	3	13	211	323	(D)
Ferrous metals and products	331–32,3398–99	(D)	2	11	129	193	(D)
Nonferrous metals and products	333–36	(D)	1	1	82	130	(D)
Fabricated metal products	34	1,595	(D)	140	343	530	(D)
Machinery	35	14,919	64	232	1,289	2,513	10,821
Office, computing, and accounting machines	357	8,905	0	4	253	874	7,774
Other machinery, except electrical	351–56,358–59	6,014	64	228	1,036	1,639	3,047
Electrical equipment	36	25,990	19	139	1,529	3,548	20,755
Radio and TV receiving equipment	365	155	0	3	31	121	0
Communication equipment	366	(D)	(D)	0	174	1,151	9,846
Electronic components	367	(D)	(D)	111	777	1,464	7,493
Other electrical equipment	361–64,369	4,811	11	26	546	812	3,416

See explanatory information and SOURCE at end of table.

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by size of total R&D program: 1998

Industry and size of company	SIC code	Total	Size of total R&D program: Less than $200,000	$200,000 to $999,999	$ 1 million to $9.9 million	$ 10 million to $99.9 million	$100 million or more
		[In millions of dollars]					
Distribution by industry:							
Transportation equipment	37	29,279	4	31	522	1,245	27,476
Motor vehicles and motor vehicles equipment	371	(D)	3	0	406	833	(D)
Other transportation equipment	373–75,379	(D)	1	31	82	98	(D)
Aircraft and missiles	372,376	14,449	0	0	34	314	14,101
Professional and scientific instruments	38	(D)	(D)	88	823	2,892	10,836
Scientific and mechanical measuring instruments	381–82	(D)	(D)	52	437	1,391	6,679
Optical, surgical, photographic, and other instruments	384–87	6,085	5	36	386	1,501	4,157
Other manufacturing industries	27,31,39	2,795	(D)	864	761	457	(D)
Nonmanufacturing		48,780	639	2,632	10,343	14,051	21,115
Transportation and utilities	40–42,44–49	(D)	(D)	63	169	487	1,978
Communications	48	(D)	(D)	36	(D)	335	1,839
Telephone communications	481	(D)	(D)	19	0	(D)	(D)
Other communications	482–484,489	(D)	0	18	(D)	(D)	(D)
Electric, gas, and sanitary services	49	(D)	2	9	125	70	(D)
Other transportation and utilities	40–42,44–47	(D)	2	17	(D)	(S) 82	(D)
Trade	50–59	11,336	128	458	1,779	1,365	7,606
Finance, insurance, and real estate	60–65,67	(D)	(D)	31	299	(D)	(D)
Services	701,72,73,75–81, 83,84,87,89	29,281	147	905	6,261	11,617	10,351
Business services	73	15,222	85	645	3,393	4,154	6,946
Computer and data processing services	737	(D)	(D)	575	3,236	3,989	6,946
Other business services	731–736,738	(D)	(D)	70	157	(S) 165	0
Health services	80	1,207	(D)	42	37	591	(D)
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	1,096	(D)	34	12	517	(D)
Other health services	802–805,808–809	111	4	8	25	74	0

See explanatory information and SOURCE at end of table.

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by size of total R&D program: 1998

Industry and size of company	SIC code	Total	Size of total R&D program: Less than $200,000	$200,000 to $999,999	$ 1 million to $9.9 million	$ 10 million to $99.9 million	$100 million or more
		[In millions of dollars]					
Distribution by industry:							
Engineering and management services	87	11,835	(D)	191	2,724	6,008	(D)
Engineering, architectural, and surveying	871	2,025	(D)	74	511	833	(D)
Research, development, and testing	873	9,169	2	85	1,919	4,983	2,180
Other engineering and management services	872,874	641	(D)	33	294	192	(D)
Other services	701,72,75–79,81, 83,84,89	1,017	18	27	107	865	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,830	344	1,174	1,835	(D)	(D)
Distribution by size of company: [Number of employees]							
Total		169,180	1,408	4,586	17,334	33,110	112,742
Fewer than 500		30,173	(D)	4,307	13,102	11,274	(D)
500 to 999		5,495	22	173	1,329	3,461	510
1,000 to 4,999		21,525	12	92	2,253	9,411	9,757
5,000 to 9,999		14,053	1	10	365	4,431	9,246
10,000 to 24,999		24,876	(D)	2	195	2,871	(D)
25,000 or more		73,055	1	2	90	1,662	71,300

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-6. Number of R&D-performing companies, by industry, by size of company, and by size of total R&D program: 1998

Industry	SIC code	Total	Size of total R&D program				
			Less than $200,000	$200,000 to $999,999	$ 1 million to $9.9 million	$ 10 million to $99.9 million	$100 million or more
		[Number of companies]					
Distribution by industry:							
All industries		41,923	23,903	10,622	5,908	1,283	207
Manufacturing		20,808	12,896	4,652	2,418	688	154
Food, kindred, and tobacco products	20,21	490	244	138	76	29	3
Textiles and apparel	22,23	138	12	70	45	9	1
Lumber, wood products, and furniture	24,25	271	179	45	34	13	0
Paper and allied products	26	285	105	58	103	17	2
Chemicals and allied products	28	706	175	247	111	139	35
Industrial chemicals	281–82,286	149	0	0	53	85	11
Drugs and medicines	283	151	0	97	5	29	20
Other chemicals	284–85,287–89	406	175	149	53	25	4
Petroleum refining and extraction	13,29	126	49	49	11	10	6
Rubber products	30	768	273	363	104	25	3
Stone, clay, and glass products	32	232	204	1	17	9	2
Primary metals	33	158	48	19	73	16	2
Ferrous metals and products	331–32,3398–99	107	34	15	48	9	1
Nonferrous metals and products	333–36	51	14	4	25	7	1
Fabricated metal products	34	1,136	634	359	125	16	2
Machinery	35	1,883	695	553	505	103	28
Office, computing, and accounting machines	357	136	0	8	80	34	15
Other machinery, except electrical	351–56,358–59	1,747	695	545	425	69	13
Electrical equipment	36	1,124	287	271	399	133	35
Radio and TV receiving equipment	365	15	0	3	9	3	0
Communication equipment	366	103	0	0	52	41	10
Electronic components	367	600	120	196	209	57	18
Other electrical equipment	361–64,369	406	167	72	129	32	7

See explanatory information and SOURCE at end of table.

Table A-6. Number of R&D-performing companies, by industry, by size of company, and by size of total R&D program: 1998

Industry	SIC code	Total	Size of total R&D program				
			Less than $200,000	$200,000 to $999,999	$ 1 million to $9.9 million	$ 10 million to $99.9 million	$100 million or more
		[Number of companies]					
Distribution by industry:							
Transportation equipment	37	542	143	98	249	35	17
Motor vehicles and motor vehicles equipment	371	316	94	0	193	22	6
Other transportation equipment	373–75,379	203	49	98	52	3	2
Aircraft and missiles	372,376	23	0	0	4	10	9
Professional and scientific instruments	38	655	103	191	228	116	17
Scientific and mechanical measuring instruments	381–82	355	35	112	142	60	7
Optical, surgical, photographic, and other instruments	384–87	299	69	78	86	56	10
Other manufacturing industries[1]	27,31,39	12,295	9,745	2,192	339	18	1
Nonmanufacturing		21,115	11,008	5,970	3,490	594	53
Transportation and utilities	40–42,44–49	324	123	143	38	14	6
Communications	48	113	0	99	2	7	5
Telephone communications	481	60	0	50	0	6	4
Other communications	482–484,489	53	0	49	2	1	1
Electric, gas, and sanitary services	49	110	62	18	27	4	0
Other transportation and utilities	40–42,44–47	101	62	26	9	3	1
Trade	50–59	3,752	2,314	931	449	43	14
Finance, insurance, and real estate	60–65,67	392	169	110	98	12	4
Services	701,72,73,75–81, 83,84,87,89	6,170	1,843	1,900	1,880	518	28
Business services	73	3,448	843	1,286	1,143	157	20
Computer and data processing services	737	3,069	638	1,181	1,078	152	20
Other business services	731–736,738	380	204	105	65	5	0
Health services	80	482	279	133	16	54	1
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	365	200	110	4	50	1
Other health services	802–805,808–809	118	80	23	12	4	0

See explanatory information and SOURCE at end of table.

Table A-6. Number of R&D-performing companies, by industry, by size of company, and by size of total R&D program: 1998

Industry	SIC code	Total	Size of total R&D program				
			Less than $200,000	$200,000 to $999,999	$ 1 million to $9.9 million	$ 10 million to $99.9 million	$100 million or more
		[Number of companies]					
Distribution by industry:							
Engineering and management services	87	1,776	431	390	695	253	7
Engineering, architectural, and surveying	871	491	172	152	136	29	2
Research, development, and testing	873	940	99	152	470	216	4
Other engineering and management services	872,874	345	160	86	89	8	1
Other services	701,72,75–79,81, 83,84,89	464	290	91	27	55	0
	07–12,14,15, 161–162,17	10,477	6,558	2,886	1,025	7	1
Distribution by size of company: [Number of employees]							
Total		41,923	23,903	10,622	5,908	1,283	207
Fewer than 500		38,921	23,433	10,119	4,790	577	1
500 to 999		1,158	294	315	414	132	3
1,000 to 4,999		1,244	142	164	570	316	53
5,000 to 9,999		288	18	16	75	139	40
10,000 to 24,999		183	3	5	42	79	54
25,000 or more		128	13	3	17	39	56

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
All industries		66,672	73,501	81,602	90,580	94,388	94,591	97,131	108,652	121,015	133,611	145,016
Manufacturing		59,415	63,199	65,251	67,639	71,025	69,901	73,375	81,236	91,845	101,202	102,211
Food, kindred, and tobacco products	20,21	1,173	1,244	1,248	1,277	1,386	1,345	1,476	1,566	1,564	1,787	1,711
Textiles and apparel	22,23	215	(S)	260	236	261	286	316	381	414	476	543
Lumber, wood products, and furniture	24,25	165	192	216	200	234	196	201	229	634	348	359
Paper and allied products	26	752	879	1,059	1,174	1,182	1,191	1,263	1,404	1,534	1,456	1,583
Chemicals and allied products	28	10,828	11,943	13,168	14,439	15,091	16,658	16,559	17,337	17,520	18,628	21,282
Industrial chemicals	281–82,286	3,939	4,340	4,902	5,225	4,911	5,165	4,780	5,139	5,246	4,970	6,467
Drugs and medicines	283	4,900	5,512	5,917	6,947	7,934	9,132	9,625	10,202	9,769	11,586	12,566
Other chemicals	284–85,287–89	1,989	2,091	2,349	2,267	2,246	2,361	2,154	1,996	2,505	2,072	2,249
Petroleum refining and extraction	13,29	1,975	2,162	2,289	2,487	2,268	2,138	1,939	1,754	1,630	1,612	1,802
Rubber products	30	718	867	1,056	(D)	1,256	1,059	1,432	1,210	1,269	1,372	1,607
Stone, clay, and glass products	32	697	615	538	455	479	529	553	441	463	606	592
Primary metals	33	620	666	717	706	514	646	672	580	637	767	720
Ferrous metals and products	331–32,3398–99	252	244	231	225	221	272	241	217	214	414	405
Nonferrous metals and products	333–36	368	422	486	481	293	374	431	363	422	353	315
Fabricated metal products	34	718	726	736	748	723	936	868	937	1,322	1,669	1,551
Machinery	35	11,929	13,342	13,575	13,720	13,903	8,295	8,011	9,676	13,338	18,393	14,846
Office, computing, and accounting machines	357	9,347	10,725	10,988	10,419	10,614	4,917	4,078	4,699	8,132	12,787	8,890
Other machinery, except electrical	351–56,358–59	2,582	2,618	2,587	3,301	3,289	3,378	3,933	4,976	5,206	5,606	5,956
Electrical equipment	36	9,975	9,575	9,267	8,865	9,516	11,682	13,537	17,060	20,356	22,747	24,378
Radio and TV receiving equipment	365	149	96	114	(D)	93	87	64	114	140	152	155
Communication equipment	366	4,798	4,159	3,584	(S)	3,381	3,954	4,939	3,845	4,359	7,377	10,173
Electronic components	367	3,684	3,655	3,496	3,177	3,320	5,105	5,870	9,628	12,497	10,786	9,776
Other electrical equipment	361–64,369	1,345	1,664	2,073	(D)	2,722	2,537	2,664	3,473	3,360	4,432	4,273
Transportation equipment	37	13,910	14,596	14,264	14,858	16,292	16,640	17,695	19,311	20,535	19,742	18,948
Motor vehicles and motor vehicles equipment	371	7,783	8,756	8,594	9,063	9,132	10,659	11,950	13,590	14,528	13,758	13,502
Other transportation equipment	373–75,379	361	337	283	262	289	297	279	232	298	307	339
Aircraft and missiles	372,376	5,766	5,503	5,387	5,533	6,871	5,684	5,466	5,489	5,710	5,677	5,108

See explanatory information and SOURCE at end of table.

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
Professional and scientific instruments	38	5,339	5,729	6,318	6,840	7,321	7,542	8,058	8,516	8,207	8,958	9,625
Scientific and mechanical measuring instruments	381–82	1,863	2,205	2,696	3,017	3,013	3,196	3,687	3,787	3,283	3,719	3,614
Optical, surgical, photographic, and other instruments	384–87	3,476	3,524	3,621	3,823	4,308	4,346	4,371	4,729	4,924	5,240	6,011
Other manufacturing industries[1]	27,31,39	401	438	541	(D)	599	758	796	835	2,423	2,642	2,664
Nonmanufacturing[2]		7,257	10,302	16,351	22,941	23,363	24,690	23,756	27,415	29,170	32,409	42,805
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	5,183	4,492	2,812	2,219
Communications	48	NA	NA	NA	NA	NA	NA	NA	4,756	3,970	1,884	1,768
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	4,697	3,897	1,826	1,665
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	59	73	58	103
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	347	311	258	182
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	80	211	670	269
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	7,514	6,338	7,961	11,273
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	710	1,280	1,500	1,623
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	NA	NA	NA	NA	13,606	15,904	18,594	24,392
Business services	73	NA	NA	NA	NA	NA	NA	NA	8,681	10,280	11,560	14,682
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	8,545	10,025	11,318	14,297
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	136	255	242	385
Health services	80	NA	NA	NA	NA	NA	NA	NA	753	735	679	1,173
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	737	713	632	1,074
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	16	23	48	99
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	4,011	4,572	5,909	8,182
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	1,050	667	781	835
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	2,829	3,776	4,782	6,780
Other engineering and management services	872, 874	NA	NA	NA	NA	NA	NA	NA	132	129	347	567

See explanatory information and SOURCE at end of table.

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	160	317	446	354
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	402	1,156	1,541	3,298
Distribution by size of company: [Number of employees]												
Total		66,672	73,501	81,602	90,580	94,388	94,591	97,131	108,652	121,015	133,611	145,016
Fewer than 500		(S)	(S)	(S)	11,285	11,532	13,006	12,802	14,684	17,948	21,854	26,739
500 to 999		1,748	1,934	2,144	7,819	7,807	3,048	3,426	4,468	4,418	4,590	5,132
1,000 to 4,999		6,820	7,546	8,363	9,403	10,865	12,219	13,533	16,162	17,761	19,049	20,905
5,000 to 9,999		4,075	4,509	4,997	7,233	7,495	8,371	8,087	9,289	11,068	13,655	13,517
10,000 to 24,999		10,512	11,631	12,890	12,397	12,328	12,606	13,625	15,125	19,133	20,597	23,921
25,000 or more		36,785	40,703	45,106	42,443	44,361	45,340	45,658	48,924	50,686	53,866	54,802

[1] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[2] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTE: The R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In millions of dollars]					
All industries		145,016	26,736	5,132	20,905	13,517	23,921	54,802
Manufacturing		102,211	8,914	2,808	15,432	10,878	17,993	46,185
Food, kindred, and tobacco products	20,21	1,711	59	49	229	412	240	722
Textiles and apparel	22,23	543	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	359	42	20	100	125	72	0
Paper and allied products	26	1,583	149	51	135	98	347	804
Chemicals and allied products	28	21,282	1,995	290	4,267	2,728	6,766	5,236
Industrial chemicals	281–82,286	6,467	1,548	194	1,061	825	(D)	(D)
Drugs and medicines	283	12,566	307	46	2,646	1,424	4,869	3,275
Other chemicals	284–85,287–89	2,249	141	50	560	479	(D)	(D)
Petroleum refining and extraction	13,29	1,802	32	7	75	50	765	874
Rubber products	30	1,607	230	101	411	(D)	264	(D)
Stone, clay, and glass products	32	592	12	12	69	98	401	0
Primary metals	33	720	50	27	150	143	(S) 187	162
Ferrous metals and products	331–32,3398–99	405	45	2	56	(D)	(D)	(D)
Nonferrous metals and products	333–36	315	6	26	94	(D)	(D)	(D)
Fabricated metal products	34	1,551	244	86	144	159	369	551
Machinery	35	14,846	1,266	594	(D)	1,493	4,509	(D)
Office, computing, and accounting machines	357	8,890	424	222	(D)	805	2,678	(D)
Other machinery, except electrical	351–56,358–59	5,956	842	372	(D)	688	1,830	(D)
Electrical equipment	36	24,378	1,548	888	3,869	2,899	2,273	12,901
Radio and TV receiving equipment	365	155	24	(D)	121	0	0	(D)
Communication equipment	366	10,173	382	290	981	804	0	7,716
Electronic components	367	9,776	842	(D)	2,175	1,829	1,752	(D)
Other electrical equipment	361–64,369	4,273	299	(D)	592	266	520	(D)

See explanatory information and SOURCE at end of table.

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In millions of dollars]					
Transportation equipment	37	18,948	(D)	(D)	503	631	(D)	16,848
Motor vehicles and motor vehicles equipment	371	13,502	115	(D)	360	(D)	615	(D)
Other transportation equipment	373–75,379	339	89	(D)	47	(D)	0	(D)
Aircraft and missiles	372,376	5,108	(D)	(D)	96	189	(D)	4,688
Professional and scientific instruments	38	9,625	1,145	596	2,155	1,463	808	3,458
Scientific and mechanical measuring instruments	381–82	3,614	656	438	660	579	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	6,011	489	158	1,495	883	(D)	(D)
Other manufacturing industries[1]	27,31,39	2,664	1,877	30	212	329	140	77
Nonmanufacturing		42,805	17,825	2,324	5,472	2,638	5,928	8,617
Transportation and utilities	40–42,44–49	2,219	68	13	132	36	127	1,844
Communications	48	1,768	49	(D)	(D)	0	(D)	(D)
Telephone communications	481	1,665	32	0	0	0	(D)	(D)
Other communications	482–484,489	103	18	(D)	(D)	0	0	(D)
Electric, gas, and sanitary services	49	182	4	(D)	59	(D)	76	(D)
Other transportation and utilities	40–42,44–47	269	15	3	(D)	(D)	(D)	223
Trade	50–59	11,273	2,617	260	1,241	1,054	(D)	(D)
Finance, insurance, and real estate	60–65,67	1,623	132	27	289	253	(D)	(D)
Services	701,72,73,75–81, 83,84,87,89	24,392	12,225	2,018	3,658	1,240	3,922	1,330
Business services	73	14,682	4,667	1,100	3,272	(D)	(D)	(D)
Computer and data processing services	737	14,297	4,510	1,078	3,213	(D)	(D)	(D)
Other business services	731–736,738	385	157	22	(S) 59	(D)	(D)	36

See explanatory information and SOURCE at end of table.

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In millions of dollars]					
Health services	80	1,173	615	(D)	(D)	(D)	(D)	0
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	1,074	549	(D)	(D)	0	(D)	0
Other health services	802–805,808–809	99	66	0	(D)	(D)	0	0
Engineering and management services	87	8,182	6,865	905	241	(D)	(D)	(D)
Engineering, architectural, and surveying	871	835	540	83	(D)	(D)	(D)	(D)
Research, development, and testing	873	6,780	6,026	661	(D)	0	0	(D)
Other engineering and management services	872,874	567	299	161	67	(D)	(D)	6
Other services	701,72,75–79,81, 83,84,89	354	79	(D)	(D)	(D)	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,298	2,783	7	153	56	(D)	(D)

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTE: The R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-9. Company and other (except Federal) funds for industrial R&D contracted to outside organizations by R&D-performing companies, by industry and by size of company: 1991, 1993–98

Industry and size of company	SIC code	1991[3]	1993	1994	1995	1996	1997	1998
		[In millions of dollars]						
Distribution by industry:								
All industries		3,319	3,462	3,618	5,177	5,833	6,000	6,710
Manufacturing		2,577	2,339	2,450	3,812	4,293	4,143	4,641
Food, kindred, and tobacco products	20,21	44	43	43	41	50	53	55
Textiles and apparel	22,23	(D)	2	4	1	3	9	0
Lumber, wood products, and furniture	24,25	(D)	8	8	7	(D)	(D)	(D)
Paper and allied products	26	12	5	4	14	4	(S) 4	5
Chemicals and allied products	28	1,087	1,117	1,239	2,386	2,537	2,505	2,932
Industrial chemicals	281–82,286	95	43	38	259	229	(D)	42
Drugs and medicines	283	771	942	1,055	1,751	2,098	2,259	2,616
Other chemicals	284–85,287–89	221	132	146	376	210	(D)	274
Petroleum refining and extraction	13,29	35	56	52	32	24	(D)	34
Rubber products	30	18	65	22	32	36	32	40
Stone, clay, and glass products	32	(D)	2	6	2	9	(D)	(D)
Primary metals	33	24	12	15	13	16	9	81
Ferrous metals and products	331–32,3398–99	4	8	10	5	4	4	79
Nonferrous metals and products	333–36	20	4	5	8	11	5	1
Fabricated metal products	34	3	21	21	10	28	10	13
Machinery	35	256	125	200	201	330	363	223
Office, computing, and accounting machines	357	229	52	113	84	220	192	66
Other machinery, except electrical	351–56,358–59	27	73	87	117	110	171	157
Electrical equipment	36	114	143	116	194	178	186	310
Radio and TV receiving equipment	365	0	(D)	1	2	(D)	(D)	(D)
Communication equipment	366	63	20	38	40	(D)	67	(D)
Electronic components	367	38	24	24	75	88	44	62
Other electrical equipment	361–64,369	13	(D)	54	77	54	(D)	(D)
Transportation equipment	37	687	(D)	591	(D)	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(S)	(D)	(D)	5	(D)	(D)	(D)
Aircraft and missiles	372,376	(D)	52	83	72	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-9. Company and other (except Federal) funds for industrial R&D contracted to outside organizations by R&D-performing companies, by industry and by size of company: 1991, 1993–98

Industry and size of company	SIC code	1991[3]	1993	1994	1995	1996	1997	1998
		[In millions of dollars]						
Distribution by industry:								
Professional and scientific instruments	38	(D)	189	57	114	55	83	46
Scientific and mechanical measuring instruments	381–82	4	25	16	45	8	24	14
Optical, surgical, photographic, and other instruments	384–87	(D)	163	40	68	47	60	32
Other manufacturing industries[1]	27,31,39	2	(D)	72	(D)	26	122	51
Nonmanufacturing[2]		742	1,123	1,168	1,365	1,540	1,857	2,069
Transportation and Utilities	40–42,44–49	NA	NA	NA	509	466	405	348
Communications	48	NA	NA	NA	264	230	(D)	(D)
Telephone communications	481	NA	NA	NA	(D)	(D)	(D)	(D)
Other communications	482–484,489	NA	NA	NA	(D)	(D)	0	0
Electric, gas, and sanitary services	49	NA	NA	NA	219	229	207	165
Other transportation and utilities	40–42,44–47	NA	NA	NA	27	6	(D)	(D)
Trade	50–59	NA	NA	NA	346	217	353	359
Finance, insurance, and real estate	60–65,67	NA	NA	NA	92	(S) 153	184	302
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	416	694	905	1,047
Business services	73	NA	NA	NA	151	226	235	251
Computer and data processing services	737	NA	NA	NA	139	224	233	250
Other business services	73–736,738	NA	NA	NA	12	2	2	1
Health services	80	NA	NA	NA	38	(S) 66	(D)	(D)
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	NA	NA	NA	(D)	(D)	(D)	(D)
Other health services	802–805,808–809	NA	NA	NA	(D)	(D)	(D)	17
Engineering and management services	87	NA	NA	NA	200	396	483	620
Engineering, architectural, and surveying	871	NA	NA	NA	13	22	11	6
Research, development, and testing	873	NA	NA	NA	187	373	472	554
Other engineering and management services	872,874	NA	NA	NA	0	0	0	60

See explanatory information and SOURCE at end of table.

Table A-9. Company and other (except Federal) funds for industrial R&D contracted to outside organizations by R&D-performing companies, by industry and by size of company: 1991, 1993–98

Industry and size of company	SIC code	1991[3]	1993	1994	1995	1996	1997	1998
		[In millions of dollars]						
Distribution by industry:								
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	27	6	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	NA	NA	NA	1	10	10	14
Distribution by size of company: [Number of employees]								
Total		3,319	3,462	3,618	5,177	5,833	6,000	6,710
Fewer than 500		(S)	751	724	674	699	799	1,005
500 to 999		35	107	126	174	161	220	138
1,000 to 4,999		275	310	397	632	632	984	1,214
5,000 to 9,999		218	327	408	393	761	992	589
10,000 to 24,999		881	468	391	786	1,458	1,031	1,318
25,000 or more		1,762	1,497	1,574	2,518	2,121	1,974	2,446

[1] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[2] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[3] As a result of a new sample design, statistics for 1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTE: The R&D in this table is the industrial R&D performed outside company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table is company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-10. Number of R&D-performing companies contracting company and other (except Federal) industrial R&D to outside organizations and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
All industries		41,923	3,053	38,921	2,557	1,158	169	1,244	191	288	65	183	44	128	27
Manufacturing		20,808	1,748	18,731	1,422	731	98	918	138	227	45	132	27	71	19
Food, kindred, and tobacco products	20,21	490	29	322	0	53	9	70	11	20	5	13	3	12	2
Textiles and apparel	22,23	138	9	51	1	39	0	31	7	7	1	7	0	2	0
Lumber, wood products, and furniture	24,25	271	6	216	2	13	0	27	2	11	2	5	0	0	0
Paper and allied products	26	285	13	201	0	20	0	39	9	11	4	8	0	6	0
Chemicals and allied products	28	706	178	506	128	73	12	81	21	27	7	14	6	5	4
Industrial chemicals	281–82,286	149	10	52	2	52	0	27	5	11	1	6	1	1	1
Drugs and medicines	283	151	71	109	52	3	1	25	10	5	1	6	5	3	2
Other chemicals	284–85,287–89	406	97	345	74	18	11	29	6	11	5	2	0	1	1
Petroleum refining and extraction	13,29	126	53	98	49	2	0	5	0	8	1	9	3	3	0
Rubber products	30	768	84	613	62	69	11	68	9	11	0	4	1	3	1
Stone, clay, and glass products	32	232	10	198	0	4	1	13	1	12	7	5	1	0	0
Primary metals	33	158	47	61	24	22	1	50	14	16	5	6	2	3	1
Ferrous metals and products	331–32,3398–99	107	43	54	24	2	0	33	12	13	5	4	1	1	1
Nonferrous metals and products	333–36	51	4	7	0	20	1	17	2	3	0	2	1	2	0
Fabricated metal products	34	1,136	183	973	153	80	9	58	16	12	2	9	2	4	1
Machinery	35	1,883	174	1,563	141	147	15	126	11	26	2	18	4	3	1
Office, computing, and accounting machines	357	136	10	86	6	22	1	16	2	6	0	5	1	1	0
Other machinery, except electrical	351–56,358–59	1,747	164	1,477	135	125	14	110	9	20	2	13	3	2	1
Electrical equipment	36	1,124	112	858	80	96	6	125	18	22	4	14	2	9	2
Radio and TV receiving equipment	365	15	1	11	0	1	1	3	0	0	0	0	0	0	0
Communication equipment	366	103	9	65	2	12	2	17	4	5	0	0	0	4	1
Electronic components	367	600	89	467	78	52	2	64	8	10	1	5	0	1	0
Other electrical equipment	361–64,369	406	13	314	0	31	1	41	6	7	3	9	2	4	1

See explanatory information and SOURCE at end of table.

Table A-10. Number of R&D-performing companies contracting company and other (except Federal) industrial R&D to outside organizations and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
Transportation equipment	37	542	59	387	47	3	0	109	2	21	3	7	2	14	5
Motor vehicles and motor vehicles equipment	371	316	52	190	47	1	0	99	0	14	1	6	2	5	2
Other transportation equipment	373–75,379	203	1	195	0	1	0	4	1	1	0	0	0	2	0
Aircraft and missiles	372,376	23	6	2	0	1	0	6	1	6	2	1	0	7	3
Professional and scientific instruments	38	655	65	498	40	63	9	72	14	13	2	5	0	4	0
Scientific and mechanical measuring instruments	381–82	355	43	286	33	33	5	27	4	4	1	3	0	2	0
Optical, surgical, photographic, and other instruments	384–87	299	22	211	7	30	4	45	10	9	1	2	0	2	0
Other manufacturing industries[1]	27,31,39	12,295	725	12,186	695	47	23	42	4	9	0	7	1	3	2
Nonmanufacturing		21,115	1,305	20,191	1,135	428	71	327	53	61	20	52	17	57	8
Transportation and utilities	40–42,44-49	324	102	176	0	60	49	41	24	18	14	13	10	16	5
Communications	48	113	4	100	0	1	0	2	0	0	0	1	1	9	3
Telephone communications	481	60	4	51	0	0	0	0	0	0	0	1	1	8	3
Other communications	482–484,489	53	0	49	0	1	0	2	0	0	0	0	0	1	0
Electric, gas, and sanitary services	49	110	90	4	0	54	49	27	22	16	12	9	6	1	1
Other transportation and utilities	40–42,44-47	101	8	72	0	6	0	12	2	2	2	3	3	6	1
Trade	50–59	3,752	282	3,368	270	222	3	127	6	8	1	6	1	21	1
Finance, insurance, and real estate	60–65,67	392	60	332	50	7	1	31	4	6	2	9	2	8	1
Services	701,72,73,75–81, 83,84,87,89	6,170	616	5,886	575	117	17	113	16	20	3	23	4	11	1
Business services	73	3,448	381	3,279	358	76	5	65	14	13	3	8	1	8	1
Computer and data processing services	737	3,069	377	2,924	357	72	4	53	12	10	2	5	1	4	1
Other business services	731–736,738	380	5	354	1	4	1	11	1	3	1	3	0	4	0

See explanatory information and SOURCE at end of table.

Table A-10. Number of R&D-performing companies contracting company and other (except Federal) industrial R&D to outside organizations and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
Health services	80	482	9	475	7	1	0	3	1	1	0	2	1	0	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	365	2	361	1	1	0	1	0	0	0	2	1	0	0
Other health services	802–805,808–809	118	7	115	6	0	0	2	1	1	0	0	0	0	0
Engineering and management services	87	1,776	222	1,704	209	36	11	26	1	4	0	4	1	2	0
Engineering, architectural, and surveying	871	491	9	453	6	13	2	20	0	2	0	3	1	0	0
Research, development, and testing	873	940	175	930	172	8	3	1	0	0	0	0	0	1	0
Other engineering and management services	872,874	345	38	321	31	14	6	5	1	2	0	1	0	1	0
Other services	701,72,75–79,81, 83,84,89	464	3	428	1	4	1	20	0	2	0	9	1	1	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	10,477	245	10,429	240	22	1	15	4	9	0	1	0	1	0

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-11. Company and other (except Federal) funds for R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and by size of company: 1988–98

Industry	SIC code	1988[4]	1989[4]	1990[4]	1991[4, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[5]	1997[5]	1998[5]
		[In millions of dollars]										
Distribution by industry:												
All industries		6,208	6,706	7,952	9,147	10,063	9,565	9,395	13,052	14,050	13,107	16,008
Manufacturing		6,062	6,450	7,537	8,369	9,228	7,795	7,895	10,846	11,540	11,743	12,768
Food, kindred, and tobacco products	20,21	27	42	41	66	88	112	117	142	155	148	190
Textiles and apparel	22,23	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Lumber, wood products, and furniture	24,25	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Paper and allied products	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	34	52
Chemicals and allied products	28	1,548	1,532	2,007	2,401	2,676	2,833	2,456	4,194	3,801	3,867	4,186
Industrial chemicals[1]	281–82,286	855	609	720	1,009	1,045	1,318	917	1,632	1,720	863	922
Drugs and medicines	283	693	923	1,287	1,392	1,631	1,516	1,539	2,562	2,082	2,413	2,608
Other chemicals	284–85,287–89	TA	TA	TA	TA	TA	TA	TA	TA	TA	591	656
Petroleum refining and extraction	13,29	59	47	76	107	119	104	111	76	78	91	75
Rubber products	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	197	261
Stone, clay, and glass products	32	(D)	(D)	59	38	41	38	27	31	32	17	40
Primary metals	33	23	24	26	20	18	12	15	26	29	20	26
Ferrous metals and products	331–32,3398–99	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	13
Nonferrous metals and products	333–36	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	13
Fabricated metal products	34	(D)	(D)	95	86	109	119	125	111	133	132	140
Machinery	35	1,326	1,432	1,451	1,476	1,439	340	308	501	1,404	1,819	1,324
Office, computing, and accounting machines	357	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,196	608
Other machinery, except electrical	351–56,358–59	NA	NA	NA	NA	NA	NA	NA	NA	NA	623	716
Electrical equipment	36	591	573	770	651	568	525	495	872	959	981	1,152
Radio and TV receiving equipment	365	(D)	(D)	(D)	2	(D)	(D)	3	(D)	(D)	0	(D)
Communication equipment	366	290	199	174	151	(D)	(D)	110	(D)	(D)	399	455
Electronic components	367	246	160	185	164	168	322	276	437	470	362	404
Other electrical equipment	361–64,369	(D)	(D)	(D)	334	217	113	107	291	260	220	(D)

See explanatory information and SOURCE at end of table.

Table A-11. Company and other (except Federal) funds for R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and by size of company: 1988–98

Industry	SIC code	1988[4]	1989[4]	1990[4]	1991[4, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[5]	1997[5]	1998[5]
		[In millions of dollars]										
Distribution by industry:												
Transportation equipment	37	1,750	1,916	2,055	2,402	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment[1]	371	1,477	1,501	1,901	2,166	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	TA	TA	TA	TA	TA	TA	TA	TA	TA	19	(D)
Aircraft and missiles	372,376	273	415	154	236	493	(D)	251	284	(D)	(D)	(D)
Professional and scientific instruments	38	404	474	611	656	685	751	900	988	960	1,201	1,248
Scientific and mechanical measuring instruments	381–82	NA	NA	NA	NA	NA	NA	NA	NA	NA	200	203
Optical, surgical, photographic, and other instruments	384–87	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,001	1,045
Other manufacturing industries[2]	27,31,39	178	269	344	467	524	(D)	572	(D)	(D)	86	36
Nonmanufacturing[3]		146	256	415	778	835	1,770	1,500	2,206	2,510	1,364	3,240
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	NA	NA	6	(D)
Communications	48	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	NA	NA	408	1,350
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	(D)

See explanatory information and SOURCE at end of table.

Table A-11. Company and other (except Federal) funds for R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and by size of company: 1988–98

Industry	SIC code	1988[4]	1989[4]	1990[4]	1991[4, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[5]	1997[5]	1998[5]
		[In millions of dollars]										
Distribution by industry:												
Services	701,72,73,75–81,83,84,87,89	NA	NA	NA	NA	NA	NA	NA	NA	NA	914	1,780
Business services	73	NA	NA	NA	NA	NA	NA	NA	NA	NA	786	1,462
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Health services	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	NA	NA	89	293
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	NA	NA	10	13
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	NA	NA	75	279
Other engineering and management services	872, 874	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	0
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	NA	NA	(D)	(D)
Other nonmanufacturing industries[2]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	NA	NA	36	87

See explanatory information and SOURCE at end of table.

Table A-11. Company and other (except Federal) funds for R&D performed outside the United States by U.S. R&D-performing domestic companies and their foreign subsidiaries, by industry and by size of company: 1988–98

Industry	SIC code	1988[4]	1989[4]	1990[4]	1991[4, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[5]	1997[5]	1998[5]
		[In millions of dollars]										
Distribution by size of company: [Number of employees]												
Total		6,208	6,706	7,952	9,147	10,063	9,565	9,395	13,052	14,050	13,107	16,008
Fewer than 500		NA	NA	NA	NA	NA	NA	NA	NA	NA	324	667
500 to 999		NA	NA	NA	NA	NA	NA	NA	NA	NA	205	172
1,000 to 4,999		NA	NA	NA	NA	NA	NA	NA	NA	NA	2,057	2,080
5,000 to 9,999		NA	NA	NA	NA	NA	NA	NA	NA	NA	1,352	1,009
10,000 to 24,999		NA	NA	NA	NA	NA	NA	NA	NA	NA	2,632	3,381
25,000 or more		NA	NA	NA	NA	NA	NA	NA	NA	NA	6,537	8,700

[1] Until 1997, the values for Industrial chemicals (SIC 281–282,286) and Other chemicals (SIC 284–285,287–289) were combined and displayed as Industrial and other chemicals (SIC 281–282, 284–289). Also, the value for Motor vehicles and motor vehicles equipment (SIC 371) and Other transportation equipment (SIC 373–375,379) were combined and displayed as Motor vehicles and other transportation (SIC 371,373–375,379).

[2] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[3] Unitl 1997, data were not broken down below this level of detail for nonmanufacturing industries.

[4] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries

[5] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
TA = Total not available separately.
NA = Not available.

NOTES: Data are reported in current U.S. dollars.

The R&D in this table is the industrial R&D performed outside the U.S. by a company's foreign subsidiaries or other foreign organizations funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofofit organizations, and State governments. Excluded from this table is company-funded R&D performed in the U.S. (e.g., R&D performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-12. Company and other (except Federal) industrial R&D performed outside the United States by U. S. R&D-performing domestic companies and their foreign subsidiaries, by country: 1998

Location of foreign subsidiary	Number of companies	Total [In millions of dollars]
Distribution by country:		
Total	1,980[1]	16,008
Canada	140	545
Germany	132	2,810
France	117	908
Japan	82	967
United Kingdom	190	1,429
Puerto Rico	14	(S) 94
Other countries	229	2,273
Undistributed[2]	1,577	6,982
Distribution by companies with R&D expenditures in one or more countries:		
Total	1,980	16,008
One country	101	214
Two countries	27	188
Three countries	6	17
Four countries	1	(D)
Five countries	2	(D)
More than five countries	0	0
Undistributed[2, 3]	1,843	15,563

[1] Detail does not add to total because categories are not mutually exclusive.

[2] Includes data reported on Form RD-1 that were not allocated to a specific country, and total foreign R&D reported on Form RD-1A. Form RD-1A does not collect data by country.

[3] To avoid double counting, if a company reported ANY foreign R&D expenditures that were not allocated to specific countries, all foreign R&D expenditures, including those that may have been allocated to specific countries, are included in this cell. For example, if a company allocated a portion of its foreign R&D expenditures to Canada and left the remainder unallocated, ALL of its foreign R&D is included in this cell because it could not be determined during processing how many other countries were sites of R&D performance.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTES: Data are reported in current U.S. dollars.

The R&D in this table is the industrial R&D performed outside the U.S. by a company's foreign subsidiaries or other foreign organizations funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofofit organizations, and State governments. Excluded from this table is company-funded R&D performed in the U.S. (e.g., R&D performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-13. Federal funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
All industries		30,343	28,554	28,125	26,372	24,722	22,809	22,463	23,451	23,653	23,928	24,164
Manufacturing		27,088	24,826	23,683	20,867	19,152	16,669	17,373	18,831	20,020	19,823	18,189
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	0	0	0	0	0	0	0	0
Textiles and apparel	22,23	(D)	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	(D)	0	0	(D)	(D)	(D)	(D)	(D)	(D)	0	14
Paper and allied products	26	(D)	0	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	238	126	123	209	(S)	(D)	(D)	(S) 210	(D)	(D)	(S) 483
Industrial chemicals	281–82,286	232	111	109	165	(S)	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	6	(D)	(D)	(D)	(S)	15	8	14	3	(S) 3	5
Other chemicals	284–85,287–89	0	(D)	(D)	(D)	(S)	(D)	(D)	(D)	0	(D)	(D)
Petroleum refining and extraction	13,29	22	(S)	(S)	11	9	14	10	6	24	(D)	6
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	(D)	9	38	6	5	2	(D)
Primary metals	33	17	22	(D)	8	(S)	23	17	13	(D)	221	(D)
Ferrous metals and products	331–32,3398–99	1	(D)	(D)	1	(D)	17	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	16	(D)	(D)	7	(D)	6	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	163	178	203	226	294	222	243	86	(D)	129	43
Machinery	35	(D)	(D)	871	1,055	1,035	86	99	(D)	117	106	73
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	33	28	(D)	(D)	53	15
Other machinery, except electrical	351–56,358–59	101	112	(D)	(D)	(D)	53	71	64	(D)	53	58
Electrical equipment	36	4,153	3,743	4,133	4,550	3,844	1,667	1,801	1,690	2,143	1,839	1,613
Radio and TV receiving equipment	365	0	0	0	0	(D)	(D)	(D)	(D)	(D)	(D)	0
Communication equipment	366	3,630	2,911	2,344	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	449	369	418	(D)	247	206	162	(D)	(D)	(D)	(D)
Other electrical equipment	361–64,369	74	463	1,371	(D)	(D)	(D)	(D)	(D)	(D)	477	538
Transportation equipment	37	20,865	19,262	17,097	12,570	11,202	10,617	10,392	13,130	12,202	12,251	10,330
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	18,402	16,828	15,248	11,096	(S)	9,372	8,794	11,462	10,515	10,619	9,341

See explanatory information and SOURCE at end of table.

Table A-13. Federal funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
Professional and scientific instruments	38	191	263	737	1,865	2,221	2,577	3,384	(S) 3,460	3,942	4,499	(D)
Scientific and mechanical measuring instruments	381–82	(S)	(S)	(S)	(D)	2,143	2,484	3,266	(S) 3,358	(D)	4,416	(D)
Optical, surgical, photographic, and other instruments	384–87	95	101	87	(D)	78	92	118	102	(D)	84	74
Other manufacturing industries[1]	27,31,39	(D)	(D)	(D)	(D)	61	(D)	(D)	(D)	(D)	156	131
Nonmanufacturing[2]		3,256	3,729	4,442	5,505	5,570	6,140	5,090	4,620	3,633	4,105	5,975
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	252	186	200	(D)
Communications	48	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	0	0	0	(D)
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	93	42	(D)	(D)
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	(D)	(S) 51	(D)	(S) 64
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Services	701,72,73,75–81,	NA	NA	NA	NA	NA	NA	NA	4,270	3,118	3,805	4,889
Business services	73	NA	NA	NA	NA	NA	NA	NA	612	361	400	540
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	514	(D)	389	(D)
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	98	(D)	11	(D)
Health services	80	NA	NA	NA	NA	NA	NA	NA	4	(D)	(D)	33
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	(D)	3	4	21
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	(D)	1	(D)	12

See explanatory information and SOURCE at end of table.

Table A-13. Federal funds for industrial R&D performance, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In millions of dollars]										
Distribution by industry:												
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	3,650	2,746	(S) 3,381	(S) 3,652
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	1,883	994	1,258	1,190
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	(D)	(S) 1,708	(D)	(S) 2,388
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	(D)	45	(D)	74
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	4	(D)	(D)	663
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	11	(D)	77	532
Distribution by size of company: [Number of employees]												
Total		30,343	28,554	28,125	26,372	24,722	22,809	22,463	23,451	23,653	23,928	24,164
Fewer than 500		816	901	895	1,887	2,025	1,614	1,164	1,978	2,301	2,209	3,436
500 to 999		131	117	(S)	181	151	182	182	225	219	376	363
1,000 to 4,999		1,093	958	881	1,050	(S)	1,115	1,083	798	512	540	620
5,000 to 9,999		864	740	257	816	763	764	825	243	468	612	536
10,000 to 24,999		1,705	1,129	1,526	3,373	3,416	2,816	2,348	(S) 1,946	(S) 1,031	913	(S) 955
25,000 or more		25,734	24,709	24,436	19,065	17,346	16,319	16,862	18,261	19,122	19,277	18,253

[1] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[2] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.
NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-14. Federal funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In millions of dollars]					
All industries		24,164	3,436	363	620	536	955	18,253
Manufacturing		18,189	490	107	204	520	(D)	(D)
Food, kindred, and tobacco products	20,21	0	0	0	0	0	0	0
Textiles and apparel	22,23	(D)	0	0	0	0	0	(D)
Lumber, wood products, and furniture	24,25	14	5	(D)	(D)	0	0	0
Paper and allied products	26	(D)	0	0	0	0	0	(D)
Chemicals and allied products	28	(S) 483	124	0	37	9	(D)	(D)
Industrial chemicals	281–82,286	(D)	122	0	(D)	9	(D)	(D)
Drugs and medicines	283	5	(D)	0	(D)	0	0	0
Other chemicals	284–85,287–89	(D)	(D)	0	(D)	0	0	0
Petroleum refining and extraction	13,29	6	0	0	0	(D)	3	(D)
Rubber products	30	(D)	0	0	0	(D)	0	0
Stone, clay, and glass products	32	(D)	0	0	(D)	0	(D)	0
Primary metals	33	(D)	(D)	(D)	0	(D)	(D)	(D)
Ferrous metals and products	331–32,3398–99	(D)	0	0	0	(D)	(D)	(D)
Nonferrous metals and products	333–36	(D)	(D)	(D)	0	0	0	(D)
Fabricated metal products	34	43	2	(D)	(D)	(D)	0	(D)
Machinery	35	73	10	0	(D)	(S) 4	19	(D)
Office, computing, and accounting machines	357	15	2	0	(D)	(D)	0	0
Other machinery, except electrical	351–56,358–59	58	8	0	(D)	(D)	19	(D)
Electrical equipment	36	1,613	187	8	62	(D)	(D)	1,334
Radio and TV receiving equipment	365	0	0	0	0	0	0	0
Communication equipment	366	(D)	(D)	0	(D)	(D)	0	(D)
Electronic components	367	(D)	(D)	(D)	34	(D)	(D)	0
Other electrical equipment	361–64,369	538	139	(D)	(D)	(D)	0	(D)

See explanatory information and SOURCE at end of table.

Table A-14. Federal funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In millions of dollars]					
Transportation equipment	37	10,330	(D)	(D)	(D)	(D)	(D)	9,986
Motor vehicles and motor vehicles equipment	371	(D)	0	0	(D)	(D)	0	(D)
Other transportation equipment	373–75,379	(D)	0	0	0	0	0	(D)
Aircraft and missiles	372,376	9,341	(D)	(D)	(D)	(D)	(D)	9,013
Professional and scientific instruments	38	(D)	13	73	(D)	13	(D)	(D)
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	74	(D)	(D)	(D)	(D)	0	(D)
Other manufacturing industries[1]	27,31,39	131	128	(D)	0	(D)	0	0
Nonmanufacturing		5,975	2,946	256	417	16	(D)	(D)
Transportation and utilities	40–42,44–49	(D)	0	(D)	(D)	(D)	0	(D)
Communications	48	(D)	0	0	(D)	0	0	(D)
Telephone communications	481	(D)	0	0	0	0	0	(D)
Other communications	482–484,489	(D)	0	0	(D)	0	0	(D)
Electric, gas, and sanitary services	49	(D)	0	(D)	0	(D)	0	(D)
Other transportation and utilities	40–42,44–47	(D)	0	0	0	(D)	0	0
Trade	50–59	(S) 64	(D)	(D)	0	0	0	(D)
Finance, insurance, and real estate	60–65,67	(D)	0	0	0	0	0	(D)
Services	701,72,73,75–81, 83,84,87,89	4,889	2,415	217	406	(D)	(D)	(D)
Business services	73	540	401	(D)	(S) 68	(D)	0	(D)
Computer and data processing services	737	(D)	(D)	(D)	(S) 68	(D)	0	(D)
Other business services	731–736,738	(D)	(D)	(D)	0	0	0	0

See explanatory information and SOURCE at end of table.

Table A-14. Federal funds for industrial R&D performance, by industry and by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In millions of dollars]					
Health services	80	33	(D)	(D)	0	0	(D)	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	21	(D)	(D)	0	0	(D)	0
Other health services	802–805,808–809	12	12	0	0	0	0	0
Engineering and management services	87	(S) 3,652	1,320	177	(D)	(D)	(D)	(D)
Engineering, architectural, and surveying	871	1,190	507	(D)	(D)	(D)	(D)	0
Research, development, and testing	873	(S) 2,388	741	(D)	0	0	0	(D)
Other engineering and management services	872,874	74	72	0	(D)	(D)	0	0
Other services	701,72,75–79,81, 83,84,89	663	(D)	0	(D)	0	(D)	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	532	(D)	0	(D)	(D)	0	0

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-15. Federal funds for industrial R&D performance, by selected agency and by selected industry for selected years: 1979–98

Industry	SIC code	1979	1981	1983	1985	1987	1989[3]	1991[3, 4]	1993[4]	1995[4]	1997[4]	1998[4]
		[In millions of dollars]										
All agencies[2]		12,518	16,382	20,680	27,196	30,752	28,554	26,372	22,809	23,451	23,928	24,164
Chemicals and allied products	28	346	421	393	230	190	126	209	(D)	(S) 210	(D)	(S) 483
Machinery	35	(T)	694	1,116	1,495	(D)	(D)	1,055	88	(D)	(D)	73
Electrical equipment	36	3,309	3,920	4,523	5,161	5,399	3,743	4,550	1,402	1,690	1,839	1,613
Motor vehicles and other transportation equipment	371,373–75,379	(T)	(T)	(T)	(T)	(D)	(D)	(D)	(D)	(D)	1,632	989
Aircraft and missiles	372,376	5,840	8,528	11,396	16,582	18,519	16,828	11,096	9,369	11,462	10,619	9,341
Other industries[1]	--	(T)	(T)	(T)	(T)	(T)	(T)	(D)	9,491	8,333	9,180	11,666
DoD												
Total		7,939	10,540	14,571	20,948	22,252	(S)	(S)	(S)	(S) 13,876	(S) 12,603	13,709
Chemicals and allied products	28	36	40	48	(S)	(D)	(S)	(D)	(D)	(S) 139	(D)	(D)
Machinery	35	541	599	963	1,287	(D)	(D)	748	58	(S) 47	(D)	(D)
Electrical equipment	36	1,920	2,338	3,057	3,812	(S)	2,229	(S)	(D)	(S) 1,442	1,565	(S) 1,274
Motor vehicles and other transportation equipment	371,373–75,379	(T)	(T)	(T)	(D)	(D)	(D)	(D)	888	1,199	(S) 1,166	318
Aircraft and missiles	372,376	4,210	6,121	8,888	13,918	13,717	(S)	(S)	(S)	(S) 6,631	(S) 4,989	(S) 4,655
Other industries[1]	--	(T)	(T)	(T)	(D)	(D)	(D)	(D)	5,707	4,418	4,637	7,322
NASA												
Total		1,786	2,306	2,150	(S)	2,805	(S)	(S)	435	(S) 2,054	(S) 2,022	(S) 1,522
Chemicals and allied products	28	(T)	(T)	(T)	(S)	(D)	0	(S)	2	4	(D)	(D)
Machinery	35	74	81	(T)	(D)	(D)	(D)	(D)	(D)	2	(S) 1	(S) 0
Electrical equipment	36	252	317	188	90	115	(D)	(S)	(D)	(D)	(S) 145	(S) 130
Motor vehicles and other transportation equipment	371,373–75,379	(T)	(T)	(T)	(T)	(D)	(D)	(D)	20	(D)	(D)	(D)
Aircraft and missiles	372,376	1,221	1,785	1,959	(S)	2,650	(S)	(S)	236	(S) 985	(S) 1,060	(S) 926
Other industries[1]	--	119	70	(T)	(D)	(D)	(D)	(D)	137	946	708	341

See explanatory information and SOURCE at end of table.

Table A-15. Federal funds for industrial R&D performance, by selected agency and by selected industry for selected years: 1979–98

Industry	SIC code	1979	1981	1983	1985	1987	1989[3]	1991[3, 4]	1993[4]	1995[4]	1997[4]	1998[4]
DOE		[In millions of dollars]										
Total		1,575	1,976	1,949	2,901	2,968	3,221	(S)	(S)	(S) 3,547	(S) 2,505	(S) 1,998
Chemicals and allied products	28	(T)	(T)	(T)	(S)	171	(S)	(S)	(D)	40	(D)	(D)
Machinery	35	(T)	(T)	(T)	(S)	(D)	(S)	(D)	(S)	31	38	37
Electrical equipment	36	784	951	917	1,188	1,184	1,353	(S)	57	72	42	(D)
Motor vehicles and other transportation equipment	371,373–75,379	16	20	(T)	(T)	(D)	(D)	(D)	(D)	0	(D)	(D)
Aircraft and missiles	372,376	253	340	207	468	688	(S)	(S)	(S)	(S) 2,498	(S) 1,307	(S) 1,145
Other industries[1]	--	287	356	(T)	(T)	(D)	(D)	(D)	1,197	906	970	687

[1] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for all companies in this group are combined with those for companies in "Other industries." As a result, statistics for "Other industries" after 1995 are not comparable with statistics for prior years.

[2] Funds for 1987–97 are based on all companies reporting Federal R&D funds.

[3] As a result of a new sample design, statistics for 1989 and 1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1995, data have been withheld.
(T) = Not separately available but included in the total.

NOTES: Data for DoD, NASA, and DOE do not sum to the totals because the data reported by all other Federal agencies are included in the totals but not shown separately. In addition, Federal R&D data collected on the Form RD-1A is not allocated by agency type.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-16. Total number of R&D-performing companies and number reporting Federal R&D funds, by industry and by size of company: 1998

Industry	SIC code	Size of company													
		Total		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
All industries		41,923	2,906	38,921	2,734	1,158	42	1,244	37	288	31	183	22	128	39
Manufacturing		20,808	673	18,731	551	731	28	918	23	227	24	132	18	71	29
Food, kindred, and tobacco products	20,21	490	0	322	0	53	0	70	0	20	0	13	0	12	0
Textiles and apparel	22,23	138	1	51	0	39	0	31	0	7	0	7	0	2	1
Lumber, wood products, and furniture	24,25	271	52	216	50	13	1	27	1	11	0	5	0	0	0
Paper and allied products	26	285	2	201	0	20	0	39	0	11	0	8	0	6	2
Chemicals and allied products	28	706	63	506	51	73	0	81	5	27	3	14	3	5	1
Industrial chemicals	281–82,286	149	58	52	49	52	0	27	2	11	3	6	3	1	1
Drugs and medicines	283	151	4	109	2	3	0	25	2	5	0	6	0	3	0
Other chemicals	284–85,287–89	406	1	345	0	18	0	29	1	11	0	2	0	1	0
Petroleum refining and extraction	13,29	126	4	98	0	2	0	5	0	8	0	9	3	3	1
Rubber products	30	768	1	613	0	69	0	68	0	11	1	4	0	3	0
Stone, clay, and glass products	32	232	2	198	0	4	0	13	1	12	0	5	1	0	0
Primary metals	33	158	8	61	1	22	1	50	0	16	3	6	1	3	2
Ferrous metals and products	331–32,3398–99	107	5	54	0	2	0	33	0	13	3	4	1	1	1
Nonferrous metals and products	333–36	51	3	7	1	20	1	17	0	3	0	2	0	2	1
Fabricated metal products	34	1,136	28	973	24	80	1	58	1	12	1	9	0	4	1
Machinery	35	1,883	80	1,563	70	147	0	126	2	26	3	18	4	3	1
Office, computing, and accounting machines	357	136	18	86	16	22	0	16	1	6	1	5	0	1	0
Other machinery, except electrical	351–56,358–59	1,747	61	1,477	53	125	0	110	1	20	2	13	4	2	1
Electrical equipment	36	1,124	91	858	61	96	12	125	6	22	4	14	3	9	5
Radio and TV receiving equipment	365	15	0	11	0	1	0	3	0	0	0	0	0	0	0
Communication equipment	366	103	7	65	2	12	0	17	2	5	1	0	0	4	2
Electronic components	367	600	25	467	6	52	10	64	4	10	1	5	3	1	0
Other electrical equipment	361–64,369	406	59	314	52	31	2	41	0	7	2	9	0	4	3

See explanatory information and SOURCE at end of table.

Table A-16. Total number of R&D-performing companies and number reporting Federal R&D funds, by industry and by size of company: 1998

Industry	SIC code	Size of company													
		Total		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Transportation equipment	37	542	23	387	2	3	1	109	2	21	5	7	1	14	12
Motor vehicles and motor vehicles equipment	371	316	5	190	0	1	0	99	1	14	1	6	0	5	3
Other transportation equipment	373–75,379	203	2	195	0	1	0	4	0	1	0	0	0	2	2
Aircraft and missiles	372,376	23	16	2	2	1	1	6	1	6	4	1	1	7	7
Professional and scientific instruments	38	655	26	498	8	63	5	72	5	13	3	5	2	4	3
Scientific and mechanical measuring instruments	381–82	355	17	286	6	33	4	27	2	4	1	3	2	2	2
Optical, surgical, photographic, and other instruments	384–87	299	9	211	2	30	1	45	3	9	2	2	0	2	1
Other manufacturing industries[1]	27,31,39	12,295	292	12,186	285	47	6	42	0	9	1	7	0	3	0
Nonmanufacturing		21,115	2,233	20,191	2,183	428	14	327	14	61	7	52	4	57	10
Transportation and utilities	40–42,44–49	324	8	176	0	60	1	41	1	18	2	13	0	16	4
Communications	48	113	4	100	0	1	0	2	1	0	0	1	0	9	3
Telephone communications	481	60	2	51	0	0	0	0	0	0	0	1	0	8	2
Other communications	482–484,489	53	2	49	0	1	0	2	1	0	0	0	0	1	1
Electric, gas, and sanitary services	49	110	4	4	0	54	1	27	0	16	2	9	0	1	1
Other transportation and utilities	40–42,44–47	101	0	72	0	6	0	12	0	2	0	3	0	6	0
Trade	50–59	3,752	7	3,368	2	222	3	127	0	8	0	6	0	21	2
Finance, insurance, and real estate	60–65,67	392	1	332	0	7	0	31	0	6	0	9	0	8	1
Services	701,72,73,75–81, 83,84,87,89	6,170	1,014	5,886	982	117	10	113	11	20	4	23	4	11	3
Business services	73	3,448	307	3,279	294	76	3	65	7	13	1	8	0	8	2
Computer and data processing services	737	3,069	305	2,924	293	72	2	53	7	10	1	5	0	4	2
Other business services	731–736,738	380	2	354	1	4	1	11	0	3	0	3	0	4	0

See explanatory information and SOURCE at end of table.

Table A-16. Total number of R&D-performing companies and number reporting Federal R&D funds, by industry and by size of company: 1998

Industry	SIC code	Size of company													
		Total		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Health services	80	482	62	475	61	1	0	3	0	1	0	2	1	0	0
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	365	52	361	51	1	0	1	0	0	0	2	1	0	0
Other health services	802–805,808–809	118	11	115	11	0	0	2	0	1	0	0	0	0	0
Engineering and management services	87	1,776	592	1,704	575	36	7	26	4	4	3	4	2	2	1
Engineering, architectural, and surveying	871	491	206	453	195	13	5	20	3	2	1	3	2	0	0
Research, development, and testing	873	940	308	930	305	8	2	1	0	0	0	0	0	1	1
Other engineering and management services	872,874	345	78	321	75	14	0	5	1	2	2	1	0	1	0
Other services	701,72,75–79,81, 83,84,89	464	53	428	52	4	0	20	0	2	0	9	1	1	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	10,477	1,203	10,429	1,200	22	0	15	2	9	1	1	0	1	0

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-17. Industry-administered federally funded R&D centers (FFRDC's)—R&D funds by character of work, full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1988–98

Item	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
	[In millions of dollars]										
Total R&D funds	2,122	2,195	2,323	2,277	2,353	1,965	2,202	2,273	2,297	2,130	2,078
Basic research	337	398	499	461	474	492	503	530	708	625	568
Applied research	371	374	386	433	507	435	503	535	231	213	230
Development	1,414	1,423	1,438	1,383	1,373	1,039	1,196	1,209	1,358	1,261	1,280
	[Employment]										
Number of FTE R&D scientists and engineers[1]	10,994	11,618	12,438	11,977	11,770	8,083	8,362	9,033	8,696	8,324	7,784
Total employment[2]	36,143	35,716	42,153	39,697	40,755	23,930	23,905	24,031	21,735	20,391	20,306

[1] These data were recorded in January of the year following the year indicated.

[2] These data were recorded in March of the year indicated.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years.

NOTE: Industry-administered federally funded research and development centers (FFRDCs) conduct R&D almost exclusively for use by the Federal Government. Data for these FFRDCs administered by industry are included in Federal R&D support shown in other tables under the industry classifications of the administering firms. See section B for a listing of industry-administered FFRDCs and their locations.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-18. Total (company, Federal, and other) funds for industrial R&D performance and number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1998

Size of company [Number of employees]	Total	Manufacturing	Nonmanufacturing
	Funds for industrial R&D [In millions of dollars]		
Total	169,180	120,401	48,780
Fewer than 500	30,175	9,404	20,771
500 to 999	5,495	2,916	2,580
1,000 to 4,999	21,525	15,636	5,889
5,000 to 9,999	14,053	11,398	2,654
10,000 to 24,999	24,876	18,729	6,147
25,000 or more	73,055	62,317	10,738
	Number of R&D-performing companies		
Total	41,923	20,808	21,115
Fewer than 500	38,921	18,731	20,191
500 to 999	1,158	731	428
1,000 to 4,999	1,244	918	327
5,000 to 9,999	288	227	61
10,000 to 24,999	183	132	52
25,000 or more	128	71	57

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-19. Concentration of total, Federal, and company and other industrial R&D funds and net sales of R&D-performing companies, ranked by size of R&D program: 1988–98

Companies ranked by size of R&D program	1988[1]	1989[1]	1990[1]	1991[1, 2]	1992[2]	1993[2]	1994[2]	1995[2]	1996[2]	1997[2]	1998[2]
	Percent of total (company, Federal, and other) R&D funds										
First 4 (1–4)	18	19	18	16	15	17	15	16	15	14	12
Next 4 (5–8)	12	13	13	8	8	7	8	8	8	8	8
Next 12 (9–20)	17	16	15	12	13	13	14	13	13	13	13
Next 20 (21–40)	12	12	12	11	11	12	13	12	12	11	11
Next 60 (41–100)	15	15	16	15	15	16	15	14	14	14	13
Next 100 (101–200)	8	8	9	12	12	8	9	8	9	9	9
Next 200 (201–400)	7	6	7	6	6	7	7	7	7	8	8
	Percent of Federal R&D funds										
First 4 (1–4)	31	36	38	14	11	23	26	35	37	40	46
Next 4 (5–8)	18	15	16	21	18	17	19	19	20	23	17
Next 12 (9–20)	27	30	26	21	27	32	32	27	23	18	14
Next 20 (21–40)	15	11	12	15	13	16	13	8	7	7	7
Next 60 (41–100)	6	6	6	13	11	5	7	5	5	5	7
Next 100 (101–200)	3	1	1	3	4	5	2	3	4	3	5
Next 200 (201–400)	0	0	0	2	2	2	1	3	4	4	4
	Percent of company and other (except Federal) R&D funds										
First 4 (1–4)	21	22	21	17	17	17	16	16	15	13	12
Next 4 (5–8)	7	7	7	7	8	7	7	7	7	7	7
Next 12 (9–20)	12	13	12	10	12	12	12	11	11	11	12
Next 20 (21–40)	12	12	13	10	11	11	11	11	10	11	10
Next 60 (41–100)	16	16	17	16	17	14	14	14	14	13	13
Next 100 (101–200)	10	10	10	15	14	9	9	9	10	10	10
Next 200 (201–400)	8	8	8	7	7	8	8	8	8	9	8
	Percent of net sales ranked by size of total R&D funds										
First 4 (1–4)	7	6	8	7	8	8	8	8	6	6	5
Next 4 (5–8)	5	5	4	3	3	3	2	2	3	2	3
Next 12 (9–20)	5	5	5	4	4	4	5	6	6	5	5
Next 20 (21–40)	6	5	5	4	4	4	5	4	4	5	5
Next 60 (41–100)	11	12	12	12	12	11	10	9	8	7	8
Next 100 (101–200)	9	8	9	9	9	8	8	8	11	8	8
Next 200 (201–400)	10	11	12	11	11	10	10	10	11	13	11

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

NOTES: Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC Code	Total	Size of company					
			Fewer than 500 employees	500 to 900 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
		1997						
All industries		4,573,376	383,693	164,954	730,532	579,895	839,149	1,875,152
Manufacturing		3,084,508	251,504	138,267	534,768	348,135	627,198	1,184,636
Food, kindred, and tobacco products	20,21	363,454	16,182	21,131	54,019	44,600	80,506	147,015
Textiles and apparel	22,23	50,725	5,703	3,953	13,939	(D)	14,880	(D)
Lumber, wood products, and furniture	24,25	40,866	3,752	4,874	11,246	12,075	8,920	0
Paper and allied products	26	134,028	(D)	(D)	21,084	10,439	41,537	56,961
Chemicals and allied products	28	349,944	18,911	9,519	72,441	69,419	94,026	85,627
Industrial chemicals	281–82,286	142,139	4,868	(D)	34,394	31,571	36,129	(D)
Drugs and medicines	283	110,054	3,681	643	16,007	17,871	36,120	35,732
Other chemicals	284–85,287–89	97,751	10,363	(D)	22,040	19,977	21,777	(D)
Petroleum refining and extraction	13,29	282,521	230	1,767	96,006	0	107,154	77,365
Rubber products	30	99,225	40,494	7,945	24,071	(D)	7,492	(D)
Stone, clay, and glass products	32	32,914	(D)	(D)	5,376	6,559	17,692	0
Primary metals	33	133,940	5,937	18,118	23,200	21,734	30,752	34,199
Ferrous metals and products	331–32,3398–99	72,704	668	245	9,980	17,755	(D)	(D)
Nonferrous metals and products	333–36	61,237	5,269	17,873	13,220	3,979	(D)	(D)
Fabricated metal products	34	109,918	19,213	(D)	23,368	14,086	30,142	(D)
Machinery	35	327,764	37,523	15,445	65,741	54,395	71,441	83,220
Office, computing, and accounting machines	357	139,516	6,977	2,068	15,456	24,264	(D)	(D)
Other machinery, except electrical	351–56,358–59	188,248	30,546	13,377	50,285	30,131	(D)	(D)
Electrical equipment	36	397,253	28,704	16,196	66,144	62,265	47,129	176,815
Radio and TV receiving equipment	365	5,896	(D)	(D)	4,164	0	0	0
Communication equipment	366	92,058	8,134	(D)	11,670	33,750	0	(D)
Electronic components	367	132,461	(D)	5,708	23,625	21,217	25,467	(D)
Other electrical equipment	361–64,369	166,838	5,380	6,760	26,685	7,298	21,662	99,053

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC Code	Total	Size of company					
			Fewer than 500 employees	500 to 900 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
		1997						
Transportation equipment	37	516,738	7,829	13,846	12,106	18,329	50,569	414,060
Motor vehicles and motor vehicles equipment	371	357,701	(D)	13,415	5,180	(D)	44,553	(D)
Other transportation equipment	373–75,379	14,141	0	(D)	1,405	(D)	(D)	(D)
Aircraft and missiles	372,376	144,896	(D)	(D)	5,521	6,612	(D)	128,270
Professional and scientific instruments	38	115,938	13,350	7,552	27,986	11,802	7,410	47,839
Scientific and mechanical measuring instruments	381–82	57,158	9,294	4,628	9,730	4,591	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	58,781	4,056	2,924	18,256	7,211	(D)	(D)
Other manufacturing industries[1]	27,31,39	129,277	48,438	6,914	18,042	13,506	17,549	24,827
Nonmanufacturing		1,488,869	132,189	26,688	195,764	231,761	211,951	690,517
Transportation and utilities	40–42,44–49	661,667	2,944	488	66,140	122,019	71,882	398,195
Communications	48	278,724	926	(D)	1,568	72,524	0	(D)
Telephone communications	481	270,988	0	0	0	72,524	0	198,463
Other communications	482–484,489	7,737	926	(D)	1,568	0	0	(D)
Electric, gas, and sanitary services	49	188,859	788	(D)	59,399	(D)	(D)	(D)
Other transportation and utilities	40–42,44–47	194,084	1,230	(D)	5,173	(D)	(D)	181,615
Trade	50–59	331,046	68,434	4,034	47,493	49,877	55,380	105,828
Finance, insurance, and real estate	60–65,67	226,679	3,403	4,202	29,748	19,579	14,182	155,565
Services	701,72,73,75–81, 83,84,87,89	216,994	45,194	17,004	43,889	16,847	(D)	(D)
Business services	73	106,900	25,892	7,869	23,221	11,742	14,985	23,191
Computer and data processing services	737	85,170	24,721	6,791	20,425	(D)	(D)	12,936
Other business services	731–736,738	21,730	1,172	1,078	2,796	(D)	(D)	10,255

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC Code	Total	Size of company					
			Fewer than 500 employees	500 to 900 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
		1997						
Health services	80	13,039	1,422	641	3,059	0	(S) 7,918	0
Offices and clinics of medical doctors , hospitals, medical, and dental labs	801,806,807	11,983	1,180	641	2,244	0	(S) 7,918	0
Other health services	802–805,808–809	1,056	242	0	815	0	0	0
Engineering and management services	87	54,588	14,890	4,985	8,143	(D)	20,425	(D)
Engineering, architectural, and surveying	871	29,944	6,446	1,473	6,309	(D)	(D)	0
Research, development, and testing	873	12,407	7,190	1,765	370	(D)	0	(D)
Other engineering and management services	872,874	12,237	1,254	1,746	1,465	(D)	(D)	0
Other services	701,72,75–79,81, 83,84,89	42,466	2,990	3,510	9,466	(D)	(D)	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	52,482	12,213	960	8,493	23,439	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC Code	Total	Size of company					
			Fewer than 500 employees	500 to 900 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
		1998						
All industries		4,683,335	366,082	170,667	702,629	746,481	896,445	1,801,030
Manufacturing		3,221,047	245,231	99,537	482,719	617,767	614,536	1,161,257
Food, kindred, and tobacco products	20,21	386,826	14,142	11,358	53,111	72,373	74,493	161,349
Textiles and apparel	22,23	48,530	3,391	(D)	10,831	6,108	14,678	(D)
Lumber, wood products, and furniture	24,25	43,577	4,276	1,405	10,720	16,353	10,822	0
Paper and allied products	26	153,439	5,516	3,424	34,986	14,979	37,647	56,888
Chemicals and allied products	28	332,962	17,765	13,998	63,885	67,513	86,510	83,291
Industrial chemicals	281–82,286	126,217	7,643	11,150	23,205	27,264	(D)	(D)
Drugs and medicines	283	118,384	2,392	722	18,243	15,714	42,898	38,416
Other chemicals	284–85,287–89	88,361	7,730	2,126	22,437	24,535	(D)	(D)
Petroleum refining and extraction	13,29	222,246	4,241	(D)	(D)	20,504	109,372	59,367
Rubber products	30	77,827	18,145	5,858	19,705	13,906	5,009	15,203
Stone, clay, and glass products	32	42,323	2,945	609	(D)	16,141	17,588	(D)
Primary metals	33	120,866	3,920	5,425	25,579	23,120	22,176	40,646
Ferrous metals and products	331–32,3398–99	79,250	3,255	154	12,933	20,903	(D)	(D)
Nonferrous metals and products	333–36	41,616	665	5,271	12,646	2,217	(D)	(D)
Fabricated metal products	34	110,032	20,645	8,242	15,351	15,404	25,210	25,180
Machinery	35	290,550	40,639	17,643	62,058	42,906	75,618	51,686
Office, computing, and accounting machines	357	96,243	4,918	3,572	17,284	13,839	(D)	(D)
Other machinery, except electrical	351–56,358–59	194,307	35,721	14,071	44,773	29,067	(D)	(D)
Electrical equipment	36	367,413	27,215	12,360	52,503	43,508	57,719	174,107
Radio and TV receiving equipment	365	5,368	(D)	(D)	4,315	0	0	0
Communication equipment	366	91,060	8,918	(D)	10,429	(S) 12,290	0	(D)
Electronic components	367	115,813	(D)	6,343	23,317	24,722	(S) 24,722	(D)
Other electrical equipment	361–64,369	155,171	6,476	3,927	14,442	6,496	32,997	90,834

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC Code	Total	Size of company					
			Fewer than 500 employees	500 to 900 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
		1998						
Transportation equipment	37	773,242	7,561	(S) 342	59,622	234,998	49,629	421,091
Motor vehicles and motor vehicles equipment	371	602,962	(D)	(D)	53,592	(D)	46,038	(D)
Other transportation equipment	373–75,379	14,694	1,871	(D)	2,153	(D)	(D)	(D)
Aircraft and missiles	372,376	155,587	(D)	(D)	3,877	9,540	(D)	138,400
Professional and scientific instruments	38	120,884	10,985	6,802	26,290	16,838	11,572	48,398
Scientific and mechanical measuring instruments	381–82	55,323	7,448	3,848	7,976	4,962	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	65,561	3,537	2,954	18,313	11,876	(D)	(D)
Other manufacturing industries[1]	27,31,39	130,331	63,845	8,957	15,063	13,116	16,493	12,857
Nonmanufacturing		1,462,288	120,850	71,131	219,911	128,714	281,910	639,773
Transportation and utilities	40–42,44–49	463,831	1,461	12,331	46,822	60,184	79,340	263,694
Communications	48	204,176	718	(D)	(D)	(D)	(D)	(D)
Telephone communications	481	193,577	18	0	0	(D)	(D)	189,402
Other communications	482–484,489	10,599	700	(D)	(D)	0	0	(D)
Electric, gas, and sanitary services	49	184,188	107	(D)	39,528	57,183	65,941	(D)
Other transportation and utilities	40–42,44–47	75,468	635	1,804	(D)	(D)	(D)	55,392
Trade	50–59	313,750	40,703	37,908	38,507	21,358	32,556	142,717
Finance, insurance, and real estate	60–65,67	370,659	10,399	1,383	80,941	13,514	80,912	183,510
Services	701,72,73,75–81, 83,84,87,89	265,855	52,586	17,275	46,851	18,555	(D)	(D)
Business services	73	142,201	31,190	10,110	28,512	13,042	26,171	33,175
Computer and data processing services	737	114,926	27,138	9,644	25,514	10,308	17,320	25,002
Other business services	731–736,738	27,275	4,052	466	2,998	2,735	8,851	8,173

See explanatory information and SOURCE at end of table.

Table A-20. Domestic net sales of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC Code	Total	Size of company					
			Fewer than 500 employees	500 to 900 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In millions of dollars]						
		1998						
Health services	80	13,961	2,633	(D)	742	(D)	(D)	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	12,292	1,927	(D)	(D)	0	(D)	0
Other health services	802–805,808–809	1,669	706	0	(D)	(D)	0	0
Engineering and management services	87	61,185	15,439	5,221	9,671	(D)	17,874	(D)
Engineering, architectural, and surveying	871	31,378	5,186	1,472	6,726	(D)	(D)	0
Research, development, and testing	873	13,340	7,536	2,106	(D)	0	0	(D)
Other engineering and management services	872,874	16,467	2,718	1,643	(D)	(D)	(D)	5,175
Other services	701,72,75–79,81, 83,84,89	48,508	3,324	(D)	7,926	(D)	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	48,193	15,701	2,234	6,790	15,103	(D)	(D)

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
All industries[1]		NA	NA	NA	NA	NA	NA	NA	3.4	3.5	3.4	3.6
Manufacturing		4.5	4.3	4.2	4.2	4.2	3.8	3.6	3.6	4.0	3.9	3.7
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	0.6	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	(D)	0.6	0.6	(D)	(D)	(D)	(D)	(D)	(D)	0.9	0.9
Paper and allied products	26	(D)	0.8	1.0	1.1	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	5.3	5.4	5.3	5.4	5.5	(D)	(D)	4.7	(D)	(D)	6.5
Industrial chemicals	281–82,286	4.4	4.2	4.5	4.6	4.6	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	8.8	(D)	(D)	8.9	9.6	12.5	10.2	10.4	10.1	10.5	10.6
Other chemicals	284–85,287–89	3.4	(D)	(D)	3.1	2.7	(D)	(D)	(D)	2.7	(D)	(D)
Petroleum refining and extraction	13,29	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.7	0.7	(D)	0.8
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	(D)	1.5	1.7	1.5	1.3	1.8	(D)
Primary metals	33	0.8	0.8	0.8	0.8	0.6	0.7	0.6	0.5	(D)	0.7	(D)
Ferrous metals and products	331–32,3398–99	0.5	(D)	(D)	(D)	(D)	0.5	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	1.0	(D)	(D)	(D)	(D)	1.2	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	1.3	1.5	1.4	1.5	1.5	1.4	1.2	1.1	(D)	1.6	1.4
Machinery	35	7.7	7.9	7.7	8.1	7.8	4.6	3.8	(D)	5.2	5.6	5.1
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	9.9	7.9	(D)	(D)	9.2	9.3
Other machinery, except electrical	351–56,358–59	2.9	(D)	(D)	(D)	(D)	2.6	2.5	2.4	(D)	3.0	3.1
Electrical equipment	36	7.5	7.3	6.5	6.5	5.6	6.2	5.9	6.0	6.7	6.2	7.1
Radio and TV receiving equipment	365	2.4	1.8	1.6	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2.9
Communication equipment	366	10.7	11.6	10.0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	9.0	(D)	8.3	7.9	7.5	8.1	7.5	(D)	(D)	(D)	(D)
Other electrical equipment	361–64,369	2.5	(D)	3.7	(D)	(D)	(D)	(D)	(D)	(D)	2.9	3.1
Transportation equipment	37	8.9	8.1	7.5	7.3	7.1	6.4	5.9	6.1	6.5	6.2	3.8
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	16.3	13.5	11.8	12.1	11.8	12.5	13.8	12.9	12.9	11.2	9.3

See explanatory information and SOURCE at end of table.

Table A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
Professional and scientific instruments	38	7.4	7.2	8.0	9.1	9.4	9.7	9.2	10.3	11.5	11.6	(D)
Scientific and mechanical measuring instruments	381–82	7.9	7.4	8.6	10.0	10.6	11.5	11.0	12.4	(D)	14.2	(D)
Optical, surgical, photographic, and other instruments	384–87	7.3	7.3	7.7	8.1	8.3	8.1	7.3	8.2	(D)	9.1	9.3
Other manufacturing industries[2]	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2.2	2.1
Nonmanufacturing[1]		NA	NA	NA	NA	NA	NA	NA	0.0	0.0	0.0	0.0
Transportation and Utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	1.2	1.0	0.5	(D)
Communications	48	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	3.0	1.3	0.7	(D)
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	0.3	0.2	(D)	(D)
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	(D)	2.3	(D)	3.6
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	NA	NA	NA	NA	7.8	8.1	10.3	11.0
Business services	73	NA	NA	NA	NA	NA	NA	NA	10.1	10.2	11.2	10.7
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	11.8	(D)	13.7	(D)
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	1.6	(D)	1.2	(D)
Health services	80	NA	NA	NA	NA	NA	NA	NA	5.2	(D)	(D)	8.6
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	(D)	(S) 6.1	(D)	8.9
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	4.6	6.6
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	7.8	9.7	17.0	19.3
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	5.7	6.2	6.8	6.5

See explanatory information and SOURCE at end of table.

Table A-21. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	(D)	14.0	(D)	68.7
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	(D)	1.8	(D)	3.9
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	0.6	(D)	(D)	2.1
Other nonmanufacturing industries[2]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	0.8	(D)	3.1	7.9
Distribution by size of company: [Number of employees]												
Total[1]		NA	NA	NA	NA	NA	NA	NA	3.4	3.5	3.4	3.6
Fewer than 500		NA	NA	NA	NA	NA	NA	NA	4.4	6.0	6.3	8.2
500 to 999		NA	NA	NA	NA	NA	NA	NA	3.2	3.1	3.0	3.2
1,000 to 4,999		NA	NA	NA	NA	NA	NA	NA	2.8	3.0	2.7	3.1
5,000 to 9,999		NA	NA	NA	NA	NA	NA	NA	2.0	2.7	2.5	1.9
10,000 to 24,999		NA	NA	NA	NA	NA	NA	NA	2.3	2.5	2.6	2.8
25,000 or more		NA	NA	NA	NA	NA	NA	NA	4.3	4.0	3.9	4.1

[1] Beginning in 1995 this table included both manufacturing and nonmanufacturing companies. Only manufacturing companies were included in prior years.

[2] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
All industries[1]		NA	NA	NA	NA	NA	NA	NA	2.8	3.0	2.9	3.1
Manufacturing		3.1	3.1	3.1	3.2	3.3	3.1	2.9	2.9	3.3	3.3	3.2
Food, kindred, and tobacco products	20,21	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4
Textiles and apparel	22,23	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.9	0.8	0.9	1.1
Lumber, wood products, and furniture	24,25	0.6	0.6	0.6	0.9	0.9	0.7	0.6	0.7	1.4	0.9	0.8
Paper and allied products	26	0.8	0.8	1.0	1.1	1.0	1.1	1.0	1.0	1.2	1.1	1.0
Chemicals and allied products	28	5.2	5.4	5.3	5.3	5.4	6.0	5.1	4.7	5.3	5.3	6.4
Industrial chemicals	281–82,286	4.2	4.1	4.4	4.4	4.4	4.4	3.3	3.9	3.7	3.5	5.1
Drugs and medicines	283	8.8	8.9	8.8	8.9	9.6	12.5	10.2	10.4	10.1	10.5	10.6
Other chemicals	284–85,287–89	3.4	3.9	3.4	3.0	2.7	2.7	2.5	1.4	2.7	2.1	2.5
Petroleum refining and extraction	13,29	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.8
Rubber products	30	1.7	1.9	2.1	2.3	2.3	2.1	2.3	1.6	1.8	1.4	2.1
Stone, clay, and glass products	32	2.0	1.8	1.7	1.6	1.6	1.5	1.5	1.5	1.2	1.8	1.4
Primary metals	33	0.7	0.7	0.8	0.8	0.6	0.7	0.6	0.5	0.6	0.6	0.6
Ferrous metals and products	331–32,3398–99	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.4	0.6	0.5
Nonferrous metals and products	333–36	1.0	1.0	1.2	1.2	0.7	1.2	0.9	0.7	1.0	0.6	0.8
Fabricated metal products	34	1.1	1.2	1.1	1.2	1.1	1.1	1.0	1.1	1.4	1.5	1.4
Machinery	35	6.8	7.3	7.2	7.5	7.3	4.5	3.8	3.6	5.1	5.6	5.1
Office, computing, and accounting machines	357	11.2	13.1	14.4	14.9	13.7	9.8	7.9	8.1	9.9	9.2	9.2
Other machinery, except electrical	351–56,358–59	2.8	2.6	2.3	2.9	2.9	2.5	2.5	2.4	2.9	3.0	3.1
Electrical equipment	36	5.3	5.2	4.5	4.3	4.0	5.4	5.2	5.4	6.1	5.7	6.6
Radio and TV receiving equipment	365	2.4	1.8	1.6	1.0	0.6	4.0	1.0	1.6	2.0	2.6	2.9
Communication equipment	366	6.1	6.8	6.1	(S)	7.0	10.1	10.3	8.0	8.5	8.0	11.2
Electronic components	367	8.0	7.7	7.4	7.2	7.0	7.8	7.3	8.0	8.5	8.1	8.4
Other electrical equipment	361–64,369	2.3	2.3	2.2	2.2	2.1	2.3	2.1	2.5	2.6	2.7	2.8
Transportation equipment	37	3.5	3.5	3.4	4.0	4.2	3.9	3.7	3.6	4.1	3.8	2.5
Motor vehicles and motor vehicles equipment	371	3.4	3.7	3.7	4.1	4.0	3.7	3.4	3.6	4.2	3.8	2.2
Other transportation equipment	373–75,379	2.6	2.5	2.1	2.1	2.1	1.9	1.2	0.9	1.2	2.2	2.3
Aircraft and missiles	372,376	3.9	3.3	3.1	4.0	4.7	4.7	5.3	4.2	4.5	3.9	3.3

See explanatory information and SOURCE at end of table.

Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
Professional and scientific instruments	38	7.1	6.8	7.1	7.1	7.2	7.2	6.5	7.3	7.7	7.7	8.0
Scientific and mechanical measuring instruments	381–82	7.6	6.9	6.9	6.3	6.2	6.4	5.8	6.6	6.7	6.5	6.5
Optical, surgical, photographic, and other instruments	384–87	7.1	7.1	7.5	8.0	8.2	7.9	7.2	8.0	8.6	8.9	9.2
Other manufacturing industries[2]	27,31,39	1.0	0.9	0.9	0.8	1.3	1.3	1.1	1.2	2.5	2.0	2.0
Nonmanufacturing[1]		NA	NA	NA	NA	NA	NA	NA	2.4	2.2	2.2	2.9
Transportation and Utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	1.1	1.0	0.4	0.5
Communications	48	NA	NA	NA	NA	NA	NA	NA	2.2	1.9	0.7	0.9
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	2.1	1.9	0.7	0.9
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	3.0	1.3	0.7	1.0
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	0.2	0.2	0.1	0.1
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	0.1	0.3	0.3	0.4
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	2.4	2.3	2.4	3.6
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	0.7	0.4	0.7	0.4
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	NA	NA	NA	NA	5.9	6.8	8.6	9.2
Business services	73	NA	NA	NA	NA	NA	NA	NA	9.5	9.9	10.8	10.3
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	11.1	12.4	13.3	12.4
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	0.9	1.1	1.1	1.4
Health services	80	NA	NA	NA	NA	NA	NA	NA	5.2	(S) 5.9	5.2	8.4
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	5.3	(S) 6.1	(D)	8.7
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	(S) 2.4	3.4	(D)	5.9
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	4.1	6.1	10.8	13.4
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	2.0	2.5	2.6	2.7

See explanatory information and SOURCE at end of table.

Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	7.2	9.7	38.5	50.8
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	1.7	1.3	2.8	3.4
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	0.6	0.7	1.0	0.7
Other nonmanufacturing industries[2]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	0.8	2.5	2.9	6.8
Distribution by size of company: [Number of employees]												
Total[1]		NA	NA	NA	NA	NA	NA	NA	2.8	3.0	2.9	3.1
Fewer than 500		NA	NA	NA	NA	NA	NA	NA	3.9	5.3	5.7	7.3
500 to 999		NA	NA	NA	NA	NA	NA	NA	3.0	3.0	2.8	3.0
1,000 to 4,999		NA	NA	NA	NA	NA	NA	NA	2.6	2.9	2.6	3.0
5,000 to 9,999		NA	NA	NA	NA	NA	NA	NA	2.0	2.6	2.4	1.8
10,000 to 24,999		NA	NA	NA	NA	NA	NA	NA	2.0	2.4	2.5	2.7
25,000 or more		NA	NA	NA	NA	NA	NA	NA	3.1	2.9	2.9	3.0

[1] Beginning in 1995 this table included both manufacturing and nonmanufacturing companies. Only manufacturing companies were included in prior years.

[2] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
All industries[1]		NA	NA	NA	NA	NA	NA	NA	2.8	3.0	2.9	3.1
Manufacturing		3.1	3.1	3.1	3.2	3.3	3.1	2.9	2.9	3.3	3.3	3.2
Food, kindred, and tobacco products	20,21	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4
Textiles and apparel	22,23	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.9	0.8	0.9	1.1
Lumber, wood products, and furniture	24,25	0.6	0.6	0.6	0.9	0.9	0.7	0.6	0.7	1.4	0.9	0.8
Paper and allied products	26	0.8	0.8	1.0	1.1	1.0	1.1	1.0	1.0	1.2	1.1	1.0
Chemicals and allied products	28	5.2	5.4	5.3	5.3	5.4	6.0	5.1	4.7	5.3	5.3	6.4
Industrial chemicals	281–82,286	4.2	4.1	4.4	4.4	4.4	4.4	3.3	3.9	3.7	3.5	5.1
Drugs and medicines	283	8.8	8.9	8.8	8.9	9.6	12.5	10.2	10.4	10.1	10.5	10.6
Other chemicals	284–85,287–89	3.4	3.9	3.4	3.0	2.7	2.7	2.5	1.4	2.7	2.1	2.5
Petroleum refining and extraction	13,29	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.8
Rubber products	30	1.7	1.9	2.1	2.3	2.3	2.1	2.3	1.6	1.8	1.4	2.1
Stone, clay, and glass products	32	2.0	1.8	1.7	1.6	1.6	1.5	1.5	1.5	1.2	1.8	1.4
Primary metals	33	0.7	0.7	0.8	0.8	0.6	0.7	0.6	0.5	0.6	0.6	0.6
Ferrous metals and products	331–32,3398–99	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.4	0.6	0.5
Nonferrous metals and products	333–36	1.0	1.0	1.2	1.2	0.7	1.2	0.9	0.7	1.0	0.6	0.8
Fabricated metal products	34	1.1	1.2	1.1	1.2	1.1	1.1	1.0	1.1	1.4	1.5	1.4
Machinery	35	6.8	7.3	7.2	7.5	7.3	4.5	3.8	3.6	5.1	5.6	5.1
Office, computing, and accounting machines	357	11.2	13.1	14.4	14.9	13.7	9.8	7.9	8.1	9.9	9.2	9.2
Other machinery, except electrical	351–56,358–59	2.8	2.6	2.3	2.9	2.9	2.5	2.5	2.4	2.9	3.0	3.1
Electrical equipment	36	5.3	5.2	4.5	4.3	4.0	5.4	5.2	5.4	6.1	5.7	6.6
Radio and TV receiving equipment	365	2.4	1.8	1.6	1.0	0.6	4.0	1.0	1.6	2.0	2.6	2.9
Communication equipment	366	6.1	6.8	6.1	(S)	7.0	10.1	10.3	8.0	8.5	8.0	11.2
Electronic components	367	8.0	7.7	7.4	7.2	7.0	7.8	7.3	8.0	8.5	8.1	8.4
Other electrical equipment	361–64,369	2.3	2.3	2.2	2.2	2.1	2.3	2.1	2.5	2.6	2.7	2.8
Transportation equipment	37	3.5	3.5	3.4	4.0	4.2	3.9	3.7	3.6	4.1	3.8	2.5
Motor vehicles and motor vehicles equipment	371	3.4	3.7	3.7	4.1	4.0	3.7	3.4	3.6	4.2	3.8	2.2
Other transportation equipment	373–75,379	2.6	2.5	2.1	2.1	2.1	1.9	1.2	0.9	1.2	2.2	2.3
Aircraft and missiles	372,376	3.9	3.3	3.1	4.0	4.7	4.7	5.3	4.2	4.5	3.9	3.3

See explanatory information and SOURCE at end of table.

Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
Professional and scientific instruments	38	7.1	6.8	7.1	7.1	7.2	7.2	6.5	7.3	7.7	7.7	8.0
Scientific and mechanical measuring instruments	381–82	7.6	6.9	6.9	6.3	6.2	6.4	5.8	6.6	6.7	6.5	6.5
Optical, surgical, photographic, and other instruments	384–87	7.1	7.1	7.5	8.0	8.2	7.9	7.2	8.0	8.6	8.9	9.2
Other manufacturing industries[2]	27,31,39	1.0	0.9	0.9	0.8	1.3	1.3	1.1	1.2	2.5	2.0	2.0
Nonmanufacturing[1]		NA	NA	NA	NA	NA	NA	NA	2.4	2.2	2.2	2.9
Transportation and Utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	1.1	1.0	0.4	0.5
Communications	48	NA	NA	NA	NA	NA	NA	NA	2.2	1.9	0.7	0.9
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	2.1	1.9	0.7	0.9
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	3.0	1.3	0.7	1.0
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	0.2	0.2	0.1	0.1
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	0.1	0.3	0.3	0.4
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	2.4	2.3	2.4	3.6
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	0.7	0.4	0.7	0.4
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	NA	NA	NA	NA	5.9	6.8	8.6	9.2
Business services	73	NA	NA	NA	NA	NA	NA	NA	9.5	9.9	10.8	10.3
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	11.1	12.4	13.3	12.4
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	0.9	1.1	1.1	1.4
Health services	80	NA	NA	NA	NA	NA	NA	NA	5.2	(S) 5.9	5.2	8.4
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	5.3	(S) 6.1	(D)	8.7
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	(S) 2.4	3.4	(D)	5.9
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	4.1	6.1	10.8	13.4
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	2.0	2.5	2.6	2.7

See explanatory information and SOURCE at end of table.

Table A-22. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D- performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[Percent]										
Distribution by industry:												
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	7.2	9.7	38.5	50.8
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	1.7	1.3	2.8	3.4
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	0.6	0.7	1.0	0.7
Other nonmanufacturing industries[2]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	0.8	2.5	2.9	6.8
Distribution by size of company: [Number of employees]												
Total[1]		NA	NA	NA	NA	NA	NA	NA	2.8	3.0	2.9	3.1
Fewer than 500		NA	NA	NA	NA	NA	NA	NA	3.9	5.3	5.7	7.3
500 to 999		NA	NA	NA	NA	NA	NA	NA	3.0	3.0	2.8	3.0
1,000 to 4,999		NA	NA	NA	NA	NA	NA	NA	2.6	2.9	2.6	3.0
5,000 to 9,999		NA	NA	NA	NA	NA	NA	NA	2.0	2.6	2.4	1.8
10,000 to 24,999		NA	NA	NA	NA	NA	NA	NA	2.0	2.4	2.5	2.7
25,000 or more		NA	NA	NA	NA	NA	NA	NA	3.1	2.9	2.9	3.0

[1] Beginning in 1995 this table included both manufacturing and nonmanufacturing companies. Only manufacturing companies were included in prior years.

[2] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of total R&D program: 1998

Industry	SIC code	Total R&D funds as a percent of net sales			Total R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
All industries		8.2	9.4	9.0	19,688	13,700	22,268
Manufacturing		8.2	10.0	7.0	19,688	12,878	18,908
Food, kindred, and tobacco products	20,21	1.0	1.3	0.3	658	261	345
Textiles and apparel	22,23	2.4	1.3	0.6	292	68	76
Lumber, wood products, and furniture	24,25	1.9	0.9	0.7	119	67	105
Paper and allied products	26	2.4	1.2	0.5	(S) 966	177	197
Chemicals and allied products	28	9.5	6.8	11.3	4,688	4,043	5,499
Industrial chemicals	281–82,286	6.3	6.2	3.8	2,669	879	930
Drugs and medicines	283	14.0	8.3	12.7	4,637	3,336	3,531
Other chemicals	284–85,287–89	3.8	2.7	2.1	1,217	279	378
Petroleum refining and extraction	13,29	1.8	1.0	0.2	1,097	469	186
Rubber products	30	5.2	2.9	2.7	751	194	277
Stone, clay, and glass products	32	2.9	1.4	1.1	384	113	74
Primary metals	33	1.2	0.7	0.6	(S) 484	100	154
Ferrous metals and products	331–32,3398–99	1.1	0.5	0.6	(S) 395	61	81
Nonferrous metals and products	333–36	1.0	1.5	0.6	188	53	56
Fabricated metal products	34	2.7	2.2	0.8	690	208	188
Machinery	35	10.2	7.5	6.8	5,547	1,817	2,544
Office, computing, and accounting machines	357	10.9	10.7	9.0	5,399	1,275	1,412
Other machinery, except electrical	351–56,358–59	5.4	5.2	3.5	1,758	725	956
Electrical equipment	36	13.3	4.5	11.1	10,707	4,061	3,956
Radio and TV receiving equipment	365	2.9	4.7	1.7	131	15	9
Communication equipment	366	15.0	13.1	12.5	8,652	888	863
Electronic components	367	13.3	6.9	11.0	4,933	1,214	1,514
Other electrical equipment	361–64,369	3.4	4.1	2.0	3,031	453	439

See explanatory information and SOURCE at end of table.

Table A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of total R&D program: 1998

Industry	SIC code	Total R&D funds as a percent of net sales			Total R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
Transportation equipment	37	6.6	6.4	3.8	18,298	6,419	3,055
Motor vehicles and motor vehicles equipment	371	4.8	1.4	0.8	12,663	539	461
Other transportation equipment	373–75,379	4.1	2.3	4.7	455	39	2
Aircraft and missiles	372,376	11.2	6.8	3.5	11,206	2,713	505
Professional and scientific instruments	38	16.9	15.0	11.0	8,181	1,228	1,692
Scientific and mechanical measuring instruments	381–82	21.5	13.4	8.1	6,195	541	522
Optical, surgical, photographic, and other instruments	384–87	11.7	11.0	9.4	3,162	777	920
Other manufacturing industries[1]	27,31,39	3.0	3.1	0.8	325	141	172
Nonmanufacturing		14.8	4.4	5.6	8,625	3,236	4,096
Transportation and utilities	40–42,44–49	1.9	0.5	0.4	1,619	490	356
Communications	48	1.9	0.4	0.9	1,619	406	165
Telephone communications	481	1.5	0.3	0.5	1,587	235	57
Other communications	482–484,489	3.1	2.5	0.0	311	0	0
Electric, gas, and sanitary services	49	0.2	0.3	0.2	70	34	65
Other transportation and utilities	40–42,44–47	0.7	0.1	0.1	221	18	14
Trade	50–59	11.1	4.5	5.6	6,011	806	1,233
Finance, insurance, and real estate	60–65,67	2.4	0.5	0.2	882	266	171
Services	701,72,73,75–81, 83,84,87,89	20.3	11.1	23.6	5,580	1,524	2,266
Business services	73	16.5	14.3	17.9	4,261	1,021	1,664
Computer and data processing services	737	16.5	14.3	17.9	4,261	1,021	1,664
Other business services	731–736,738	4.1	1.5	0.5	(S) 154	39	55

See explanatory information and SOURCE at end of table.

Table A-23. Total (company, Federal, and other) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of total R&D program: 1998

Industry	SIC code	Total R&D funds as a percent of net sales			Total R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
Health services	80	7.9	1.5	0.5	577	24	13
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	6.5	0.2	2.1	537	4	1
Other health services	802–805,808–809	9.8	3.7	0.3	63	7	1
Engineering and management services	87	44.4	36.0	72.9	(S) 2,474	511	829
Engineering, architectural, and surveying	871	38.1	37.8	5.2	752	194	326
Research, development, and testing	873	48.2	38.0	78.0	(S) 2,180	350	628
Other engineering and management services	872,874	12.5	3.5	1.2	219	72	62
Other services	701,72,75–79,81, 83,84,89	0.9	1.5	0.5	193	38	38
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	5.3	0.9	0.6	426	52	60

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (S) = Indicates imputation of more than 50 percent.

NOTE: Rankings were based on total (company, Federal, and other) R&D funds.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of company-financed R&D program: 1998

Industry	SIC code	Company and other R&D funds as a percent of net sales			Company and other R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
All industries		6.6	12.8	5.8	16,805	10,563	16,767
Manufacturing		6.6	5.4	7.5	16,238	9,104	14,978
Food, kindred, and tobacco products	20,21	1.0	1.3	0.3	658	261	345
Textiles and apparel	22,23	2.4	1.3	0.6	292	68	76
Lumber, wood products, and furniture	24,25	1.9	0.8	0.7	119	66	96
Paper and allied products	26	2.2	1.2	0.5	(S) 923	177	197
Chemicals and allied products	28	9.5	6.8	11.5	4,686	4,043	5,357
Industrial chemicals	281–82,286	6.2	4.6	3.8	2,530	706	921
Drugs and medicines	283	14.0	8.3	12.7	4,637	3,336	3,531
Other chemicals	284–85,287–89	3.8	2.7	2.1	1,217	279	368
Petroleum refining and extraction	13,29	1.8	1.0	0.2	1,097	467	184
Rubber products	30	4.2	2.1	2.7	581	158	277
Stone, clay, and glass products	32	2.9	1.4	1.1	384	113	74
Primary metals	33	0.6	1.0	0.6	270	99	154
Ferrous metals and products	331–32,3398–99	0.5	0.5	0.5	(S) 187	61	75
Nonferrous metals and products	333–36	1.0	1.5	0.6	182	53	54
Fabricated metal products	34	2.7	2.2	0.7	682	208	164
Machinery	35	10.2	7.5	6.8	5,520	1,816	2,535
Office, computing, and accounting machines	357	10.9	10.7	8.9	5,399	1,274	1,400
Other machinery, except electrical	351–56,358–59	5.0	5.7	3.5	1,729	718	942
Electrical equipment	36	12.8	4.1	9.9	10,274	3,671	3,445
Radio and TV receiving equipment	365	2.9	4.7	1.7	131	15	9
Communication equipment	366	13.9	12.2	9.3	7,798	804	837
Electronic components	367	13.3	6.8	11.0	4,930	1,202	1,514
Other electrical equipment	361–64,369	3.0	4.1	2.0	2,634	452	439

See explanatory information and SOURCE at end of table.

Table A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of company-financed R&D program: 1998

Industry	SIC code	Company and other R&D funds as a percent of net sales			Company and other R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
Transportation equipment	37	4.4	3.4	2.0	13,738	2,246	1,612
Motor vehicles and motor vehicles equipment	371	4.5	1.4	0.8	11,934	539	457
Other transportation equipment	373–75,379	1.9	2.3	4.7	211	39	2
Aircraft and missiles	372,376	3.5	2.9	2.2	4,050	754	296
Professional and scientific instruments	38	7.1	15.8	10.0	3,458	1,150	1,634
Scientific and mechanical measuring instruments	381–82	4.9	13.3	7.3	1,402	537	474
Optical, surgical, photographic, and other instruments	384–87	11.5	10.9	9.3	3,111	773	908
Other manufacturing industries[1]	27,31,39	3.0	3.1	0.8	325	141	171
Nonmanufacturing		13.0	3.8	5.0	7,868	2,777	3,484
Transportation and utilities	40–42,44–49	1.3	0.4	0.4	1,355	328	309
Communications	48	1.3	0.3	0.6	1,355	235	143
Telephone communications	481	1.3	0.3	0.5	1,355	235	57
Other communications	482–484,489	0.9	2.5	0.0	86	0	0
Electric, gas, and sanitary services	49	0.2	0.3	0.1	56	33	59
Other transportation and utilities	40–42,44–47	0.7	0.1	0.1	221	18	14
Trade	50–59	11.0	4.5	5.6	5,986	806	1,233
Finance, insurance, and real estate	60–65,67	2.4	0.5	0.2	882	266	170
Services	701,72,73,75–81, 83,84,87,89	14.4	14.1	22.9	4,407	1,139	1,933
Business services	73	16.4	14.3	17.9	4,233	1,021	1,664
Computer and data processing services	737	16.4	14.3	17.9	4,233	1,021	1,664
Other business services	731–736,738	4.0	1.5	0.4	(S) 148	39	50

See explanatory information and SOURCE at end of table.

Table A-24. Company and other (except Federal) industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of company-financed R&D program: 1998

Industry	SIC code	Company and other R&D funds as a percent of net sales			Company and other R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
Health services	80	7.9	1.5	0.5	574	24	11
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	6.5	0.2	1.3	536	4	0
Other health services	802–805,808–809	9.7	2.7	0.3	62	6	1
Engineering and management services	87	48.8	41.0	15.4	641	387	680
Engineering, architectural, and surveying	871	21.5	3.9	2.1	230	78	120
Research, development, and testing	873	40.4	90.8	14.1	616	327	616
Other engineering and management services	872,874	12.3	3.5	1.2	217	72	58
Other services	701,72,75–79,81, 83,84,89	0.7	0.7	0.3	185	25	26
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	5.2	0.9	0.6	418	50	59

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (S) = Indicates imputation of more than 50 percent.

NOTE: Rankings were based on company and other R&D funds.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally financed R&D program: 1998

Industry	SIC code	Federal R&D funds as a percent of net sales			Federal R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
All industries		19.0	2.3	2.0	11,057	4,168	3,388
Manufacturing		17.3	1.7	2.1	10,959	(D)	(D)
Food, kindred, and tobacco products	20,21	0.0	0.0	0.0	0	0	0
Textiles and apparel	22,23	0.0	0.0	0.0	(D)	0	0
Lumber, wood products, and furniture	24,25	2.1	0.0	0.0	10	0	0
Paper and allied products	26	0.2	0.0	0.0	(D)	0	0
Chemicals and allied products	28	2.9	0.2	0.0	(D)	11	7
Industrial chemicals	281–82,286	2.5	0.0	0.0	(D)	10	(D)
Drugs and medicines	283	0.5	0.0	0.0	5	0	0
Other chemicals	284–85,287–89	4.3	0.0	0.0	(D)	0	0
Petroleum refining and extraction	13,29	0.0	0.0	0.0	5	0	0
Rubber products	30	2.6	0.0	0.0	(D)	0	0
Stone, clay, and glass products	32	0.0	0.0	0.0	(D)	0	0
Primary metals	33	1.6	0.0	0.0	219	6	0
Ferrous metals and products	331–32,3398–99	2.8	0.0	0.0	(D)	(D)	0
Nonferrous metals and products	333–36	0.1	0.0	0.0	10	0	0
Fabricated metal products	34	0.7	0.1	0.0	41	0	0
Machinery	35	0.2	0.1	0.0	55	(S) 7	3
Office, computing, and accounting machines	357	0.6	0.0	0.0	13	0	0
Other machinery, except electrical	351–56,358–59	0.2	0.1	0.0	46	5	1
Electrical equipment	36	1.4	11.8	0.3	1,332	82	51
Radio and TV receiving equipment	365	0.0	0.0	0.0	0	0	0
Communication equipment	366	4.6	0.3	0.0	988	10	0
Electronic components	367	1.0	0.2	0.0	49	15	5
Other electrical equipment	361–64,369	0.5	0.0	0.0	401	5	(D)

See explanatory information and SOURCE at end of table.

Table A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally financed R&D program: 1998

Industry	SIC code	Federal R&D funds as a percent of net sales			Federal R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
Transportation equipment	37	8.1	1.1	0.6	8,043	1,689	594
Motor vehicles and motor vehicles equipment	371	0.4	0.0	0.0	(D)	(D)	0
Other transportation equipment	373–75,379	2.7	0.0	0.0	(D)	0	0
Aircraft and missiles	372,376	8.1	3.0	0.9	8,043	1,179	120
Professional and scientific instruments	38	13.3	3.9	0.8	(D)	125	52
Scientific and mechanical measuring instruments	381–82	17.6	2.7	0.7	(D)	87	17
Optical, surgical, photographic, and other instruments	384–87	0.6	0.2	0.0	70	(S) 5	(D)
Other manufacturing industries[1]	27,31,39	0.2	0.0	0.0	2	0	0
Nonmanufacturing		6.8	25.3	3.5	(S) 2,280	(S) 418	386
Transportation and utilities	40–42,44–49	0.5	0.1	0.0	472	11	0
Communications	48	0.5	0.0	0.0	458	0	0
Telephone communications	481	0.2	0.0	0.0	(D)	0	0
Other communications	482–484,489	2.4	0.0	0.0	(D)	0	0
Electric, gas, and sanitary services	49	0.1	0.0	0.0	(D)	0	0
Other transportation and utilities	40–42,44–47	0.0	0.0	0.0	0	0	0
Trade	50–59	0.1	0.1	0.0	(S) 63	(S) 1	0
Finance, insurance, and real estate	60–65,67	0.1	0.0	0.0	(D)	0	0
Services	701,72,73,75–81, 83,84,87,89	38.8	87.8	2.9	(S) 2,125	232	319
Business services	73	1.2	50.4	5.2	123	67	70
Computer and data processing services	737	1.2	50.4	4.1	123	67	60
Other business services	731–736,738	0.4	0.0	0.0	(D)	0	0

See explanatory information and SOURCE at end of table.

Table A-25. Federal industrial R&D funds as a percent of net sales in R&D-performing companies, by industry and ranked by size of federally financed R&D program: 1998

Industry	SIC code	Federal R&D funds as a percent of net sales			Federal R&D funds		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
		[Percent]			[In millions of dollars]		
Health services	80	0.1	0.3	0.0	4	(D)	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	0.0	0.0	0.0	2	0	0
Other health services	802–805,808–809	1.9	0.0	0.0	2	0	0
Engineering and management services	87	38.8	87.8	57.7	(S) 2,125	232	269
Engineering, architectural, and surveying	871	30.9	83.0	5.1	609	175	207
Research, development, and testing	873	45.5	53.2	26.8	(D)	69	93
Other engineering and management services	872,874	0.5	0.1	0.0	9	0	0
Other services	701,72,75–79,81, 83,84,89	0.8	0.0	0.0	34	0	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	0.4	42.7	0.0	11	1	0

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTE: Rankings were based on Federal R&D funds.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-26. Total (company, Federal, and other) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953–98

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]							
1953[1]	3,630	17,988	151	748	726	3,598	2,753	13,642
1954[1]	4,070	19,941	166	813	814	3,988	3,090	15,140
1955[1]	4,640	22,372	189	911	928	4,474	3,523	16,986
1956	6,605	30,764	253	1,178	1,268	5,906	5,084	23,680
1957	7,731	34,856	271	1,222	1,670	7,529	5,790	26,105
1958	8,389	36,940	295	1,299	1,911	8,415	6,183	27,226
1959	9,618	41,908	320	1,394	1,991	8,675	7,307	31,839
1960	10,509	45,161	376	1,616	2,029	8,719	8,104	34,826
1961	10,908	46,338	395	1,678	1,977	8,398	8,536	36,262
1962	11,464	48,087	488	2,047	2,449	10,273	8,527	35,768
1963	12,630	52,363	522	2,164	2,457	10,187	9,651	40,012
1964	13,512	55,196	549	2,243	2,600	10,621	10,363	42,333
1965	14,185	56,831	592	2,372	2,658	10,649	10,935	43,810
1966	15,548	60,569	624	2,431	2,843	11,075	12,081	47,063
1967	16,385	61,854	629	2,374	2,915	11,004	12,841	48,475
1968	17,429	63,057	642	2,323	3,124	11,302	13,663	49,432
1969	18,308	63,262	618	2,135	3,287	11,358	14,403	49,768
1970	18,067	59,275	602	1,975	3,427	11,243	14,038	46,056
1971	18,320	57,143	590	1,840	3,415	10,652	14,315	44,651
1972	19,552	58,504	593	1,774	3,514	10,515	15,445	46,215
1973	21,249	60,195	631	1,788	3,825	10,836	16,793	47,572
1974	22,887	59,493	699	1,817	4,288	11,146	17,900	46,530
1975	24,187	57,465	730	1,734	4,570	10,858	18,887	44,873
1976	26,997	60,599	819	1,838	5,112	11,475	21,066	47,286
1977	29,825	62,882	911	1,921	5,636	11,883	23,278	49,079
1978[1]	33,304	65,443	1,035	2,034	6,300	12,380	25,969	51,030
1979	38,226	69,212	1,158	2,097	7,225	13,082	29,843	54,034
1980[1]	44,505	73,769	1,325	2,196	8,450	14,006	34,730	57,567
1981	51,810	78,488	1,614	2,445	10,699	16,208	39,497	59,835
1982[1]	58,650	83,583	1,904	2,713	12,323	17,562	44,423	63,308
1983	65,268	89,213	2,223	3,039	13,927	19,036	49,118	67,138
1984	74,800	98,525	2,608	3,435	15,765	20,765	56,427	74,324
1985	84,239	107,270	2,862	3,644	18,255	23,246	63,122	80,379
1986[2]	87,823	108,989	4,047	5,022	19,759	24,521	64,017	79,445
1987[2]	92,155	110,950	4,324	5,206	19,813	23,854	68,018	81,890
1988[2, 3]	97,015	112,690	4,500	5,227	20,748	24,100	71,767	83,363
1989[2, 3]	102,055	113,748	5,216	5,814	22,691	25,291	74,148	82,644

See explanatory information and SOURCE at end of table

Table A-26. Total (company, Federal, and other) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953–98

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]							
1990[2, 3]	109,727	117,230	5,128	5,479	24,785	26,480	79,814	85,271
1991[2, 3, 4]	116,952	120,173	7,837	8,053	27,446	28,202	81,669	83,918
1992[2, 4]	119,110	119,110	7,002	7,002	26,168	26,168	85,940	85,940
1993[2, 4]	117,400	114,380	6,919	6,741	24,686	24,051	85,796	83,589
1994[2, 4]	119,595	113,802	7,017	6,677	23,490	22,352	89,088	84,773
1995[2, 4]	132,103	122,875	6,099	5,673	27,454	25,536	98,552	91,668
1996[2, 4]	144,667	132,080	8,207	7,493	29,241	26,697	107,218	97,889
1997[2, 4]	157,539	141,202	10,419	9,339	32,642	29,257	114,478	102,606
1998[2, 4]	169,180	150,115	13,595	12,063	30,572	27,127	125,013	110,925

[1] Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1998,* NSF 99-335.

[2] The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for details.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

NOTE: Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-27. Company and other (except Federal) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953–98

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]							
1953[1]	2,200	10,902	132	654	438	2,170	1,630	8,077
1954[1]	2,320	11,367	143	701	492	2,411	1,685	8,256
1955[1]	2,460	11,861	162	781	560	2,700	1,738	8,380
1956	3,277	15,263	216	1,006	794	3,698	2,267	10,559
1957	3,396	15,311	230	1,037	992	4,472	2,174	9,802
1958	3,630	15,984	252	1,110	1,137	5,007	2,241	9,868
1959	3,983	17,355	248	1,081	1,178	5,133	2,557	11,142
1960	4,428	19,029	297	1,276	1,196	5,140	2,935	12,613
1961	4,668	19,830	314	1,334	1,165	4,949	3,189	13,547
1962	5,029	21,095	345	1,447	1,438	6,032	3,246	13,616
1963	5,360	22,222	375	1,555	1,450	6,012	3,535	14,656
1964	5,792	23,660	384	1,569	1,560	6,373	3,848	15,719
1965	6,445	25,821	406	1,627	1,620	6,490	4,419	17,704
1966	7,216	28,111	451	1,757	1,804	7,028	4,961	19,326
1967	8,020	30,276	427	1,612	1,849	6,980	5,744	21,684
1968	8,869	32,088	462	1,671	2,081	7,529	6,326	22,887
1969	9,857	34,060	458	1,583	2,272	7,851	7,127	24,627
1970	10,288	33,753	444	1,457	2,378	7,802	7,466	24,495
1971	10,654	33,231	456	1,422	2,441	7,614	7,757	24,195
1972	11,535	34,515	463	1,385	2,562	7,666	8,510	25,464
1973	13,104	37,122	499	1,414	2,832	8,023	9,773	27,686
1974	14,667	38,126	536	1,393	3,263	8,482	10,868	28,251
1975	15,582	37,021	573	1,361	3,440	8,173	11,569	27,486
1976	17,436	39,138	634	1,423	3,912	8,781	12,890	28,934
1977	19,340	40,776	701	1,478	4,311	9,089	14,328	30,209
1978[1]	22,115	43,456	785	1,543	4,870	9,570	16,460	32,344
1979	25,708	46,547	893	1,617	5,670	10,266	19,145	34,664
1980[1]	30,476	50,515	1,035	1,716	6,550	10,857	22,891	37,943
1981	35,428	53,671	1,313	1,989	8,359	12,663	25,756	39,018
1982[1]	40,105	57,154	1,523	2,170	9,363	13,343	29,219	41,640
1983	44,588	60,946	1,760	2,406	10,286	14,060	32,542	44,481
1984	51,404	67,708	2,132	2,808	11,541	15,202	37,731	49,698
1985	57,043	72,638	2,373	3,022	12,908	16,437	41,762	53,180
1986[2]	59,932	74,376	3,496	4,339	15,082	18,717	41,354	51,320
1987[2]	61,403	73,926	3,583	4,314	15,153	18,243	42,667	51,369
1988[2, 3]	66,672	77,445	3,507	4,074	16,531	19,202	46,634	54,169
1989[2, 3]	73,501	81,923	3,832	4,271	17,993	20,055	51,676	57,597

See explanatory information and SOURCE at end of table.

Table A-27. Company and other (except Federal) funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953–98

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]							
1990[2, 3]	81,602	87,182	3,760	4,017	18,432	19,692	59,410	63,472
1991[2, 3, 4]	90,580	93,074	6,125	6,294	21,425	22,015	63,030	64,766
1992[2, 4]	94,388	94,388	5,816	5,816	21,184	21,184	67,385	67,385
1993[2, 4]	94,591	92,158	5,961	5,808	19,956	19,443	68,678	66,912
1994[2, 4]	97,131	92,426	6,078	5,784	19,372	18,434	71,683	68,211
1995[2, 4]	108,652	101,062	5,379	5,003	23,755	22,096	79,516	73,961
1996[2, 4]	121,015	110,486	6,848	6,252	25,370	23,163	88,798	81,072
1997[2, 4]	133,611	119,755	8,766	7,857	29,782	26,694	95,064	85,206
1998[2, 4]	145,016	128,674	11,701	10,382	27,808	24,674	105,506	93,617

[1] Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1998* , Final report, NSF 99-335.

[2] The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for details.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

NOTE: Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-28. Federal funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953–98

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]							
1953[1]	1,430	7,086	19	94	288	1,427	1,123	5,565
1954[1]	1,750	8,574	23	113	322	1,578	1,405	6,884
1955[1]	2,180	10,511	27	130	368	1,774	1,785	8,607
1956	3,328	15,501	37	172	474	2,208	2,817	13,121
1957	4,335	19,545	41	185	678	3,057	3,616	16,303
1958	4,759	20,956	43	189	774	3,408	3,942	17,358
1959	5,635	24,553	72	314	813	3,542	4,750	20,697
1960	6,081	26,132	79	339	833	3,580	5,169	22,213
1961	6,240	26,508	81	344	812	3,449	5,347	22,715
1962	6,434	26,988	143	600	1,011	4,241	5,281	22,152
1963	7,270	30,141	147	609	1,007	4,175	6,116	25,357
1964	7,720	31,536	165	674	1,040	4,248	6,515	26,614
1965	7,740	31,010	186	745	1,038	4,159	6,516	26,106
1966	8,332	32,458	173	674	1,039	4,048	7,120	27,737
1967	8,365	31,578	202	763	1,066	4,024	7,097	26,791
1968	8,560	30,970	180	651	1,043	3,774	7,337	26,545
1969	8,451	29,202	160	553	1,015	3,507	7,276	25,142
1970	7,779	25,522	158	518	1,049	3,442	6,572	21,562
1971	7,666	23,911	134	418	974	3,038	6,558	20,455
1972	8,017	23,989	130	389	952	2,849	6,935	20,751
1973	8,145	23,074	132	374	993	2,813	7,020	19,887
1974	8,220	21,367	163	424	1,025	2,664	7,032	18,279
1975	8,605	20,444	157	373	1,130	2,685	7,318	17,387
1976	9,561	21,461	185	415	1,200	2,694	8,176	18,352
1977	10,485	22,106	210	443	1,325	2,794	8,950	18,870
1978[1]	11,189	21,987	250	491	1,430	2,810	9,509	18,685
1979	12,518	22,665	265	480	1,555	2,815	10,698	19,370
1980[1]	14,029	23,254	290	481	1,900	3,149	11,839	19,624
1981	16,382	24,817	301	456	2,340	3,545	13,741	20,817
1982[1]	18,545	26,429	381	543	2,960	4,218	15,204	21,667
1983	20,680	28,267	463	633	3,641	4,977	16,576	22,657
1984	23,396	30,817	476	627	4,224	5,564	18,696	24,626
1985	27,196	34,631	489	623	5,347	6,809	21,360	27,200
1986[2]	27,891	34,613	551	684	4,678	5,805	22,662	28,124
1987[2]	30,752	37,024	740	891	4,660	5,610	25,352	30,523
1988[2, 3]	30,343	35,246	993	1,153	4,217	4,898	25,133	29,194
1989[2, 3]	28,554	31,826	1,384	1,543	4,698	5,236	22,472	25,047

See explanatory information and SOURCE at end of table.

Table A-28. Federal funds for performance of industrial basic research, applied research, and development, in current and in constant dollars: 1953–98

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars	Current dollars	Constant 1992 dollars
	[In millions of dollars]							
1990[2, 3]	28,125	30,048	1,368	1,462	6,353	6,787	20,404	21,799
1991[2, 3, 4]	26,372	27,098	1,712	1,759	6,021	6,187	18,639	19,152
1992[2, 4]	24,722	24,722	1,186	1,186	4,983	4,983	18,555	18,555
1993[2, 4]	22,809	22,222	958	933	4,730	4,608	17,118	16,678
1994[2, 4]	22,463	21,375	939	894	4,119	3,919	17,405	16,562
1995[2, 4]	23,451	21,813	720	670	3,699	3,441	19,031	17,702
1996[2, 4]	23,653	21,595	1,358	1,240	3,871	3,534	(S) 18,423	16,820
1997[2, 4]	23,928	21,447	1,654	1,482	2,861	2,564	19,412	17,399
1998[2, 4]	24,164	21,441	1,894	1,681	2,763	2,452	19,507	17,309

[1] Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1998,* NSF 99-335.

[2] The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for details.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design,statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (S) = Indicates inputation of more than 50 percent.

NOTE: Gross domestic product (GDP) implicit price deflators were used to convert current dollars to constant (1992) dollars.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-29. Funds for performance of industrial basic research, applied research, and development, by industry and by source of funds 1998

Industry	SIC code	Total			Basic research			Applied research			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]											
All industries		169,180	24,164	145,016	13,595	1,894	11,701	30,572	2,763	27,808	125,013	19,507	105,506
Manufacturing		120,401	18,189	102,211	(D)	(D)	7,641	(D)	(D)	21,600	88,899	15,928	72,970
Food, kindred, and tobacco products	20,21	1,711	0	1,711	91	0	91	565	0	565	1,055	0	1,055
Textiles and apparel	22,23	(D)	(D)	543	46	(D)	(D)	80	0	80	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	374	14	359	48	0	48	(D)	(D)	37	(D)	(D)	274
Paper and allied products	26	(D)	(D)	1,583	548	0	548	291	0	291	(D)	(D)	744
Chemicals and allied products	28	21,764	(S) 483	21,282	(D)	(D)	3,032	5,772	150	5,622	(D)	(D)	12,628
Industrial chemicals	281–82,286	(D)	(D)	6,467	(D)	(D)	720	2,322	125	2,197	(D)	(D)	3,550
Drugs and medicines	283	12,571	5	12,566	(D)	(D)	2,183	(D)	(D)	2,730	7,653	0	7,653
Other chemicals	284–85,287–89	(D)	(D)	2,249	129	0	129	(D)	(D)	695	(D)	(D)	1,425
Petroleum refining and extraction	13,29	1,808	6	1,802	78	2	76	(D)	(D)	757	(D)	(D)	(D)
Rubber products	30	(D)	(D)	1,607	155	0	155	(D)	(D)	278	1,174	0	1,174
Stone, clay, and glass products	32	(D)	(D)	592	(D)	(D)	(D)	209	0	209	322	(D)	(D)
Primary metals	33	(D)	(D)	720	(D)	(D)	(D)	(D)	(D)	201	(D)	(D)	(D)
Ferrous metals and products	331–32,3398–99	(D)	(D)	405	(D)	(D)	7	(D)	(D)	132	(D)	(D)	266
Nonferrous metals and products	333–36	(D)	(D)	315	(D)	(D)	(D)	69	0	69	102	(D)	(D)
Fabricated metal products	34	1,595	43	1,551	102	0	102	(D)	(D)	304	(D)	(D)	1,145
Machinery	35	14,919	73	14,846	(D)	(D)	642	(D)	(D)	3,942	10,311	49	10,262
Office, computing, and accounting machines	357	8,905	15	8,890	(D)	(D)	276	(D)	(D)	3,165	5,452	3	5,449
Other machinery, except electrical	351–56,358–59	6,014	58	5,956	(D)	(D)	366	(D)	(D)	777	4,859	46	4,813
Electrical equipment	36	25,990	1,613	24,378	(D)	(D)	1,123	5,975	109	5,866	18,809	1,421	17,389
Radio and TV receiving equipment	365	155	0	155	34	0	34	11	0	11	110	0	110
Communication equipment	366	(D)	(D)	10,173	(D)	(D)	(D)	1,148	0	1,148	(D)	(D)	8,862
Electronic components	367	(D)	(D)	9,776	(D)	(D)	(D)	(D)	(D)	4,026	(D)	(D)	5,115
Other electrical equipment	361–64,369	4,811	538	4,273	(D)	(D)	291	(D)	(D)	680	3,757	456	3,301

See explanatory information and SOURCE at end of table.

Table A-29. Funds for performance of industrial basic research, applied research, and development, by industry and by source of funds 1998

Industry	SIC code	Total			Basic research			Applied research			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]											
Transportation equipment	37	29,279	10,330	18,948	(D)	(D)	(D)	(D)	(D)	1,439	26,111	9,056	17,055
Motor vehicles and motor vehicles equipment	371	(D)	(D)	13,502	(D)	(D)	(D)	(D)	(D)	1,097	(D)	(D)	12,162
Other transportation equipment	373–75,379	(D)	(D)	339	(D)	0	(D)	(D)	(D)	70	(D)	(D)	230
Aircraft and missiles	372,376	14,449	9,341	5,108	(D)	(D)	172	(D)	(D)	272	12,800	8,136	4,664
Professional and scientific instruments	38	(D)	(D)	9,625	(D)	(D)	909	1,734	200	1,533	12,001	4,820	7,182
Scientific and mechanical measuring instruments	381–82	(D)	(D)	3,614	359	0	359	876	(S) 175	701	(D)	(D)	2,553
Optical, surgical, photographic, and other instruments	384–87	6,085	74	6,011	(D)	(D)	550	858	25	832	(D)	(D)	4,629
Other manufacturing industries[1]	27,31,39	2,795	131	2,664	(D)	(D)	200	585	110	476	2,009	21	1,988
Nonmanufacturing		48,780	5,975	42,805	(D)	(D)	4,060	(D)	(D)	6,208	36,116	3,579	32,536
Transportation and utilities	40–42,44–49	(D)	(D)	2,219	(D)	(D)	(D)	(D)	(D)	413	2,124	398	1,727
Communications	48	(D)	(D)	1,768	(D)	(D)	(D)	(D)	(D)	293	(D)	(D)	1,419
Telephone communications	481	(D)	(D)	1,665	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other communications	482–484,489	(D)	(D)	103	22	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electric, gas, and sanitary services	49	(D)	(D)	182	13	0	13	44	0	44	(D)	(D)	(D)
Other transportation and utilities	40–42,44–47	(D)	(D)	269	(D)	(D)	(D)	77	0	77	183	(D)	(D)
Trade	50–59	11,336	(S) 64	11,273	(D)	(D)	620	(D)	(D)	1,528	(D)	(D)	9,125
Finance, insurance, and real estate	60–65,67	(D)	(D)	1,623	(D)	(D)	137	33	0	33	1,460	7	1,453
Services	701, 72, 73, 75–81,83,84,87,89	29,281	4,889	24,392	(D)	(D)	2,777	4,777	1,263	3,513	(D)	(D)	18,102
Business services	73	15,222	540	14,682	(D)	(D)	(D)	1,614	189	1,425	(D)	(D)	12,598
Computer and data processing services	737	(D)	(D)	14,297	(D)	(D)	(D)	1,586	189	1,397	12,599	297	12,301
Other business services	731–736,738	(D)	(D)	385	61	0	61	27	0	27	(D)	(D)	297

See explanatory information and SOURCE at end of table.

Table A-29. Funds for performance of industrial basic research, applied research, and development, by industry and by source of funds 1998

Industry	SIC code	Total			Basic research			Applied research			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]											
Health services	80	1,207	33	1,173	1,003	11	992	(D)	(D)	101	(D)	(D)	(D)
Offices and clinics of medical doctors, hospitals, medical, and dental labs	801,806,807	1,096	21	1,074	986	0	986	(D)	(D)	48	(D)	(D)	(D)
Other health services	802–805,808–809	111	12	99	17	11	6	54	1	53	39	0	39
Engineering and management services	87	11,835	(S) 3,652	8,182	(D)	(D)	1,048	(D)	(D)	(D)	7,250	(D)	(D)
Engineering, architectural, and surveying	871	2,025	1,190	835	(D)	(D)	52	(D)	(D)	(D)	1,223	(D)	(D)
Research, development, and testing	873	9,169	(S) 2,388	6,780	(D)	(D)	804	2,337	669	1,667	5,671	1,361	4,309
Other engineering and management services	872, 874	641	74	567	(D)	(D)	193	(D)	(D)	(D)	357	(D)	(D)
Other services	701,72,75–79,81, 83,84,89	1,017	663	354	(D)	(D)	(D)	(D)	(D)	(D)	751	522	229
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,830	532	3,298	622	175	447	836	115	721	2,372	241	2,131

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies
(S) = Indicates imputation of more than 50 percent.

NOTE: The R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-30. Number of companies conducting industrial basic research and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic
All industries		41,923	12,922	38,921	12,029	1,158	424	1,244	322	288	72	183	47	128	27
Manufacturing		20,808	5,635	18,731	5,082	731	214	918	217	227	61	132	41	71	19
Food, kindred, and tobacco products	20,21	490	244	322	207	53	6	70	16	20	9	13	4	12	2
Textiles and apparel	22,23	138	83	51	41	39	33	31	5	7	2	7	2	2	0
Lumber, wood products, and furniture	24,25	271	28	216	16	13	7	27	3	11	1	5	1	0	0
Paper and allied products	26	285	159	201	151	20	0	39	3	11	2	8	2	6	1
Chemicals and allied products	28	706	158	506	55	73	53	81	30	27	10	14	9	5	2
Industrial chemicals	281–82,286	149	67	52	2	52	43	27	12	11	5	6	4	1	1
Drugs and medicines	283	151	20	109	2	3	1	25	9	5	2	6	5	3	1
Other chemicals	284–85,287–89	406	71	345	51	18	8	29	9	11	3	2	0	1	0
Petroleum refining and extraction	13,29	126	7	98	0	2	0	5	2	8	0	9	3	3	2
Rubber products	30	768	182	613	142	69	23	68	14	11	1	4	1	3	1
Stone, clay, and glass products	32	232	119	198	98	4	0	13	7	12	10	5	4	0	0
Primary metals	33	158	29	61	0	22	15	50	6	16	4	6	1	3	3
Ferrous metals and products	331–32,3398–99	107	11	54	0	2	0	33	6	13	4	4	0	1	1
Nonferrous metals and products	333–36	51	18	7	0	20	15	17	0	3	0	2	1	2	2
Fabricated metal products	34	1,136	263	973	224	80	21	58	14	12	1	9	2	4	0
Machinery	35	1,883	462	1,563	418	147	17	126	18	26	5	18	4	3	0
Office, computing, and accounting machines	357	136	15	86	8	22	2	16	4	6	1	5	1	1	0
Other machinery, except electrical	351–56,358–59	1,747	447	1,477	411	125	16	110	14	20	4	13	3	2	0
Electrical equipment	36	1,124	336	858	285	96	16	125	23	22	6	14	3	9	3
Radio and TV receiving equipment	365	15	5	11	4	1	0	3	1	0	0	0	0	0	0
Communication equipment	366	103	13	65	5	12	2	17	4	5	1	0	0	4	1
Electronic components	367	600	227	467	205	52	8	64	11	10	2	5	1	1	0
Other electrical equipment	361–64,369	406	92	314	71	31	7	41	7	7	3	9	2	4	2

See explanatory information and SOURCE at end of table.

Table A-30. Number of companies conducting industrial basic research and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic
Transportation equipment	37	542	112	387	50	3	1	109	51	21	4	7	2	14	4
Motor vehicles and motor vehicles equipment	371	316	53	190	0	1	0	99	49	14	1	6	2	5	1
Other transportation equipment	373–75,379	203	52	195	49	1	1	4	1	1	1	0	0	2	0
Aircraft and missiles	372,376	23	7	2	1	1	0	6	1	6	2	1	0	7	3
Professional and scientific instruments	38	655	148	498	115	63	10	72	16	13	5	5	1	4	1
Scientific and mechanical measuring instruments	381–82	355	67	286	56	33	5	27	5	4	1	3	0	2	0
Optical, surgical, photographic, and other instruments	384–87	299	81	211	59	30	5	45	11	9	4	2	1	2	1
Other manufacturing industries[1]	27,31,39	12,295	3,303	12,186	3,279	47	11	42	10	9	1	7	2	3	0
Nonmanufacturing		21,115	7,287	20,191	6,947	428	210	327	105	61	12	52	6	57	8
Transportation and utilities	40–42,44–49	324	119	176	99	60	1	41	7	18	6	13	3	16	3
Communications	48	113	52	100	49	1	0	2	0	0	0	1	0	9	3
Telephone communications	481	60	2	51	0	0	0	0	0	0	0	1	0	8	2
Other communications	482–484,489	53	50	49	49	1	0	2	0	0	0	0	0	1	1
Electric, gas, and sanitary services	49	110	11	4	0	54	1	27	4	16	5	9	2	1	0
Other transportation and utilities	40–42,44–47	101	55	72	50	6	0	12	3	2	1	3	1	6	0
Trade	50–59	3,752	1,267	3,368	1,054	222	151	127	56	8	3	6	0	21	3
Finance, insurance, and real estate	60–65,67	392	81	332	54	7	2	31	23	6	0	9	0	8	2
Services	701,72,73,75–81, 83,84,87,89	6,170	1,569	5,886	1,511	117	36	113	17	20	2	23	3	11	0
Business services	73	3,448	736	3,279	700	76	23	65	11	13	2	8	1	8	0
Computer and data processing services	737	3,069	530	2,924	498	72	21	53	10	10	2	5	0	4	0
Other business services	731–736,738	380	206	354	202	4	2	11	1	3	0	3	1	4	0

See explanatory information and SOURCE at end of table.

Table A-30. Number of companies conducting industrial basic research and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic	Total	Basic
Health services	80	482	140	475	139	1	0	3	1	1	0	2	0	0	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	365	100	361	100	1	0	1	0	0	0	2	0	0	0
Other health services	802–805,808–809	118	40	115	39	0	0	2	1	1	0	0	0	0	0
Engineering and management services	87	1,776	447	1,704	431	36	12	26	4	4	0	4	0	2	0
Engineering, architectural, and surveying	871	491	114	453	108	13	3	20	3	2	0	3	0	0	0
Research, development, and testing	873	940	286	930	279	8	7	1	0	0	0	0	0	1	0
Other engineering and management services	872,874	345	47	321	44	14	2	5	1	2	0	1	0	1	0
Other services	701,72,75–79,81, 83,84,89	464	246	428	242	4	1	20	1	2	0	9	2	1	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	10,477	4,252	10,429	4,229	22	20	15	2	9	1	1	0	1	0

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-31. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry and by size of company: 1988–98 and projected 1999

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[4, 5]	1997[5]	1998[5]	Projected 1999
		[In millions of dollars]											
Distribution by industry:													
All industries		3,706	3,789	4,004	4,615	3,225	2,747	2,549	2,330	2,184	1,640	1,800	1,605
Manufacturing		3,155	3,175	3,274	3,918	2,631	2,111	1,740	1,797	1,763	1,269	1,431	1,209
Food, kindred, and tobacco products	20,21	(3)	(D)	(D)	(D)	(D)	0	(D)	(D)	0	(D)	(D)	(D)
Textiles and apparel	22,23	(D)	(D)	(D)	0	0	0	0	0	0	0	0	0
Lumber, wood products, and furniture	24,25	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0	0
Paper and allied products	26	1	(D)	(D)	(D)	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	(S)	111	417	(D)	72	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Industrial chemicals	281–82,286	(D)	108	414	(D)	66	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	(D)	(D)	(D)	(D)	(D)	0	0	0	0	0	(D)	(D)
Other chemicals	284–85,287–89	4	(D)	(D)	(D)	(D)	0	(D)	2	2	6	(D)	(D)
Petroleum refining and extraction	13,29	1,056	1,128	1,177	1,416	1,150	798	(D)	(D)	(D)	387	408	264
Rubber products	30	(D)	(D)	(D)	(D)	(D)	2	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Primary metals	33	21	(D)	(D)	26	3	17	68	(D)	(D)	(D)	(D)	(D)
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0
Fabricated metal products	34	(D)	14	49	2	(D)	(D)	1	(D)	(D)	(D)	0	0
Machinery	35	244	260	254	(S)	154	(D)	(D)	(D)	(D)	(D)	56	32
Office, computing, and accounting machines	357	(D)	(D)	0	(D)	(D)	0	0	0	0	0	0	0
Other machinery, except electrical	351–56,358–59	(D)	(D)	235	(D)	(D)	(D)	(D)	(D)	(D)	(D)	56	32
Electrical equipment	36	680	647	627	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Radio and TV receiving equipment	365	0	0	0	0	0	0	0	0	0	0	0	0
Communication equipment	366	(D)	(D)	(D)	(D)	(D)	(D)	12	(D)	(D)	(D)	(D)	(D)
Electronic components	367	(D)	(D)	(D)	(D)	8	14	(D)	(D)	(D)	0	(D)	(D)
Other electrical equipment	361–64,369	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-31. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry and by size of company: 1988–98 and projected 1999

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[4, 5]	1997[5]	1998[5]	Projected 1999
		[In millions of dollars]											
Distribution by industry:													
Transportation equipment	37	(D)	847	863	(S)	(D)	(D)	(D)	(D)	(D)	(D)	680	(D)
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	0	0	0	0	0	0	0	0	0
Aircraft and missiles	372,376	652	577	626	(D)	478	381	(D)	(D)	(D)	(D)	(D)	(D)
Professional and scientific instruments	38	16	12	11	(S)	(S)	(D)	(D)	(D)	0	1	(D)	0
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	(D)	0	(D)	0	0	1	0	0
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0	(D)	0
Other manufacturing industries[1]	27,31,39	0	(D)	(D)	(D)	0	0	0	(D)	0	0	0	0
Nonmanufacturing[2]		551	614	730	697	594	636	809	533	421	371	370	(S) 396
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	106	100	(D)	(D)	53
Communications	48	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	106	(D)	(D)	(D)	53
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	0	(D)	(D)	(D)	0
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	0	0	0
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	NA	NA	NA	NA	(S) 218	94	169	77	(D)
Business services	73	NA	NA	NA	NA	NA	NA	NA	0	0	(D)	0	0
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	0	0	(D)	0	0

See explanatory information and SOURCE at end of table.

Table A-31. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry and by size of company: 1988–98 and projected 1999

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[4, 5]	1997[5]	1998[5]	Projected 1999
		[In millions of dollars]											
Distribution by industry:													
Health services	80	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	0	0	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	0	0	0
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	77	(D)
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	93	80	98	(D)	(D)
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)	(D)
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	0	0	0	0	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-31. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry and by size of company: 1988–98 and projected 1999

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 5]	1992[5]	1993[5]	1994[5]	1995[5]	1996[4, 5]	1997[5]	1998[5]	Projected 1999
		[In millions of dollars]											
Distribution by size of company: [Number of employees]													
Total		NA	NA	NA	NA	NA	NA	2,549	2,330	2,184	1,640	1,800	1,605
Fewer than 500		NA	NA	NA	NA	NA	NA	28	39	39	101	42	(D)
500 to 999		NA	NA	NA	NA	NA	NA	86	22	24	11	(D)	(D)
1,000 to 4,999		NA	NA	NA	NA	NA	NA	76	45	24	112	50	19
5,000 to 9,999		NA	NA	NA	NA	NA	NA	48	48	47	10	72	(D)
10,000 to 24,999		NA	NA	NA	NA	NA	NA	782	749	640	437	494	335
25,000 or more		NA	NA	NA	NA	NA	NA	1,529	1,427	1,410	971	1,140	1,194

[1] Beginning in 1996, manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[2] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

[5] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-32. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1988–98 and projected 1999

Industry	SIC code	1988[1]	1989[1]	1990[1]	1991[1, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[2, 3]	1997[3]	1998[3]	Projected 1999[3]
		[In millions of dollars]											
Total		2,317	2,418	2,558	2,691	2,084	1,694	1,660	1,360	1,306	884	1,107	935
Chemicals and allied products	28	59	97	412	(D)	(D)	(D)	(D)	35	35	46	(D)	(D)
Petroleum refining and extraction	13,29	1,050	1,124	1,174	1,409	1,143	790	596	646	617	387	408	264
Machinery	35	229	246	220	(S)	146	177	270	108	110	78	56	32
Electrical equipment	36	123	92	90	101	159	114	174	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	211	160	199	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
All other manufacturing industries		450	451	173	(S)	41	24	73	30	33	27	81	67
Nonmanufacturing industries	07–10,12–17, 40–42,44–49, 50–59,60–65,67, 701,73,75–76, 78–79,80–81, 83–84,87,89	195	248	290	274	281	403	449	398	(D)	269	327	(D)

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-33. Federal funds for industrial energy R&D performance, by selected industry: 1988–98 and projected 1999

Industry	SIC code	1988[1]	1982[1]	1990[1]	1991[1, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[2, 3]	1997[3]	1998[3]	Projected 1999[3]
		[In millions of dollars]											
Total		1,389	1,371	1,446	1,924	1,141	1,053	888	970	878	756	694	670
Chemicals and allied products	28	13	14	5	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Petroleum refining and extraction	13,29	6	4	3	6	7	8	(D)	(D)	(D)	0	0	0
Machinery	35	15	14	34	(S)	(D)	(D)	(D)	(D)	(D)	(D)	0	0
Electrical equipment	36	557	555	537	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	441	417	427	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
All other manufacturing industries		1	0	2	1	2	2		1	1	0	2	2
Nonmanufacturing industries	07-10, 12-17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	356	367	438	423	313	233	359	(S) 134	49	102	43	(D)

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-34. Total (company, Federal, and other) funds for industrial energy R&D and projected 1999

Primary energy source	1988[1]	1989[1]	1990[1]	1991[1, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[2, 3]	1997[3]	1998[3]	Projected 1999[3]
	[In millions of dollars]											
Total	3,706	3,789	4,004	4,615	3,225	2,747	2,549	2,330	2,184	1,640	1,800	1,605
Fossil fuels	1,583	1,652	1,879	2,128	1,498	1,082	966	811	838	752	968	862
Oil	NA	(S)	NA	(S)	NA	693	NA	608	627	328	NA	NA
Gas	NA	(S)	NA	(S)	NA	215	NA	124	104	150	NA	NA
Shale	NA	77	NA	(S)	NA	(D)	NA	0	0	(D)	NA	NA
Coal	NA	(S)	NA	(S)	NA	97	NA	62	(D)	155	NA	NA
Synthetic fossil fuels	NA	17	NA	(S)	NA	23	NA	(D)	(D)	37	NA	NA
Mining	NA	(S)	NA	(S)	NA	(D)	NA	3	(D)	31	NA	NA
Other	NA	(S)	NA	(S)	NA	(D)	NA	(D)	(D)	87	NA	NA
Other fossil fuels	NA	(S)	NA	58	NA	(D)	NA	17	(D)	(D)	NA	NA
Nuclear	1,098	919	973	1,139	849	818	(D)	255	160	86	(D)	(D)
Fission	NA	856	NA	1,134	NA	(D)	NA	(D)	(D)	58	NA	NA
Fusion	NA	63	NA	5	NA	(D)	NA	(D)	(D)	28	NA	NA
Total geothermal, solar, and conservation and utilization	492	612	(D)	866	608	442	469	380	353	149	(D)	(D)
Geothermal	NA	(D)	NA	(S)	NA	90	NA	(D)	(D)	(D)	NA	NA
Solar	NA	(D)	NA	(S)	NA	59	NA	(D)	(D)	(D)	NA	NA
Conservation and utilization	NA	391	NA	(S)	NA	293	NA	219	201	101	NA	NA
All other energy	533	606	681	507	271	404	(D)	884	833	652	611	528

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-35. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1988–98 and projected 1999

Primary energy source	1988[1]	1989[1]	1990[1]	1991[1, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[2, 3]	1997[3]	1998[3]	Projected 1999[3]
	[In millions of dollars]											
Total	2,317	2,418	2,558	2,691	2,084	1,694	1,660	1,360	1,306	884	1,107	935
Fossil fuels	1,519	1,485	1,704	1,869	1,414	1,003	874	787	816	679	910	815
Oil	NA	(S)	NA	(S)	NA	(D)	NA	(D)	623	(D)	NA	NA
Gas	NA	(S)	NA	(S)	NA	210	NA	(D)	(D)	146	NA	NA
Shale	NA	(S)	NA	(S)	NA	0	NA	0	0	(D)	NA	NA
Coal	NA	(S)	NA	(S)	NA	57	NA	43	73	123	NA	NA
Synthetic fossil fuels	NA	(D)	NA	(S)	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Mining	NA	(D)	NA	(D)	NA	0	NA	3	(D)	17	NA	NA
Other	NA	(S)	NA	(D)	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Other fossil fuels	NA	(S)	NA	(S)	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Nuclear	117	39	72	46	72	58	(D)	(D)	(D)	47	(D)	(D)
Fission	NA	27	NA	45	NA	(D)	NA	63	(D)	(D)	NA	NA
Fusion	NA	12	NA	1	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Total geothermal, solar, and conservation and utilization	314	416	278	478	474	307	300	245	226	(D)	(D)	(D)
Geothermal	NA	(D)	NA	(S)	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Solar	NA	(D)	NA	(S)	NA	(D)	NA	14	(D)	(D)	NA	NA
Conservation and utilization	NA	384	NA	(S)	NA	203	NA	(D)	(D)	(D)	NA	NA
All other energy	367	478	504	298	124	325	(D)	(D)	(D)	(D)	(D)	(D)

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-36. Federal funds for industrial energy R&D performance, by primary energy source: 1988–98 and projected 1999

Primary energy source	1988[1]	1989[1]	1990[1]	1991[1, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[2, 3]	1997[3]	1998[3]	Projected 1999[3]
	[In millions of dollars]											
Total	1,389	1,371	1,446	1,924	1,141	1,053	888	970	878	756	694	670
Fossil fuels	63	(D)	(D)	(S)	84	79	92	24	22	73	58	46
Oil	NA	(S)	NA	(S)	NA	(D)	NA	(D)	4	(D)	NA	NA
Gas	NA	(S)	NA	(S)	NA	5	NA	(D)	(D)	4	NA	NA
Shale	NA	(S)	NA	(S)	NA	(D)	NA	0	0	(D)	NA	NA
Coal	NA	(S)	NA	(S)	NA	40	NA	19	(D)	32	NA	NA
Synthetic fossil fuels	NA	(D)	NA	(S)	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Mining	NA	(D)	NA	(D)	NA	(D)	NA	0	0	14	NA	NA
Other	NA	(S)	NA	(D)	NA	(S)	NA	(D)	(D)	(D)	NA	NA
Other fossil fuels	NA	(S)	NA	(S)	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Nuclear	979	859	885	1,093	776	759	536	(D)	(D)	39	(D)	(D)
Fission	NA	809	NA	1,089	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Fusion	NA	50	NA	4	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Total geothermal, solar, and conservation and utilization	178	(D)	(D)	(S)	135	136	169	135	127	(D)	(D)	(D)
Geothermal	NA	(D)	NA	11	NA	(D)	NA	(D)	(D)	7	NA	NA
Solar	NA	(D)	NA	38	NA	(D)	NA	(D)	(D)	(D)	NA	NA
Conservation and utilization	NA	(D)	NA	(S)	NA	(S)	NA	(D)	(D)	(D)	NA	NA
All other energy	165	(D)	174	(S)	146	79	(S) 91	(D)	(D)	(D)	(D)	(D)

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] Total (company, Federal, and other) funds for industrial energy R&D performance were not collected in 1996. As a result, the published 1996 data are the projected 1996 data as collected in 1995.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-37. Number of companies performing industrial energy R&D and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy
All Industries		41,923	57	38,921	5	1,158	3	1,244	12	288	8	183	18	128	11
Manufacturing		20,808	44	18,731	3	731	2	918	10	227	6	132	14	71	9
Food, kindred, and tobacco products	20,21	490	1	322	0	53	0	70	0	20	0	13	1	12	0
Textiles and apparel	22,23	138	0	51	0	39	0	31	0	7	0	7	0	2	0
Lumber, wood products, and furniture	24,25	271	0	216	0	13	0	27	0	11	0	5	0	0	0
Paper and allied products	26	285	2	201	0	20	0	39	0	11	1	8	0	6	1
Chemicals and allied products	28	706	6	506	0	73	0	81	3	27	1	14	1	5	1
Industrial chemicals	281–82,286	149	2	52	0	52	0	27	0	11	0	6	1	1	1
Drugs and medicines	283	151	1	109	0	3	0	25	1	5	0	6	0	3	0
Other chemicals	284–85,287–89	406	3	345	0	18	0	29	2	11	1	2	0	1	0
Petroleum refining and extraction	13,29	126	7	98	0	2	0	5	0	8	0	9	6	3	1
Rubber products	30	768	2	613	0	69	1	68	0	11	1	4	0	3	0
Stone, clay, and glass products	32	232	2	198	0	4	1	13	0	12	0	5	1	0	0
Primary metals	33	158	3	61	0	22	0	50	0	16	1	6	1	3	1
Ferrous metals and products	331–32,3398–99	107	3	54	0	2	0	33	0	13	1	4	1	1	1
Nonferrous metals and products	333–36	51	0	7	0	20	0	17	0	3	0	2	0	2	0
Fabricated metal products	34	1,136	0	973	0	80	0	58	0	12	0	9	0	4	0
Machinery	35	1,883	9	1,563	0	147	0	126	5	26	1	18	2	3	1
Office, computing, and accounting machines	357	136	0	86	0	22	0	16	0	6	0	5	0	1	0
Other machinery, except electrical	351–56,358–59	1,747	9	1,477	0	125	0	110	5	20	1	13	2	2	1
Electrical equipment	36	1,124	6	858	2	96	0	125	2	22	0	14	1	9	1
Radio and TV receiving equipment	365	15	0	11	0	1	0	3	0	0	0	0	0	0	0
Communication equipment	366	103	3	65	1	12	0	17	2	5	0	0	0	4	0
Electronic components	367	600	1	467	1	52	0	64	0	10	0	5	0	1	0
Other electrical equipment	361–64,369	406	2	314	0	31	0	41	0	7	0	9	1	4	1

See explanatory information and SOURCE at end of table.

Table A-37. Number of companies performing industrial energy R&D and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company											
				Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy
Transportation equipment	37	542	5	387	0	3	0	109	0	21	1	7	1	14	3
Motor vehicles and motor vehicles equipment	371	316	1	190	0	1	0	99	0	14	0	6	1	5	0
Other transportation equipment	373–75,379	203	0	195	0	1	0	4	0	1	0	0	0	2	0
Aircraft and missiles	372,376	23	4	2	0	1	0	6	0	6	1	1	0	7	3
Professional and scientific instruments	38	655	1	498	1	63	0	72	0	13	0	5	0	4	0
Scientific and mechanical measuring instruments	381–82	355	0	286	0	33	0	27	0	4	0	3	0	2	0
Optical, surgical, photographic, and other instruments	384–87	299	1	211	1	30	0	45	0	9	0	2	0	2	0
Other manufacturing industries[1]	27,31,39	12,295	0	12,186	0	47	0	42	0	9	0	7	0	3	0
Nonmanufacturing		21,115	13	20,191	2	428	1	327	2	61	2	52	4	57	2
Transportation and Utilities	40–42,44–49	324	6	176	0	60	0	41	1	18	1	13	3	16	1
Communications	48	113	0	100	0	1	0	2	0	0	0	1	0	9	0
Telephone communications	481	60	0	51	0	0	0	0	0	0	0	1	0	8	0
Other communications	482–484,489	53	0	49	0	1	0	2	0	0	0	0	0	1	0
Electric, gas, and sanitary services	49	110	6	4	0	54	0	27	1	16	1	9	3	1	1
Other transportation and utilities	40–42,44–47	101	0	72	0	6	0	12	0	2	0	3	0	6	0
Trade	50–59	3,752	0	3,368	0	222	0	127	0	8	0	6	0	21	0
Finance, insurance, and real estate	60–65,67	392	0	332	0	7	0	31	0	6	0	9	0	8	0
Services	701,72,73,75–81, 83,84,87,89	6,170	5	5,886	2	117	1	113	0	20	1	23	1	11	0
Business services	73	3,448	0	3,279	0	76	0	65	0	13	0	8	0	8	0
Computer and data processing services	737	3,069	0	2,924	0	72	0	53	0	10	0	5	0	4	0
Other business services	731–736,738	380	0	354	0	4	0	11	0	3	0	3	0	4	0

See explanatory information and SOURCE at end of table.

Table A-37. Number of companies performing industrial energy R&D and total number of R&D-performing companies, by industry and by size of company: 1998

Industry	SIC code	Total		Size of company: Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy
Health services	80	482	0	475	0	1	0	3	0	1	0	2	0	0	0
Offices and clinics of medical doctors , hospitals, medical and dental labs	801,806,807	365	0	361	0	1	0	1	0	0	0	2	0	0	0
Other health services	802–805,808–809	118	0	115	0	0	0	2	0	1	0	0	0	0	0
Engineering and management services	87	1,776	5	1,704	2	36	1	26	0	4	1	4	1	2	0
Engineering, architectural, and surveying	871	491	3	453	0	13	1	20	0	2	1	3	1	0	0
Research, development, and testing	873	940	2	930	2	8	0	1	0	0	0	0	0	1	0
Other engineering and management services	872,874	345	0	321	0	14	0	5	0	2	0	1	0	1	0
Other services	701,72,75–79,81, 83,84,89	464	0	428	0	4	0	20	0	2	0	9	0	1	0
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	10,477	2	10,429	0	22	0	15	1	9	0	1	0	1	1

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

NOTES: Energy R&D data are collected only on Form RD-1, the questionnaire sent to larger R&D-performing companies. Consequently, the universe of companies that perform energy R&D may not be represented by the statistics in this table. See the technical notes in Section B for more information on Form RD-1 and Form RD-1A.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-38. Total (company, Federal, and other) funds for industrial R&D performance by State for selected years: 1979–98

State	1979	1981	1983	1985	1987	1989[1]	1991[1, 2]	1993[2]	1995[2]	1997[2]	1998[2]
	[In millions of dollars]										
United States, total	38,226	51,810	65,268	84,239	92,155	102,055	116,952	117,400	132,103	157,539	169,180
Alabama	62	100	187	(S)	1,523	430	596	(S) 557	686	(S) 589	707
Alaska	(T)	(T)	(T)	(D)	10	9	21	14	30	24	189
Arizona	372	758	(T)	1,079	809	921	1,080	1,039	(S) 1,356	1,854	1,727
Arkansas	11	52	(T)	(D)	129	51	(S)	179	181	118	118
California	7,437	7,626	(T)	(S)	18,636	23,781	(S)	21,975	28,710	34,011	35,568
Colorado	269	529	741	988	1,207	1,167	(S)	1,966	1,865	2,248	3,565
Connecticut	985	1,514	1,682	2,129	2,121	2,421	1,756	2,228	3,906	3,014	3,113
Delaware	(T)	(T)	(T)	(D)	(D)	(D)	(D)	(S) 913	(S) 1,077	(S) 1,009	2,476
District of Columbia	33	(T)	(T)	(D)	(D)	(D)	46	(S) 515	(S) 672	(D)	(S) 503
Florida	620	1,449	(T)	1,973	2,041	2,352	(S)	2,386	4,101	3,442	3,300
Georgia	147	220	348	(D)	958	722	993	792	1,175	1,273	1,444
Hawaii	(T)	(T)	(T)	13	70	9	13	255	14	87	(S) 17
Idaho	(T)	(T)	(T)	451	467	(D)	(S)	686	827	(S) 1,181	(S) 1,028
Illinois	1,673	2,077	2,291	(D)	4,099	4,068	5,750	5,023	(S) 5,776	6,248	6,892
Indiana	723	1,054	(T)	(D)	1,860	1,823	2,274	2,141	(S) 2,721	2,677	(S) 2,622
Iowa	150	393	287	(D)	328	365	527	505	998	578	634
Kansas	216	211	293	(D)	1,128	406	(S)	(S) 280	569	(S) 1,136	(S) 1,279
Kentucky	209	170	191	(D)	238	227	176	282	452	359	427
Louisiana	83	158	257	(D)	128	169	(S)	106	61	172	102
Maine	40	(T)	(T)	(D)	39	33	(S)	(D)	286	83	82
Maryland	424	(T)	(T)	1,548	1,292	1,093	1,376	1,296	1,075	1,425	1,744
Massachusetts	1,690	1,907	2,466	4,495	5,255	5,851	(S)	5,960	7,416	8,300	10,604
Michigan	3,614	4,272	5,716	6,436	7,095	8,506	9,283	18,845	12,388	13,009	12,648
Minnesota	802	1,180	1,814	(D)	2,145	2,075	2,070	2,341	(S) 2,636	3,116	3,321
Mississippi	(T)	(T)	(T)	62	42	56	(S)	51	66	73	73
Missouri	746	1,137	(T)	(D)	1,823	2,391	(S)	(S) 1,339	(S) 2,028	(S) 1,290	(S) 1,313
Montana	(T)	(T)	(T)	(D)	7	(D)	(S)	(D)	17	92	82
Nebraska	15	28	26	(D)	59	64	67	93	150	71	93
Nevada	(T)	(T)	(T)	(S)	55	29	95	65	322	380	434
New Hampshire	(T)	(T)	(T)	(D)	90	(D)	(D)	247	472	652	1,187
New Jersey	2,191	3,355	4,364	5,975	5,876	6,410	8,933	8,009	8,200	11,069	10,415
New Mexico	(T)	(T)	(T)	(D)	950	1,039	1,217	(D)	1,461	(S) 1,310	(S) 1,205

See explanatory information and SOURCE at end of table.

Table A-38. Total (company, Federal, and other) funds for industrial R&D performance by State for selected years: 1979–98

State	1979	1981	1983	1985	1987	1989[1]	1991[1, 2]	1993[2]	1995[2]	1997[2]	1998[2]
	[In millions of dollars]										
New York	2,959	4,057	5,951	7,561	6,276	8,107	9,457	8,597	8,651	(S) 9,939	11,176
North Carolina	327	546	786	(D)	1,666	1,311	1,470	1,886	2,226	3,590	3,362
North Dakota	(T)	(T)	(T)	10	57	(S)	(S)	(D)	12	33	34
Ohio	1,635	1,781	2,282	3,067	3,415	3,964	5,406	4,494	4,001	5,608	5,338
Oklahoma	174	339	407	(D)	367	333	448	299	288	428	245
Oregon	116	(T)	(T)	(D)	281	357	(S)	455	741	1,102	1,492
Pennsylvania	2,143	3,003	3,963	3,844	4,430	4,653	(S)	4,652	5,331	(S) 6,609	7,083
Rhode Island	49	87	171	213	224	140	174	154	520	(S) 704	(S) 1,320
South Carolina	82	(T)	(T)	(D)	500	388	479	461	739	(S) 783	695
South Dakota	(T)	(T)	(T)	(S)	4	4	6	(D)	19	26	5
Tennessee	(T)	(T)	(T)	(D)	621	934	843	788	1,003	1,089	2,040
Texas	1,233	(T)	(T)	3,762	4,077	5,051	5,439	4,562	(S) 6,211	7,265	8,408
Utah	142	265	242	(D)	774	389	407	279	803	1,027	1,109
Vermont	(T)	(T)	(T)	(D)	236	(D)	(D)	(D)	248	246	112
Virginia	464	539	941	862	1,284	1,131	1,275	1,046	1,577	1,767	2,707
Washington	(T)	(T)	(T)	2,351	2,939	2,728	3,677	(S) 4,575	(S) 4,294	(S) 6,610	(S) 7,476
West Virginia	(T)	(T)	(T)	(D)	83	(D)	(D)	(S) 100	243	(D)	(S) 225
Wisconsin	420	558	(T)	728	1,165	1,035	1,304	1,296	1,706	1,707	1,919
Wyoming	(T)	(T)	2	3	4	(D)	2	15	25	28	(S) 2
Undistributed funds	3,245	(T)	3,931	1,495	2,281	2,945	772	683	(S) 1,773	(S) 7,211	(S) 5,520

[1] As a result of a new sample design, statistics for 1989–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

[2] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years.

KEY: (D) = Data have been withheld to avoid disclosing information about individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
(T) = Data are not separately available but included in total.

NOTES: The 1993 data collected during the 1995 survey includes respondent revisions for both total R&D and State R&D allocations. Companies new to the survey may not have reported data by State on the report form they received and may not have had 1993 State data on their 1995 form. For these companies, 1993 State data were allocated to the State in which the company's headquarters was located.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-39. Total (company, Federal, and other) funds for industrial R&D performance, by State and by source of funds: 1998

State	Total	Federal	Company
	[In millions of dollars]		
United States, total	169,180	24,164	145,017
Alabama	707	180	527
Alaska	189	180	9
Arizona	1,727	(S) 490	1,237
Arkansas	118	(D)	(D)
California	35,568	(S) 3,803	31,764
Colorado	3,565	1,237	2,329
Connecticut	3,113	179	2,935
Delaware	2,476	13	2,463
District of Columbia	(S) 503	90	413
Florida	3,300	889	2,411
Georgia	1,444	86	1,358
Hawaii	(S) 17	(D)	(D)
Idaho	(S) 1,028	(D)	(D)
Illinois	6,892	(S) 136	6,755
Indiana	(S) 2,622	(D)	(D)
Iowa	634	(D)	(D)
Kansas	(S) 1,279	(D)	(D)
Kentucky	427	(D)	(D)
Louisiana	102	14	87
Maine	82	(D)	(D)
Maryland	1,744	655	1,089
Massachusetts	10,604	(S) 2,419	8,185
Michigan	12,648	(D)	(D)
Minnesota	3,321	(S) 334	2,986
Mississippi	73	(S) 17	57
Missouri	(S) 1,313	(D)	(D)
Montana	82	(D)	(D)
Nebraska	93	(D)	(D)
Nevada	434	(D)	(D)
New Hampshire	1,187	(D)	(D)
New Jersey	10,415	(S) 134	10,282
New Mexico	(S) 1,205	(D)	(D)
New York	11,176	(S) 2,216	8,960
North Carolina	3,362	12	3,350
North Dakota	34	0	34
Ohio	5,338	605	4,732
Oklahoma	245	2	243
Oregon	1,492	(S) 26	1,467
Pennsylvania	7,083	(S) 485	6,598
Rhode Island	(S) 1,320	(D)	(D)
South Carolina	695	(D)	(D)
South Dakota	5	0	5
Tennessee	2,040	(D)	(D)
Texas	8,408	(S) 223	8,185

See explanatory information and SOURCE at end of table.

Table A-39. Total (company, Federal, and other) funds for industrial R&D performance, by State and by source of funds: 1998

State	Total	Federal	Company
	[In millions of dollars]		
Utah	1,109	(S) 181	928
Vermont	112	(S) 32	80
Virginia	2,707	1,614	1,093
Washington	(S) 7,476	(D)	(D)
West Virginia	(S) 225	(D)	(D)
Wisconsin	1,919	(D)	(D)
Wyoming	(S) 2	0	2
Undistributed funds	(S) 5,520	(S) 934	4,582

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTE: The R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-40. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company, for the U.S. and top 10 R&D-performing States: 1998

Industry and size of company	SIC code	U.S., total	California	Michigan	New York	Massa-chusetts	New Jersey	Texas	Wash-ington	Pennsyl-vania	Illinois	Ohio	All other States plus undistributed
		[In millions of dollars]											
Distribution by industry:													
All industries		169,180	35,568	12,648	11,176	10,604	10,415	8,408	(S) 7,476	7,083	6,892	5,338	53,576
Manufacturing		120,401	22,293	11,707	(S) 8,149	6,363	8,781	(S) 5,381	(S) 4,422	5,585	6,195	4,503	37,026
Food, kindred, and tobacco products	20,21	1,711	(S) 33	134	(S) 112	7	189	14	16	63	270	32	839
Textiles and apparel	22,23	(D)	(D)	0	(D)	16	0	40	0	12	(D)	(D)	453
Lumber, wood products, and furniture	24,25	374	31	(S) 88	4	0	(D)	3	(D)	5	5	(D)	233
Paper and allied products	26	(D)	(D)	(D)	(D)	25	(D)	(D)	82	168	21	24	1,109
Chemicals and allied products	28	21,764	1,710	995	2,616	(D)	3,728	419	(D)	2,304	(S) 1,317	1,133	6,771
Industrial chemicals	281–82,286	(D)	(D)	377	1,730	(S) 155	(S) 514	295	(D)	725	(D)	221	2,445
Drugs and medicines	283	12,571	1,338	(D)	597	352	2,953	(D)	(D)	1,513	(D)	(D)	3,825
Other chemicals	284–85,287–89	(D)	(D)	(D)	(S) 289	(D)	(S) 261	(D)	(D)	(S) 66	116	(D)	502
Petroleum refining and extraction	13,29	1,808	(D)	(D)	(D)	(D)	(D)	535	0	14	(D)	(D)	481
Rubber products	30	(D)	145	159	66	35	38	(D)	9	53	42	(S) 736	502
Stone, clay, and glass products	32	(D)	5	(S) 58	(D)	0	(D)	10	0	(S) 130	(D)	(S) 90	77
Primary metals	33	(D)	(D)	15	30	12	(D)	(S) 50	(D)	(S) 155	56	49	436
Ferrous metals and products	331–32, 3398–99	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	41	24	(D)	306
Nonferrous metals and products	333–36	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	31	(D)	130
Fabricated metal products	34	1,595	(S) 216	95	35	173	54	(D)	(D)	(S) 121	56	156	664
Machinery	35	14,919	4,957	362	355	485	(D)	(S) 741	(D)	527	904	346	4,590
Office, computing, and accounting machines	357	8,905	3,878	(D)	(D)	418	(D)	(D)	(D)	202	33	(S) 63	2,277
Other machinery, except electrical	351–56,358–59	6,014	1,079	(D)	(D)	67	82	(D)	86	325	871	283	2,313

See explanatory information and SOURCE at end of table.

Table A-40. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company, for the U.S. and top 10 R&D-performing States: 1998

Industry and size of company	SIC code	U.S., total	California	Michigan	New York	Massa-chusetts	New Jersey	Texas	Wash-ington	Pennsyl-vania	Illinois	Ohio	All other States plus undistributed
		[In millions of dollars]											
Distribution by industry:													
Electrical equipment	36	25,990	(S) 7,901	127	673	2,002	(D)	(S) 3,116	(D)	640	2,753	755	6,427
Radio and TV receiving equipment	365	155	22	(D)	0	(D)	0	0	0	(D)	(D)	0	24
Communication equipment	366	(D)	(S) 1,125	(D)	68	812	(D)	(S) 1,718	(D)	(D)	(D)	89	3,425
Electronic components	367	(D)	5,921	24	142	543	52	(S) 1,314	81	(S) 212	210	(D)	1,345
Other electrical equipment	361–64,369	4,811	(S) 834	59	464	(D)	(D)	(S) 83	11	137	(S) 218	(D)	1,634
Transportation equipment	37	29,279	(S) 3,760	9,532	(S) 2,796	(D)	64	132	(D)	378	167	894	8,263
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(S) 56	(D)	(D)	(D)	(D)	(S) 35	104	669	1,726
Other transportation equipment	373–75,379	(D)	(S) 294	(D)	0	(D)	(D)	(D)	0	(D)	(D)	0	226
Aircraft and missiles	372,376	14,449	(D)	273	(S) 2,740	28	50	100	(D)	(D)	(D)	(S) 225	6,312
Professional and scientific instruments	38	(D)	2,810	(D)	(S) 1,102	(S) 2,784	(S) 1,198	91	104	(S) 933	(S) 373	162	4,993
Scientific and mechanical measuring instruments	381–82	(D)	(S) 1,992	(D)	(D)	(S) 2,424	(D)	38	57	68	(D)	110	3,619
Optical, surgical, photographic, and other instruments	384–87	6,085	819	81	(D)	360	(D)	(S) 53	47	(S) 864	(D)	53	1,374
Other manufacturing industries[1]	27,31,39	2,795	373	35	68	209	137	137	336	(S) 84	119	109	1,188
Nonmanufacturing		48,780	13,275	940	3,027	4,242	(S) 1,635	3,027	(S) 3,055	1,498	696	835	16,550
Transportation and utilities	40–42,44–49	(D)	195	14	(D)	(D)	(D)	84	(D)	(S) 217	(D)	22	1,025
Communications	48	(D)	169	0	(D)	(D)	(D)	(D)	0	(D)	0	0	(D)
Telephone communications	481	(D)	111	0	(D)	(D)	(D)	(D)	0	24	0	0	646
Other communications	482–484,489	(D)	58	0	0	0	(D)	0	0	(D)	0	0	(D)
Electric, gas, and sanitary services	49	(D)	(D)	14	39	3	5	(D)	(D)	14	(D)	(D)	68
Other transportation and utilities	40–42,44–47	(D)	(D)	0	0	0	0	12	0	(D)	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-40. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company, for the U.S. and top 10 R&D-performing States: 1998

Industry and size of company	SIC code	U.S., total	California	Michigan	New York	Massa-chusetts	New Jersey	Texas	Wash-ington	Pennsyl-vania	Illinois	Ohio	All other States plus undistributed
		[In millions of dollars]											
Distribution by industry:													
Trade	50–59	11,336	3,313	286	1,369	(S) 1,771	140	415	79	260	67	30	3,607
Finance, insurance, and real estate	60–65,67	(D)	(S) 28	0	(D)	(D)	(D)	57	0	1	64	(D)	650
Services	701,72,73, 75–81,83, 84,87,89	29,281	8,049	501	1,077	1,799	(S) 744	2,133	(S) 2,876	976	513	641	9,972
Business services	73	15,222	3,558	322	805	812	(S) 455	1,431	(S) 2,695	218	(D)	266	4,521
Computer and data processing services	737	(D)	3,502	319	794	(D)	(S) 414	1,391	(D)	210	132	(D)	4,339
Other business services	731–736,738	(D)	57	3	11	(D)	41	40	(D)	8	(D)	(D)	182
Health services	80	1,207	63	(D)	(D)	0	(D)	517	0	(D)	0	9	82
Offices and clinics of medical doctors, hospitals, medical dental labs	801,806,807	1,096	5	(D)	0	0	(D)	517	0	(D)	0	(D)	43
Other health services	802–805, 808–809	111	58	0	(D)	0	7	0	0	0	0	(D)	39
Engineering and management services	87	11,835	4,340	175	266	986	(D)	185	(D)	179	362	353	4,566
Engineering, architectural, and surveying	871	2,025	510	23	26	(S) 99	48	(S) 91	12	10	(S) 16	36	1,153
Research, development, and testing	873	9,169	3,752	149	172	689	168	93	162	151	291	298	3,244
Other engineering and management services	872,874	641	78	4	68	198	(D)	1	(D)	18	54	19	170
Other services	701,72,75–79, 81,83,84,89	1,017	88	(D)	(D)	(D)	(D)	0	(D)	(D)	(D)	14	802
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,830	1,690	139	94	30	61	338	(D)	43	(D)	(D)	1,295

See explanatory information and SOURCE at end of table.

Table A-40. Total (company, Federal, and other) funds for industrial R&D performance, by industry and by size of company, for the U.S. and top 10 R&D-performing States: 1998

Industry and size of company		U.S., total	California	Michigan	New York	Massa-chusetts	New Jersey	Texas	Wash-ington	Pennsyl-vania	Illinois	Ohio	All other States plus undistributed
		[In millions of dollars]											
Distribution by size of company: [Number of employees]													
Total		169,180	35,568	12,648	11,176	10,604	10,415	8,408	(S) 7,476	7,083	6,892	5,338	53,576
Fewer than 500		30,175	9,127	1,028	2,588	2,177	570	1,308	1,145	721	664	570	10,276
500 to 999		5,495	1,635	(S) 102	220	619	147	99	74	199	138	398	1,864
1,000 to 4,999		21,525	6,074	753	730	1,368	872	770	192	1,619	859	535	7,752
5,000 to 9,999		14,053	3,169	627	(S) 676	904	1,441	(S) 894	50	440	374	588	4,890
10,000 to 24,999		24,876	2,833	961	(S) 960	(S) 1,875	2,673	(S) 2,475	(D)	(D)	(S) 731	(S) 697	7,445
25,000 or more		73,055	(S) 12,729	9,177	(S) 6,002	(S) 3,661	(S) 4,712	(S) 2,861	(D)	(D)	(S) 4,125	2,549	21,348

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-41. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by type of cost: 1998

Industry and size of company	SIC code	Total R&D costs	Wages of R&D personnel	Materials and supplies	R&D depreciation	Other costs
		[In millions of dollars]	[Percent]			
Distribution by industry						
All industries		169,180	(S) 48.0	(S) 16.9	1.2	(S) 33.9
Manufacturing		120,401	(S) 44.9	(S) 19.1	1.3	(S) 34.8
Food, kindred, and tobacco products	20,21	1,711	48.3	10.7	1.3	39.8
Textiles and apparel	22,23	(D)	(S) 51.4	(S) 23.3	0.1	(S) 25.2
Lumber, wood products, and furniture	24,25	374	59.8	(S) 23.1	1.4	15.8
Paper and allied products	26	(D)	(S) 50.5	(S) 14.1	0.5	(S) 34.9
Chemicals and allied products	28	21,764	(S) 43.2	(S) 12.2	2.5	(S) 42.0
Industrial chemicals	281–82,286	(D)	(S) 52.0	(S) 12.7	1.6	(S) 33.7
Drugs and medicines	283	12,571	(S) 39.5	12.3	2.9	(S) 45.3
Other chemicals	284–85,287–89	(D)	46.1	9.3	3.0	41.6
Petroleum refining and extraction	13,29	1,808	(S) 43.3	(S) 14.0	1.2	(S) 41.4
Rubber products	30	(D)	(S) 48.4	23.3	0.5	(S) 27.8
Stone, clay, and glass products	32	(D)	(S) 39.7	15.7	3.1	41.5
Primary metals	33	(D)	57.4	13.3	0.4	(S) 28.9
Ferrous metals and products	331–32,3398–99	(D)	(S) 50.0	12.3	0.1	(S) 37.6
Nonferrous metals and products	333–36	(D)	71.3	15.3	1.0	(S) 12.4
Fabricated metal products	34	1,595	52.0	(S) 16.6	0.8	(S) 30.6
Machinery	35	14,919	37.8	14.2	1.7	46.3
Office, computing, and accounting machines	357	8,905	32.6	8.8	1.6	56.9
Other machinery, except electrical	351–56,358–59	6,014	47.0	23.2	1.9	28.0
Electrical equipment	36	25,990	(S) 50.6	(S) 20.9	1.3	(S) 27.2
Radio and TV receiving equipment	365	155	65.9	7.9	2.5	23.7
Communication equipment	366	(D)	(S) 53.1	(S) 27.0	0.4	(S) 19.5
Electronic components	367	(D)	(S) 49.6	(S) 15.9	2.1	(S) 32.4
Other electrical equipment	361–64,369	4,811	46.2	15.9	1.6	(S) 36.3
Transportation equipment	37	29,279	(S) 38.2	28.1	0.5	(S) 33.1
Motor vehicles and motor vehicles equipment	371	(D)	39.0	32.3	0.5	28.2
Other transportation equipment	373–75,379	(D)	(S) 55.5	19.7	0.0	24.8
Aircraft and missiles	372,376	14,449	(S) 36.8	(S) 24.5	0.5	(S) 38.2
Professional and scientific instruments	38	(D)	(S) 53.1	(S) 13.5	0.5	(S) 32.9
Scientific and mechanical measuring instruments	381–82	(D)	(S) 54.0	(S) 12.8	0.3	(S) 32.8
Optical, surgical, photographic, and other instruments	384–87	6,085	(S) 51.8	(S) 14.5	0.7	(S) 32.9
Other manufacturing industries[1]	27,31,39	2,795	(S) 79.5	9.4	0.3	10.8

See explanatory information and SOURCE at end of table.

Table A-41. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by type of cost: 1998

Industry and size of company	SIC code	Total R&D costs	Wages of R&D personnel	Materials and supplies	R&D depreciation	Other costs
		[In millions of dollars]	[Percent]			
Distribution by industry						
Nonmanufacturing		48,780	59.0	(S) 9.7	1.3	30.1
Transportation and Utilities	40–42,44–49	(D)	(S) 52.3	(S) 7.9	0.9	(S) 38.8
Communications	48	(D)	(S) 52.0	(S) 7.1	1.1	(S) 39.8
Telephone communications	481	(D)	(S) 52.5	(S) 7.3	1.2	(S) 39.0
Other communications	482–484,489	(D)	49.4	5.8	0.0	44.8
Electric, gas, and sanitary services	49	(D)	(S) 41.7	17.9	0.0	40.4
Other transportation and utilities	40–42,44–47	(D)	66.8	8.5	0.0	24.7
Trade	50–59	11,336	55.1	12.0	2.9	30.0
Finance, insurance, and real estate	60–65,67	(D)	(S) 66.6	(S) 7.5	0.0	(S) 25.9
Services	701,72,73,75–81, 83,84,87,89	29,281	(S) 58.9	(S) 9.5	0.8	30.8
Business services	73	15,222	64.5	(S) 4.9	0.5	(S) 30.1
Computer and data processing services	737	(D)	64.5	(S) 4.9	0.5	(S) 30.1
Other business services	731–736,738	(D)	(S) 63.1	3.9	0.0	(S) 33.0
Health services	80	1,207	64.9	20.2	0.0	14.9
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	1,096	64.8	21.5	0.0	13.7
Other health services	802–805,808–809	111	66.2	5.1	0.5	28.2
Engineering and management services	87	11,835	(S) 49.5	(S) 14.9	1.3	34.3
Engineering, architectural, and surveying	871	2,025	(S) 48.2	(S) 14.3	0.7	(S) 36.8
Research, development, and testing	873	9,169	48.0	(S) 15.7	1.4	34.9
Other engineering and management services	872,874	641	(S) 93.3	0.2	0.0	6.5
Other services	701,72,75–79,81, 83,84,89	1,017	86.3	2.8	0.3	10.5
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,830	90.3	2.5	0.0	7.2

See explanatory information and SOURCE at end of table.

Table A-41. Total (company, Federal, and other) funds for industrial R&D performance, by industry, by size of company, and by type of cost: 1998

Industry and size of company		Total R&D costs	Wages of R&D personnel	Materials and supplies	R&D depreciation	Other costs
		[In millions of dollars]	[Percent]			
Distribution by size of company: [Number of employees]						
Total		169,180	(S) 48.0	(S) 16.9	1.2	(S) 33.9
Fewer than 500		30,175	78.1	5.9	0.8	15.2
500 to 999		5,495	53.0	13.3	1.7	32.1
1,000 to 4,999		21,525	49.7	12.6	2.4	35.3
5,000 to 9,999		14,053	(S) 50.9	(S) 15.2	1.1	(S) 32.7
10,000 to 24,999		24,876	(S) 48.2	(S) 14.4	1.4	(S) 36.0
25,000 or more		73,055	(S) 43.1	(S) 20.6	0.9	(S) 35.4

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-42. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and by size of company: 1988–99

Industry and size of company	SIC code	1988[2]	1989[2]	1990[2]	1991[2, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[3]	1997[3]	1998[3]	1999[3]
		[In thousands]											
Total (Annual average)[1]		715.6	733.0	758.5	776.4	772.0	766.6	757.3	789.4	859.3	918.6	974.6	NA
Distribution by industry:													
Total (January)		708.6	722.5	743.6	773.4	779.3	764.7	768.5	746.1	832.8	885.7	951.5	997.7
Manufacturing		606.7	597.3	NA	NA	576.7	568.2	571.1	547.2	606.2	639.9	682.1	659.1
Food, kindred, and tobacco products	20,21	(S)	(S)	(S)	9.4	9.8	9.6	10.3	8.9	9.8	10.4	11.0	10.4
Textiles and apparel	22,23	2.4	2.5	2.8	(S)	2.8	3.1	3.3	2.9	3.8	3.7	3.2	2.8
Lumber, wood products, and furniture	24,25	1.3	1.4	(S)	(S)	1.5	1.6	3.3	2.3	2.9	3.4	3.6	3.5
Paper and allied products	26	6.1	6.4	8.5	(S)	10.7	10.6	10.6	10.6	(S) 11.0	(S) 11.2	(S) 10.4	(S) 12.3
Chemicals and allied products	28	75.8	78.3	80.4	81.6	85.6	86.5	93.1	99.6	94.3	89.0	89.5	90.7
Industrial chemicals	281–82,286	(S)	(S)	(S)	(S)	29.9	26.4	28.8	33.7	28.4	31.2	26.7	26.6
Drugs and medicines	283	33.0	34.4	34.3	35.4	38.7	42.3	48.5	50.3	49.0	43.1	45.3	50.0
Other chemicals	284–85,287–89	20.3	18.8	18.9	17.0	17.0	17.8	15.8	15.6	16.9	14.8	17.5	14.1
Petroleum refining and extraction	13,29	9.5	10.7	11.1	11.4	11.5	11.0	9.7	8.4	8.4	9.0	7.9	8.0
Rubber products	30	(S)	(S)	(S)	(S)	14.8	13.0	9.0	9.8	10.2	9.9	11.5	12.8
Stone, clay, and glass products	32	8.6	7.6	7.0	6.0	5.3	5.1	4.0	4.3	3.9	3.7	(S) 3.9	4.0
Primary metals	33	5.6	5.5	5.2	4.6	5.1	4.6	5.1	6.5	4.1	(S) 5.5	(S) 6.4	6.1
Ferrous metals and products	331–32,3398–99	2.3	2.3	(S)	(S)	1.7	1.6	2.6	1.9	1.6	1.6	(S) 4.0	(S) 3.9
Nonferrous metals and products	333–36	3.3	3.3	3.3	3.0	(S)	(S)	2.5	4.6	2.5	(S) 3.9	2.5	2.2
Fabricated metal products	34	10.5	9.9	10.1	(S)	8.7	7.9	10.2	9.2	9.1	10.0	12.8	12.2
Machinery	35	98.4	100.4	113.3	109.7	99.3	97.4	70.4	68.6	87.3	88.7	112.1	96.1
Office, computing, and accounting machines	357	74.4	75.0	84.7	77.6	67.1	65.8	34.6	31.8	33.7	45.3	66.1	45.6
Other machinery, except electrical	351–56,358–59	24.0	25.4	28.6	32.1	32.2	31.6	35.8	36.8	53.6	43.4	46.0	50.5
Electrical equipment	36	132.5	122.5	105.2	95.9	91.9	89.2	96.5	103.3	125.8	135.9	171.6	(S) 173.8
Radio and TV receiving equipment	365	1.3	1.5	0.8	1.0	1.0	1.0	0.8	0.9	1.3	1.6	1.2	1.5
Communication equipment	366	73.1	58.0	47.1	35.8	31.2	(S)	(S) 36.0	(S) 41.7	(S) 34.7	(S) 37.6	69.0	(S) 92.3
Electronic components	367	44.3	42.8	(S)	32.6	28.4	28.9	40.1	40.8	(S) 64.6	(S) 75.3	(S) 66.8	(S) 53.1
Other electrical equipment	361–64,369	(S)	(S)	21.3	(S)	31.2	28.8	19.6	20.0	25.3	21.4	34.6	26.9

See explanatory information and SOURCE at end of table.

Table A-42. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and by size of company: 1988–99

Industry and size of company	SIC code	1988[2]	1989[2]	1990[2]	1991[2, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[3]	1997[3]	1998[3]	1999[3]
		[In thousands]											
Distribution by industry:													
Transportation equipment	37	188.2	185.4	170.2	149.7	141.1	147.5	129.6	120.8	156.6	(S) 161.8	(S) 144.1	133.0
Motor vehicles and motor vehicles equipment	371	47.3	45.8	49.4	45.3	44.5	45.1	51.0	51.1	57.0	63.8	64.1	62.8
Other transportation equipment	373–75,379	(S)	(S)	(S)	(S)	(S)	(S)	(S) 5.8	6.2	4.0	3.4	3.1	(S) 3.8
Aircraft and missiles	372,376	136.4	134.8	115.3	100.2	92.9	97.9	72.8	63.5	95.5	(S) 94.6	(S) 77.0	(S) 66.4
Professional and scientific instruments	38	(S)	(S)	(S)	(S)	(S)	(S)	(S) 100.6	84.4	(S) 70.9	(S) 64.3	(S) 66.3	(S) 58.4
Scientific and mechanical measuring instruments	381–82	(S)	(S)	(S)	(S)	(S)	(S)	(S) 66.4	63.2	(S) 48.2	(S) 42.6	(S) 43.7	(S) 34.0
Optical, surgical, photographic, and other instruments	384–87	24.9	14.5	8.1	(S)	(S)	20.8	34.2	21.2	22.7	21.7	22.6	(S) 24.4
Other manufacturing industries[4]	27,31,39	6.4	5.4	5.6	(S)	6.0	5.8	15.5	7.5	8.2	33.4	27.8	34.8
Nonmanufacturing[5]		101.9	125.2	(S)	(S)	202.6	196.5	197.4	198.9	226.6	245.8	269.5	338.7
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	NA	29.3	29.4	15.2	(S) 16.1
Communications	48	NA	NA	NA	NA	NA	NA	NA	NA	25.4	24.7	(S) 8.4	(S) 14.1
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	NA	24.7	23.9	(S) 7.8	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	NA	0.8	0.8	0.6	(D)
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	NA	(S) 3.2	(S) 4.0	1.1	1.0
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	NA	0.7	0.8	5.7	1.0
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	NA	47.5	39.6	46.4	65.0
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	NA	5.6	15.9	(S)18.3	17.5
Services	701,72,73,75–81, 83,84,87,89	NA	NA	NA	NA	NA	NA	NA	NA	139.6	143.9	168.7	196.7
Business services	73	NA	NA	NA	NA	NA	NA	NA	NA	80.2	87.8	105.1	127.5
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	NA	77.3	85.1	102.6	122.8
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	NA	3.0	2.8	2.5	4.7
Health services	80	NA	NA	NA	NA	NA	NA	NA	NA	5.0	6.6	4.7	4.6
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	NA	4.4	6.3	4.0	3.4
Other health services	802–805,808–809	NA	NA	NA	NA	NA	NA	NA	NA	0.6	(S) 0.3	0.7	1.2

See explanatory information and SOURCE at end of table.

Table A-42. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and by size of company: 1988–99

Industry and size of company	SIC code	1988[2]	1989[2]	1990[2]	1991[2, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[3]	1997[3]	1998[3]	1999[3]
		[In thousands]											
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	NA	52.9	45.3	54.5	57.6
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	NA	(S) 22.8	18.0	20.9	16.5
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	NA	28.8	24.9	28.3	34.8
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	NA	1.4	(S) 2.3	5.3	6.3
Other services	701,72,75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	NA	1.5	4.2	4.4	7.0
Other nonmanufacturing industries[4]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	NA	4.6	17.0	20.8	43.4
Distribution by size of company: [Number of employees]													
Total		708.6	722.5	743.6	773.4	779.3	764.7	768.5	746.1	832.8	885.7	951.5	997.7
Fewer than 500		109.0	105.4	(S)	(S)	142.1	125.1	148.6	139.8	165.1	177.3	201.8	231.0
500 to 999		19.3	18.0	18.6	18.6	46.2	46.1	27.9	29.7	36.6	37.7	41.3	44.5
1,000 to 4,999		81.9	76.1	75.4	79.3	94.2	99.3	108.9	110.8	124.4	131.6	137.8	139.9
5,000 to 9,999		40.2	47.3	57.2	55.1	57.6	56.4	60.3	52.8	61.1	82.2	100.6	103.3
10,000 to 24,999		94.5	87.0	73.9	90.3	99.9	102.6	90.6	91.8	97.0	104.9	116.5	122.2
25,000 or more		363.7	388.7	404.2	408.4	339.2	335.2	332.1	321.2	348.6	(S) 351.9	(S) 353.5	356.8

[1] The annual average number of full-time-equivalent (FTE) R&D scientists and engineers is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. The result is attributed to the earlier year.

[2] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years.

[4] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[5] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-43. Number of full-time equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry, by size of company, and by source of R&D funds: January 1999

Industry	SIC code	Total	Federal	Company
		[In thousands]		
Distribution by industry:				
All industries		997.7	(S) 100.0	897.7
Manufacturing		659.1	(S) 77.7	(S) 581.5
Food, kindred, and tobacco products	20,21	10.4	0.0	10.4
Textiles and apparel	22,23	2.8	(D)	(D)
Lumber, wood products, and furniture	24,25	3.5	(D)	(D)
Paper and allied products	26	(S) 12.3	(D)	(D)
Chemicals and allied products	28	90.7	(S) 0.6	90.1
Industrial chemicals	281–82,286	26.6	(S) 0.4	(S) 26.2
Drugs and medicines	283	50.0	(D)	(D)
Other chemicals	284–85,287–89	14.1	(D)	(D)
Petroleum refining and extraction	13,29	8.0	(D)	(D)
Rubber products	30	12.8	(D)	(D)
Stone, clay, and glass products	32	4.0	(D)	(D)
Primary metals	33	6.1	(D)	(D)
Ferrous metals and products	331–32,3398–99	(S) 3.9	(D)	(D)
Nonferrous metals and products	333–36	2.2	(D)	(D)
Fabricated metal products	34	12.2	(D)	(D)
Machinery	35	96.1	(S) 0.4	95.7
Office, computing, and accounting machines	357	45.6	(D)	(D)
Other machinery, except electrical	351–56,358–59	50.5	(D)	(D)
Electrical equipment	36	(S) 173.8	(S) 16.8	(S) 157.0
Radio and TV receiving equipment	365	1.5	0.0	1.5
Communication equipment	366	(S) 92.3	(D)	(D)
Electronic components	367	(S) 53.1	(S) 0.2	(S) 52.9
Other electrical equipment	361–64,369	26.9	(D)	(D)
Transportation equipment	37	133.0	(S) 44.0	89.0
Motor vehicles and motor vehicles equipment	371	62.8	(D)	(D)
Other transportation equipment	373–75,379	(S) 3.8	(D)	(D)
Aircraft and missiles	372,376	(S) 66.4	(S) 42.2	24.2
Professional and scientific instruments	38	(S) 58.4	(S) 13.0	(S) 45.4
Scientific and mechanical measuring instruments	381–82	(S) 34.0	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	(S) 24.4	(D)	(D)
Other manufacturing industries[1]	27,31,39	34.8	(D)	(D)
Nonmanufacturing		338.7	(S) 22.3	316.4
Transportation and utilities	40–42,44–49	(S) 16.1	(D)	(D)
Communications	48	(S) 14.1	(D)	(D)
Telephone communications	481	(S) 9.2	(D)	(D)
Other communications	482–484,489	(D)	(D)	(D)
Electric, gas, and sanitary services	49	1.0	(D)	(D)
Other transportation and utilities	40–42,44–47	1.0	0.0	(S) 1.0

See explanatory information and SOURCE at end of table.

Table A-43. Number of full-time equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry, by size of company, and by source of R&D funds: January 1999

Industry	SIC code	Total	Federal	Company
		[In thousands]		
Distribution by industry:				
Trade	50–59	65.0	(S) 0.4	64.6
Finance, insurance, and real estate	60–65,67	17.5	0.0	17.5
Services	701,72,73,75–81, 83,84,87,89	196.7	(S) 16.5	180.2
Business services	73	127.5	2.5	125.0
Computer and data processing services	737	122.8	(D)	(D)
Other business services	731–736,738	4.7	(D)	(D)
Health services	80	4.6	(D)	(D)
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	3.4	(D)	(D)
Other health services	802–805,808–809	1.2	(D)	(D)
Engineering and management services	87	57.6	(S) 13.8	43.8
Engineering, architectural, and surveying	871	16.5	(S) 8.7	7.8
Research, development, and testing	873	34.8	(D)	(D)
Other engineering and management services	872,874	6.3	(D)	(D)
Other services	701,72,75–79,81, 83,84,89	7.0	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	43.4	(D)	(D)
Distribution by size of company: [Number of employees]				
Total		997.7	(S) 100.0	897.7
Fewer than 500		231.0	5.8	225.2
500 to 999		44.5	1.9	42.6
1,000 to 4,999		139.9	(S) 4.2	135.7
5,000 to 9,999		103.3	(S) 3.1	(S) 100.2
10,000 to 24,999		122.3	(S) 6.2	116.1
25,000 or more		356.8	(S) 78.9	(S) 277.9

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTE: The company R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-44. R&D funds per scientist or engineer in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In dollars]										
Distribution by industry:												
All industries		132,300	134,500	141,300	148,600	157,912	153,336	157,459	167,339	168,362	171,495	173,585
Manufacturing		NA	NA	NA	NA	NA	NA	163,508	173,523	179,538	183,097	179,551
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	130,000	144,215	135,261	152,494	167,017	154,853	166,821	159,251
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	(D)	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	99,055	104,429
Paper and allied products	26	(D)	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	139,400	149,000	159,000	167,600	183,508	(D)	(D)	180,971	(D)	(D)	241,640
Industrial chemicals	281–82,286	(S)	(S)	(S)	181,000	193,871	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	142,800	(D)	(D)	(D)	196,631	202,607	190,662	205,637	212,185	262,201	263,791
Other chemicals	284–85,287–89	105,600	(D)	(D)	(D)	135,423	(D)	(D)	(D)	158,355	(D)	(D)
Petroleum refining and extraction	13,29	182,700	194,000	201,800	217,000	205,318	208,360	202,587	209,495	189,981	(D)	228,309
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	(D)	(D)	(D)	137,990	141,251	110,172	124,685	(S) 160,632	(D)
Primary metals	33	118,600	(S)	(D)	142,200	114,057	138,552	115,371	111,743	(D)	(S) 165,397	(D)
Ferrous metals and products	331–32,3398–99	(S)	(D)	(D)	(D)	(D)	138,851	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	(S)	(D)	(D)	(D)	(D)	(S) 138,326	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	88,100	(S)	(S)	115,500	123,828	129,131	111,431	112,010	(D)	158,211	127,637
Machinery	35	(D)	130,000	138,500	147,800	152,797	100,631	(D)	(D)	152,894	184,263	143,282
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	99,564	(D)	(D)	(D)	230,471	159,339
Other machinery, except electrical	351–56,358–59	99,400	(D)	(D)	(D)	(D)	102,213	112,692	111,421	(D)	126,651	124,681

See explanatory information and SOURCE at end of table.

Table A-44. R&D funds per scientist or engineer in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In dollars]										
Distribution by industry:												
Electrical equipment	36	124,100	132,400	142,800	147,100	150,118	144,725	152,615	163,626	171,907	159,879	(S) 150,462
Radio and TV receiving equipment	365	124,200	103,400	113,200	(D)	(D)	(D)	(D)	(D)	(D)	(D)	112,924
Communication equipment	366	160,300	170,600	177,100	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	(S)	(S)	128,400	(D)	127,801	154,366	148,071	(D)	(D)	(D)	(D)
Other electrical equipment	361–64,369	68,500	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	175,531	156,599
Transportation equipment	37	195,600	211,700	215,700	189,400	191,274	196,777	216,686	233,968	(S) 205,665	(S) 209,164	(S) 211,270
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	193,300	207,300	213,700	177,000	180,552	176,450	186,898	213,328	(S) 170,733	(S) 189,972	(S) 201,493
Professional and scientific instruments	38	(S)	(S)	(S)	(S)	(S)	(S) 115,180	146,585	154,251	(S) 179,723	(S) 206,112	(D)
Scientific and mechanical measuring instruments	381–82	(S)	(S)	(S)	(S)	(S)	(S) 94,036	140,971	128,237	(D)	(S) 188,560	(D)
Optical, surgical, photographic, and other instruments	384–87	316,700	(S)	(S)	(S)	(S)	161,721	159,723	220,383	(D)	240,293	(S) 259,180
Other manufacturing industries[1]	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	91,458	89,324
Nonmanufacturing[2]		74,900	(S)	(S)	137,400	152,411	159,188	140,374	150,578	138,882	141,730	160,428
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	370,933	159,442	135,133	(D)
Communications	48	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	157,435	94,495	84,028	(D)
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	(S) 274,704	(S) 98,427	(D)	(D)
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-44. R&D funds per scientist or engineer in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In dollars]										
Distribution by industry:												
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	(D)	146,774	(D)	203,524
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(D)	(D)
Services	701,72,73, 75–81,83, 84,87,89	NA	NA	NA	NA	NA	NA	NA	256,085	134,175	143,277	160,259
Business services	73	NA	NA	NA	NA	NA	NA	NA	231,680	126,625	123,974	130,910
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	234,483	(D)	124,766	(D)
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	158,453	(D)	95,896	(D)
Health services	80	NA	NA	NA	NA	NA	NA	NA	305,132	(D)	(D)	257,703
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	(D)	(S) 133,871	(D)	293,435
Other health services	802–805, 808–809	NA	NA	NA	NA	NA	NA	NA	(D)	(D)	(S) 100,372	116,774
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	289,459	149,040	186,234	211,088
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	(S) 257,067	(S) 81,271	104,608	108,047
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	(D)	204,445	(D)	290,737
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	(D)	(S) 93,929	(D)	110,737
Other services	701,72,75–79, 81,83,84,89	NA	NA	NA	NA	NA	NA	NA	221,147	(D)	(D)	179,048
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	179,020	(D)	85,625	119,333

See explanatory information and SOURCE at end of table.

Table A-44. R&D funds per scientist or engineer in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company		1988[3]	1989[3]	1990[3]	1991[3, 4]	1992[4]	1993[4]	1994[4]	1995[4]	1996[4]	1997[4]	1998[4]
		[In dollars]										
Distribution by size of company: [Number of employees]												
Total		132,300	134,500	141,300	148,600	157,912	153,336	157,459	167,339	168,362	171,495	173,585
Fewer than 500		67,100	66,200	(S)	103,400	111,358	106,888	97,012	109,319	118,280	126,925	139,430
500 to 999		(S)	98,200	(S)	178,700	176,585	87,233	123,239	141,660	124,765	125,611	128,106
1,000 to 4,999		100,600	101,900	91,400	119,400	127,135	128,565	134,558	144,213	142,747	145,436	155,058
5,000 to 9,999		100,400	102,500	110,800	150,800	148,285	156,899	144,327	167,284	161,035	156,090	137,803
10,000 to 24,999		143,000	127,300	135,300	167,300	156,190	160,229	172,678	180,849	199,722	194,323	208,403
25,000 or more		160,700	168,200	193,700	180,100	182,839	184,804	193,002	200,606	(S) 199,286	(S) 207,375	205,706

[1] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

[2] Until 1995, data were not broken down below this level of detail for most nonmanufacturing industries.

[3] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[4] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
(NA) = Not available.

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier year, and the ratio is attributed to the earlier year.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-45. R&D funds per scientist or engineer in R&D-performing companies, by industry, by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In dollars]						
All industries		173,585	139,430	128,106	155,058	137,803	208,403	(S) 205,706
Manufacturing		179,551	119,608	118,108	163,769	157,262	207,905	(S) 201,535
Food, kindred, and tobacco products	20,21	159,251	80,761	90,033	120,996	(S) 149,261	149,131	(S) 225,149
Textiles and apparel	22,23	(D)	124,098	99,961	116,834	(S) 350,996	(S) 136,124	(D)
Lumber, wood products, and furniture	24,25	104,429	59,614	94,224	112,575	137,691	(S) 103,633	0
Paper and allied products	26	(D)	105,691	(D)	175,846	(S) 175,014	(S) 156,159	(S) 136,039
Chemicals and allied products	28	241,640	352,424	156,794	201,153	220,633	262,769	243,900
Industrial chemicals	281–82,286	(D)	569,051	203,611	206,114	269,327	222,173	(D)
Drugs and medicines	283	263,791	201,454	111,314	247,931	227,992	314,219	246,451
Other chemicals	284–85,287–89	(D)	90,874	103,072	(S) 106,414	156,354	(D)	(D)
Petroleum refining and extraction	13,29	228,309	124,047	98,133	221,087	(D)	191,891	(S) 273,823
Rubber products	30	(D)	78,613	115,758	137,765	(S) 295,680	152,386	(D)
Stone, clay, and glass products	32	(D)	43,673	(S) 83,485	104,961	(S) 145,988	(S) 180,148	0
Primary metals	33	(D)	162,425	78,905	(S) 133,913	(S) 147,997	(S) 165,881	(S) 159,160
Ferrous metals and products	331–32,3398–99	(D)	558,037	70,267	(S) 101,629	(S) 141,187	(D)	(D)
Nonferrous metals and products	333–36	(D)	36,797	79,495	(S) 164,706	(D)	(D)	(D)
Fabricated metal products	34	127,637	57,515	97,864	74,381	136,340	147,433	(D)
Machinery	35	143,282	106,946	95,401	156,628	(S) 83,077	219,876	(D)
Office, computing, and accounting machines	357	159,339	93,402	141,885	217,617	145,284	194,341	(D)
Other machinery, except electrical	351–56,358–59	124,681	115,326	79,812	117,631	(S) 55,398	271,551	(D)
Electrical equipment	36	(S) 150,462	129,718	123,767	158,018	151,540	(S) 152,933	(S) 152,880
Radio and TV receiving equipment	365	112,924	146,745	(D)	(D)	0	0	0
Communication equipment	366	(D)	123,496	(S) 109,297	112,605	(S) 76,059	0	(S) 157,044
Electronic components	367	(D)	121,741	147,805	206,859	262,647	(S) 138,543	(D)
Other electrical equipment	361–64,369	156,599	156,257	103,083	141,420	(S) 168,747	236,266	153,361
Transportation equipment	37	(S) 211,270	224,587	(S) 63,536	140,288	134,950	176,896	(S) 219,527
Motor vehicles and motor vehicles equipment	371	(D)	200,237	(D)	155,410	(S) 137,669	160,014	(D)
Other transportation equipment	373–75,379	(D)	227,230	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	(S) 201,493	(D)	(D)	99,062	(S) 125,658	(D)	(S) 205,437

See explanatory information and SOURCE at end of table.

Table A-45. R&D funds per scientist or engineer in R&D-performing companies, by industry, by size of company: 1998

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In dollars]						
Professional and scientific instruments	38	(D)	135,337	141,431	169,332	255,133	(S) 228,932	(S) 314,421
Scientific and mechanical measuring instruments	381–82	(D)	112,160	150,800	116,131	290,586	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	(S) 259,180	188,544	118,963	217,265	236,411	(D)	(D)
Other manufacturing industries[1]	27,31,39	89,324	76,273	102,830	143,868	(S) 187,408	(S) 167,701	(D)
Nonmanufacturing		160,428	150,740	141,658	135,867	89,988	209,935	233,787
Transportation and utilities	40–42,44–49	(D)	101,169	(S) 121,661	141,912	122,666	390,089	(S) 174,574
Communications	48	(D)	186,517	(D)	(D)	(S) 0	(D)	(S) 195,892
Telephone communications	481	(D)	254,120	0	0	(S) 0	(D)	(S) 220,542
Other communications	482–484,489	(D)	126,612	(D)	(D)	0	0	(D)
Electric, gas, and sanitary services	49	(D)	(S) 40,540	(D)	121,209	188,044	360,437	(D)
Other transportation and utilities	40–42,44–47	(D)	47,642	(D)	(D)	(D)	(D)	84,935
Trade	50–59	203,524	143,110	133,951	143,081	157,517	(D)	(D)
Finance, insurance, and real estate	60–65,67	(D)	(S) 39,860	36,204	102,971	(S) 91,035	(D)	54,438
Services	701,72,73,75–81, 83,84,87,89	160,259	164,449	148,442	135,141	64,848	203,721	(S) 331,090
Business services	73	130,910	111,462	122,867	131,729	69,735	(D)	(D)
Computer and data processing services	737	(D)	112,430	124,801	131,498	69,482	(D)	(D)
Other business services	731–736,738	(D)	88,572	76,736	(S) 145,965	(D)	(D)	(D)
Health services	80	257,703	385,839	(D)	(D)	(D)	(D)	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	293,435	554,786	(D)	(D)	0	(D)	0
Other health services	802–805,808–809	116,774	119,423	0	(D)	(D)	0	0
Engineering and management services	87	211,088	216,888	200,485	(S) 159,297	(D)	(D)	(D)
Engineering, architectural, and surveying	871	108,047	106,325	113,324	(D)	(D)	(D)	0
Research, development, and testing	873	290,737	260,658	271,695	(D)	0	0	(D)
Other engineering and management services	872,874	110,737	192,007	(S) 164,661	119,863	(D)	(D)	0

See explanatory information and SOURCE at end of table.

Table A-45. R&D funds per scientist or engineer in R&D-performing companies, by industry, by size of company: 1998

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In dollars]						
Other services	701,72,75–79,81, 83,84,89	179,048	178,784	(S) 25,876	(S) 148,774	(D)	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	119,333	124,994	(D)	(S) 189,626	(S) 142,785	(D)	(D)

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier year, and the ratio is attributed to the earlier year.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-46. R&D funds per scientist or engineer in R&D-performing companies ranked by size of R&D program: 1988–98

Companies ranked by size of R&D program	1988[1]	1989[1]	1990[1]	1991[1, 2]	1992[2]	1993[2]	1994[2]	1995[2]	1996[2]	1997[2]	1998[2]
	[In dollars]										
First 4	226,200	218,100	219,600	213,200	202,492	252,629	218,906	234,791	231,784	(S) 229,602	(S) 242,408
Next 4	210,700	225,800	249,000	223,700	238,950	199,559	(S) 245,626	(S) 188,928	(S) 185,032	180,389	193,597
Next 12	153,000	148,700	129,100	159,900	170,276	199,118	188,437	190,548	202,670	(S) 238,022	(S) 239,162
Next 20	154,500	132,500	145,800	(S)	(S)	(S)	182,699	204,159	210,552	213,496	196,276
Next 60	141,300	145,400	164,200	170,500	181,760	193,925	181,163	196,023	202,405	206,350	208,144
Next 100	137,300	141,900	137,000	169,000	173,101	138,227	174,524	162,707	160,560	155,255	162,965
Next 200	124,500	106,100	120,200	121,000	126,545	140,292	156,025	152,977	151,812	157,347	154,395
Average of above 400 R&D performing companies	160,600	161,500	161,200	169,000	158,098	154,814	174,536	167,339	168,362	171,495	173,585

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (S) = Indicates imputation of more than 50 percent. Prior to 1993, data have been withheld.

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier year, and the ratio is attributed to the earlier year.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-47. Domestic employment of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In thousands]						
		1997						
All industries		20,221	1,975	790	2,860	2,254	3,188	9,154
Manufacturing		11,700	1,235	626	2,090	1,403	2,170	4,176
Food, kindred, and tobacco products	20,21	1,217	67	91	245	120	229	465
Textiles and apparel	22,23	384	40	(D)	112	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	252	20	41	68	65	59	0
Paper and allied products	26	547	16	(S) 2	84	48	162	235
Chemicals and allied products	28	1,019	72	23	205	195	276	248
Industrial chemicals	281–82,286	411	16	(D)	86	83	(D)	(D)
Drugs and medicines	283	316	23	2	54	49	89	99
Other chemicals	284–85,287–89	292	33	(D)	64	63	(D)	(D)
Petroleum refining and extraction	13,29	241	1	2	33	0	114	90
Rubber products	30	475	73	62	149	(D)	(D)	(D)
Stone, clay, and glass products	32	163	10	8	31	33	81	0
Primary metals	33	494	12	34	82	122	143	102
Ferrous metals and products	331–32,3398–99	301	2	2	41	101	(D)	(D)
Nonferrous metals and products	333–36	193	10	32	41	(S) 21	(D)	(D)
Fabricated metal products	34	681	127	(D)	160	64	(D)	(D)
Machinery	35	1,387	204	74	324	204	275	305
Office, computing, and accounting machines	357	419	20	(D)	44	61	(D)	(D)
Other machinery, except electrical	351–56,358–59	968	184	(D)	281	144	(D)	(D)
Electrical equipment	36	1,586	167	99	287	235	195	604
Radio and TV receiving equipment	365	14	3	(D)	10	0	(D)	(D)
Communication equipment	366	378	37	(D)	49	116	(D)	(D)
Electronic components	367	491	83	(D)	96	69	(D)	(D)
Other electrical equipment	361–64,369	703	44	37	132	50	109	331
Transportation equipment	37	1,834	40	42	54	101	134	1,463
Motor vehicles and motor vehicles equipment	371	1,023	(D)	39	18	(D)	102	766
Other transportation equipment	373–75,379	87	0	(D)	13	(D)	(D)	(D)
Aircraft and missiles	372,376	725	(D)	(D)	23	38	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-47. Domestic employment of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In thousands]						
		1997						
Professional and scientific instruments	38	676	90	40	158	72	43	272
Scientific and mechanical measuring instruments	381–82	381	64	26	57	26	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	295	26	15	101	46	(D)	(D)
Other manufacturing industries	27,31,39	743	296	32	97	77	109	132
Nonmanufacturing		8,521	740	164	770	851	1,018	4,978
Transportation and utilities	40–42,44–49	3,980	15	4	142	438	166	3,215
Communications	48	1,109	2	(D)	5	314	(D)	(D)
Telephone communications	481	1,050	0	0	0	314	0	736
Other communications	482–484,489	59	2	(D)	5	0	(D)	(D)
Electric, gas, and sanitary services	49	525	3	(D)	128	(D)	(D)	(D)
Other transportation and utilities	40–42,44–47	2,346	11	(D)	(S) 8	(D)	(D)	2,290
Trade	50–59	1,655	272	10	162	137	508	567
Finance, insurance, and real estate	60–65,67	584	33	(D)	62	68	(D)	(D)
Services	701,72,73,75–81, 83,84,87,89	2,036	319	118	358	141	288	812
Business services	73	1,318	172	56	139	97	76	777
Computer and data processing services	737	510	163	(D)	108	65	(D)	(S) 90
Other business services	731–736,738	807	9	(D)	32	32	(D)	687
Health services	80	109	16	2	36	0	55	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	97	14	2	27	0	55	0
Other health services	802–805,808–809	12	3	0	9	0	0	0
Engineering and management services	87	325	108	29	50	(D)	(D)	(D)
Engineering, architectural, and surveying	871	148	47	(D)	39	(D)	47	0
Research, development, and testing	873	98	51	(D)	3	0	(D)	(D)
Other engineering and management services	872,874	79	10	11	8	(D)	(D)	0
Other services	701,72,75–79,81, 83,84,89	284	23	31	133	(D)	(D)	(D)
Other nonmanufacturing industries	07–12,14,15, 161–162,17	266	101	(D)	46	67	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-47. Domestic employment of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In thousands]						
		1998						
All industries		18,289	2,174	800	2,776	2,057	2,929	7,554
Manufacturing		11,672	1,350	488	2,043	1,614	2,093	4,083
Food, kindred, and tobacco products	20,21	1,150	53	35	145	142	218	557
Textiles and apparel	22,23	358	12	(D)	82	49	118	(D)
Lumber, wood products, and furniture	24,25	271	31	9	66	83	82	0
Paper and allied products	26	623	28	14	133	79	139	231
Chemicals and allied products	28	938	78	45	192	191	231	201
Industrial chemicals	281–82,286	339	25	30	60	75	(D)	(D)
Drugs and medicines	283	318	15	2	66	36	104	94
Other chemicals	284–85,287–89	281	38	13	66	80	(D)	(D)
Petroleum refining and extraction	13,29	303	10	(D)	11	(D)	135	89
Rubber products	30	538	109	45	140	(D)	55	(D)
Stone, clay, and glass products	32	209	22	3	29	76	79	0
Primary metals	33	469	24	13	118	111	87	116
Ferrous metals and products	331–32,3398–99	292	22	2	71	92	(D)	(D)
Nonferrous metals and products	333–36	177	2	12	47	19	(D)	(D)
Fabricated metal products	34	710	150	55	118	78	134	175
Machinery	35	1,223	226	96	277	196	293	136
Office, computing, and accounting machines	357	261	16	(D)	42	47	73	(D)
Other machinery, except electrical	351–56,358–59	962	210	(D)	235	149	220	(D)
Electrical equipment	36	1,395	122	69	248	158	238	559
Radio and TV receiving equipment	365	15	2	(D)	12	0	0	(D)
Communication equipment	366	338	11	(D)	41	(S) 37	(D)	241
Electronic components	367	419	66	39	121	71	(D)	(D)
Other electrical equipment	361–64,369	623	42	21	75	50	157	277
Transportation equipment	37	2,105	70	(S) 2	254	160	109	1,509
Motor vehicles and motor vehicles equipment	371	1,275	(D)	(D)	226	(D)	93	(D)
Other transportation equipment	373–75,379	98	21	(D)	10	(D)	(D)	(D)
Aircraft and missiles	372,376	733	(D)	(D)	18	43	(D)	655

See explanatory information and SOURCE at end of table.

Table A-47. Domestic employment of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In thousands]						
		1998						
Professional and scientific instruments	38	653	75	43	145	90	70	229
Scientific and mechanical measuring instruments	381–82	326	46	24	49	25	(D)	(D)
Optical, surgical, photographic, and other instruments	384–87	327	28	19	96	65	(D)	(D)
Other manufacturing industries[1]	27,31,39	728	342	33	85	69	105	94
Nonmanufacturing		6,617	823	312	733	443	835	3,471
Transportation and utilities	40–42,44–49	1,899	10	43	112	138	208	1,388
Communications	48	801	3	(D)	(D)	0	(D)	(D)
Telephone communications	481	(D)	1	0	0	0	(D)	736
Other communications	482–484,489	(D)	2	(D)	(D)	0	0	(D)
Electric, gas, and sanitary services	49	416	1	38	86	(D)	142	(D)
Other transportation and utilities	40–42,44–47	682	7	(D)	(D)	(D)	(D)	582
Trade	50–59	1,819	216	168	197	52	102	1,084
Finance, insurance, and real estate	60–65,67	818	44	5	130	51	(D)	(D)
Services	701,72,73,75–81, 83,84,87,89	1,769	410	82	257	138	368	514
Business services	73	1,061	250	53	148	85	124	401
Computer and data processing services	737	694	219	51	121	63	70	170
Other business services	731–736,738	367	31	3	27	22	54	231
Health services	80	82	23	(D)	7	(D)	(D)	0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	63	17	(D)	(D)	0	(D)	0
Other health services	802–805,808–809	19	6	0	(D)	(D)	0	0
Engineering and management services	87	382	112	25	62	28	(D)	(D)
Engineering, architectural, and surveying	871	159	36	(D)	47	(D)	53	0
Research, development, and testing	873	104	58	(D)	(D)	0	0	(D)
Other engineering and management services	872,874	118	17	10	(D)	(D)	(D)	42

See explanatory information and SOURCE at end of table.

Table A-47. Domestic employment of R&D-performing companies, by industry and by size of company: 1997–98

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[In thousands]						
		1998						
Other services	701,72,75–79,81, 83,84,89	245	25	(D)	40	(D)	128	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	311	143	14	38	63	(D)	(D)

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-48. R&D scientists and engineers per 1,000 employees in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[2]	1989[2]	1990[2]	1991[2, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[3]	1997[3]	1998[3]
Distribution by industry:												
All industries[1]		NA	NA	NA	NA	NA	NA	44	47	49	47	55
Manufacturing		46	46	47	50	51	52	47	54	56	58	57
Food, kindred, and tobacco products	20,21	8	8	8	9	9	9	8	10	10	9	9
Textiles and apparel	22,23	(S)	(S)	6	7	8	7	7	10	9	8	8
Lumber, wood products, and furniture	24,25	5	5	6	5	6	16	7	12	10	14	13
Paper and allied products	26	11	13	16	17	19	19	15	(S) 20	20	(S) 19	(S) 20
Chemicals and allied products	28	69	69	69	69	71	80	84	78	85	88	97
Industrial chemicals	281–82,286	54	56	59	60	61	58	63	67	70	65	78
Drugs and medicines	283	94	92	96	95	116	138	141	141	142	143	157
Other chemicals	284–85, 287–89	60	60	53	53	43	51	53	38	49	60	50
Petroleum refining and extraction	13,29	24	26	26	26	27	27	23	26	32	33	26
Rubber products	30	(S)	26	32	38	33	24	21	21	22	24	24
Stone, clay, and glass products	32	26	26	24	24	23	21	19	22	19	(S) 24	19
Primary metals	33	12	12	11	11	11	11	14	9	14	(S) 13	13
Ferrous metals and products	331–32, 3398–99	9	8	7	7	7	9	7	6	8	(S) 13	(S) 13
Nonferrous metals and products	333–36	17	16	15	(S)	(S)	15	23	12	20	13	12
Fabricated metal products	34	17	(S)	20	19	16	21	15	15	17	19	17
Machinery	35	66	71	73	74	74	61	59	75	67	81	79
Office, computing, and accounting machines	357	114	126	131	137	139	124	157	173	163	158	175
Other machinery, except electrical	351–56, 358–59	29	31	33	36	37	41	39	55	42	47	53
Electrical equipment	36	71	68	66	67	65	75	75	91	98	108	(S) 125
Radio and TV receiving equipment	365	45	44	30	30	28	51	43	56	55	87	101
Communication equipment	366	94	96	89	91	(S)	(S)	(S) 153	(S) 147	(S) 163	182	(S) 273
Electronic components	367	100	96	89	95	92	122	104	(S) 142	137	(S) 136	(S) 127
Other electrical equipment	361–64,369	26	30	38	43	44	31	29	38	37	49	43

See explanatory information and SOURCE at end of table.

Table A-48. R&D scientists and engineers per 1,000 employees in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[2]	1989[2]	1990[2]	1991[2, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[3]	1997[3]	1998[3]
Distribution by industry:												
Transportation equipment	37	72	71	68	73	76	70	68	78	83	(S) 79	63
Motor vehicles and motor vehicles equipment	371	41	41	43	49	51	54	50	53	67	63	49
Other transportation equipment	373–75,379	40	52	45	(S)	(S)	(S)	43	26	12	35	(S) 39
Aircraft and missiles	372,376	103	101	96	98	101	94	108	121	134	(S) 106	(S) 91
Professional and scientific instruments	38	62	59	71	(S)	(S)	(S)	99	(S) 100	106	(S) 98	(S) 90
Scientific and mechanical measuring instruments	381–82	84	96	95	(S)	(S)	(S)	127	(S) 135	145	(S) 115	(S) 104
Optical, surgical, photographic, and other instruments	384–87	48	28	17	(S)	59	98	60	64	69	77	(S) 75
Other manufacturing industries	27,31,39	17	14	14	14	14	32	14	16	49	37	48
Nonmanufacturing[1]		NA	NA	NA	NA	NA	NA	36	35	36	32	51
Transportation and utilities	40–42,44–49	NA	NA	NA	NA	NA	NA	NA	14	15	4	(S) 9
Communications	48	NA	NA	NA	NA	NA	NA	NA	28	30	(S) 8	(S) 18
Telephone communications	481	NA	NA	NA	NA	NA	NA	NA	28	29	(S) 7	(D)
Other communications	482–484,489	NA	NA	NA	NA	NA	NA	NA	96	74	10	(D)
Electric, gas, and sanitary services	49	NA	NA	NA	NA	NA	NA	NA	(S) 6	7	2	3
Other transportation and utilities	40–42,44–47	NA	NA	NA	NA	NA	NA	NA	1	1	2	1
Trade	50–59	NA	NA	NA	NA	NA	NA	NA	25	25	28	36
Finance, insurance, and real estate	60–65,67	NA	NA	NA	NA	NA	NA	NA	13	22	(S) 31	21
Services	701,72,73, 75–81,83, 84,87,89	NA	NA	NA	NA	NA	NA	NA	75	65	83	111
Business services	73	NA	NA	NA	NA	NA	NA	NA	64	62	80	120
Computer and data processing services	737	NA	NA	NA	NA	NA	NA	NA	149	158	201	177
Other business services	731–736,738	NA	NA	NA	NA	NA	NA	NA	4	3	3	13
Health services	80	NA	NA	NA	NA	NA	NA	NA	35	73	43	57
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	NA	NA	NA	NA	NA	NA	NA	38	85	41	54
Other health services	802–805, 808–809	NA	NA	NA	NA	NA	NA	NA	24	17	59	65

See explanatory information and SOURCE at end of table.

Table A-48. R&D scientists and engineers per 1,000 employees in R&D-performing companies, by industry and by size of company: 1988–98

Industry and size of company	SIC code	1988[2]	1989[2]	1990[2]	1991[2, 3]	1992[3]	1993[3]	1994[3]	1995[3]	1996[3]	1997[3]	1998[3]
Distribution by industry:												
Engineering and management services	87	NA	NA	NA	NA	NA	NA	NA	163	89	168	151
Engineering, architectural, and surveying	871	NA	NA	NA	NA	NA	NA	NA	(S) 113	129	142	104
Research, development, and testing	873	NA	NA	NA	NA	NA	NA	NA	392	82	289	333
Other engineering and management services	872,874	NA	NA	NA	NA	NA	NA	NA	28	36	67	53
Other services	701,72, 75–79,81, 83,84,89	NA	NA	NA	NA	NA	NA	NA	10	21	16	28
Other nonmanufacturing industries	07–12,14,15, 161–162,17	NA	NA	NA	NA	NA	NA	NA	14	78	78	140
Distribution by size of company: [Number of employees]												
Total[1]		NA	NA	NA	NA	NA	NA	44	47	49	47	55
Fewer than 500		NA	NA	NA	NA	NA	NA	60	85	97	102	106
500 to 999		NA	NA	NA	NA	NA	NA	42	44	47	52	56
1,000 to 4,999		NA	NA	NA	NA	NA	NA	41	45	46	48	50
5,000 to 9,999		NA	NA	NA	NA	NA	NA	31	32	40	45	50
10,000 to 24,999		NA	NA	NA	NA	NA	NA	31	37	38	37	42
25,000 or more		NA	NA	NA	NA	NA	NA	48	45	45	(S) 39	47

[1] Until 1995, this table included only manufacturing companies.

[2] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[3] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
NA = Not available.

NOTES: The number of R&D scientists and engineers per 1,000 employees for 1995 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1995 and January 1996 by the number of employees in all activities in March 1995. Similar procedures were used for earlier years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-49. R&D funds per employee in R&D-performing companies, by size of company: 1988–98

Size of company [Number of employees]	1988[1]	1989[1]	1990[1]	1991[1, 2]	1992[2]	1993[2]	1994[2]	1995[2]	1996[2]	1997[2]	1998[2]
	Total (company, Federal, and other) R&D funds per employee [in dollars]										
Total	5,594	5,920	6,291	6,842	7,366	7,225	6,945	7,439	7,992	7,791	9,251
Fewer than 500	5,377	5,660	6,339	7,279	7,493	8,718	6,041	8,611	11,056	12,183	13,882
500 to 999	2,906	3,197	3,826	(T)	14,206	5,184	5,043	5,620	5,755	6,287	6,872
1,000 to 4,999	3,223	3,404	3,738	4,243	4,907	5,046	5,377	6,201	6,439	6,849	7,755
5,000 to 9,999	3,992	4,158	4,456	4,706	5,253	5,379	4,771	4,975	5,652	6,331	6,832
10,000 to 24,999	3,713	3,607	4,401	5,223	5,468	5,294	5,406	6,445	7,375	6,747	8,494
25,000 or more	7,388	7,863	8,005	8,252	8,908	9,123	9,305	8,738	8,890	7,990	9,671
	Company and other (except Federal) R&D funds per employee [in dollars]										
Total	3,844	3,607	4,401	5,322	5,839	5,834	5,682	6,118	6,685	6,608	7,929
Fewer than 500	4,782	5,201	5,701	6,242	6,384	7,828	5,559	7,589	9,800	11,065	12,301
500 to 999	2,677	3,029	3,598	(T)	13,937	4,871	4,792	5,350	5,484	5,810	6,418
1,000 to 4,999	2,761	2,990	3,346	3,817	4,488	4,623	5,094	5,910	6,259	6,660	7,531
5,000 to 9,999	3,335	3,624	4,286	4,228	4,764	4,935	4,625	4,848	5,423	6,059	6,572
10,000 to 24,999	3,163	3,217	3,863	4,106	4,282	4,400	4,622	5,710	6,998	6,461	8,168
25,000 or more	4,402	5,016	5,251	5,739	6,404	6,691	6,783	6,363	6,455	5,884	7,254

[1] As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

KEY: (T) = Data not separately available, but are included in total.

NOTE: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table A-50. Distribution of total employment in R&D-performing companies ranked by size of R&D program: 1988–98

Companies ranked by size of R&D program	1988[1]	1989[1]	1990[1]	1991[1, 2]	1992[2]	1993[2]	1994[2]	1995[2]	1996[2]	1997[2]	1998[2]
	[Percent]										
Total	100	100	100	100	100	100	100	100	100	100	100
First 4 (1–4)	7	7	7	7	7	6	6	6	6	5	5
Next 4 (5–8)	3	3	3	3	3	2	2	2	2	3	3
Next 12 (9–20)	6	6	5	5	5	5	4	4	4	3	4
Next 20 (21–40)	5	4	5	4	4	4	4	4	4	4	4
Next 60 (41–100)	9	10	9	9	8	8	7	7	7	5	7
Next 100 (101–200)	8	8	8	10	9	9	8	7	8	9	8
Next 200 (201–400)	9	9	11	10	10	10	9	9	9	17	11
All others	53	53	52	52	47	55	59	61	59	34	60

[1] As a result of a new sample design, statistics for 1988–91 have been revised. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

[2] As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. See the technical notes for more information.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

SECTION B. TECHNICAL NOTES

Page

SURVEY METHODOLOGY 141

COMPARABILITY OF STATISTICS 149

TECHNICAL TABLES 153

B-1. Number of companies in the target population and selected for the sample, by industry: 1998 153

B-2. Relative standard error for selected estimates, by industry and by size of company: 1998 156

B-3. Unit response rates—percentage of companies that responded to the survey, by industry and survey form: 1998 161

B-4. Imputation rates for survey items, by industry: 1998 166

B-5. Reported items—percentage of R&D-performing companies that reported non-zero data for major survey items: 1998 170

B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998 171

SURVEY DEFINITIONS 177

REFERENCES 179

SURVEY METHODOLOGY[7]

REPORTING UNIT

The reporting unit for the Survey of Industrial Research and Development is the company[8], defined as a business organization of one or more establishments under common ownership or control. The survey includes two groups of enterprises: (1) companies known to conduct R&D, and (2) a sample representation of companies for which information on the extent of R&D activity is uncertain.

FRAME CREATION

The Standard Statistical Establishment List (SSEL), a Bureau of the Census compilation that contains information on more than 3 million establishments with paid employees, was the target population from which the frame used to select the 1998 survey sample was created (see table B-1 for population and sample sizes). For companies with more than one establishment, data were summed to the company level and the resulting company record was used to select the sample and process and tabulate the survey data.

After data were summed to the company level, each company then was assigned a single Standard Industrial Classification (SIC) code based on payroll. The method used followed the hierarchical structure of the SIC coding system. The company was first assigned to the economic division, manufacturing or nonmanufacturing, that accounted for the highest percentage of its aggregated payroll. Then the company was assigned the 2-digit SIC code that accounted for the highest percentage of its payroll within the assigned economic division. Finally, the company was assigned the 3-digit SIC code that accounted for the highest percentage of its payroll within the assigned 2-digit industry. Assignment below the three-digit level was not done because of the concentration of R&D in relatively few industries and disclosure concerns (see below for detailed discussions of both issues).

The frame from which the survey sample was drawn included all for-profit companies classified in nonfarm industries. For surveys prior to 1992, the frame was limited to companies above certain size criteria based on number of employees.[9] These criteria varied by industry. Some industries were excluded from the frame because it was believed that they contributed little or no R&D activity to the final survey estimates. For the 1992 sample, new industries were added to the frame,[10] and the size criteria were lowered considerably and applied uniformly to firms in all industries. As a result, nearly 2 million enterprises with 5 or more employees were given a chance of selection for subsequent samples, including the 1998 sample. For comparison, the frame for the 1987 sample included 154,000 companies of specified sizes and industries.

DEFINING SAMPLING STRATA

A fundamental change initiated in 1995 and repeated for subsequent samples was the redefinition of the sampling strata. For the survey years 1992–94, 165 sampling strata were established, each stratum corresponding to one or more 3-digit-level SIC codes. The objective was to select sufficient representation of industries to determine whether alternative or expanded publication levels were warranted. Starting with the 1995 survey, the sampling strata corresponded to publication level industry aggregations. For each year, 40 publication levels were defined. These correspond to the original 25 groupings of manufacturing industries used as sampling strata before 1992 and an additional 15 groupings of nonmanufacturing industries. Companies were assigned to strata based on their 3-digit SIC codes.

IDENTIFYING CERTAINTY COMPANIES

The criteria for identifying companies selected for the survey with certainty, which were most recently modified in 1996, have remained the same for subsequent surveys. To limit the growth occurring each year in the number of certainty cases within the total sample, the

[7]Information for this section was provided by the Manufacturing and Construction Division of the U.S. Bureau of the Census, which collected and compiled the survey data for NSF. Copies of the technical papers cited can be obtained from NSF's Research and Development Statistics Program in the Division of Science Resources Studies.

[8]In the Survey of Industrial Research and Development and in the publications presenting statistics resulting from the survey, the terms "firm," "company," and "enterprise" are used interchangeably. "Industry" refers to the activity or group of activities included in the 2- or 3-digit standard industrial classifications (SICs) or groups of SICs used to array statistics resulting from the survey.

[9]See U.S. Bureau of the Census (1994d).

[10]These industries are listed and discussed below under "Comparability of Statistics."

certainty criterion was raised for the 1996 survey from $1 million to $5 million in total R&D expenditures based on data gathered from the 1995 survey. With a fixed total sample size, there was concern that the representation of the very large noncertainty universe by a smaller sample each year would be inadequate. Before 1994, companies with 1,000 or more employees had been selected with certainty, but it was observed that the level of spending varied considerably and that many of these companies reported no R&D expenditures each year. For these reasons, it was determined that these companies should be given chances of selection based upon the size of their R&D spending if they were in the previous survey or upon an estimated R&D value if they were not. Consequently, the size criterion based on the number of employees was dropped for surveys after 1994.

Frame Partitioning

Partitioning of the frame for noncertainty companies into large and small companies was first introduced in 1994 because of concern arising from a study of 1992 survey results which showed that a disproportionate number of small companies was being selected for the sample, and often assigned very large weights. These small companies seldom reported R&D activity. This disproportion was a result of the minimum probability rule (see "Sample Size" below) used as part of the independent probability proportionate to size (pps) sampling procedure employed exclusively prior to 1994 (pps is discussed in detail later under "Sample Selection"). This rule increased the probabilities of selection for several hundred thousand smaller companies. For 1994 and subsequent surveys, simple random sampling (srs) was applied to the small company partition causing the smaller companies to be sampled more efficiently than with independent pps sampling since there was little variability in their size (srs is discussed in detail later under "Sample Selection"). The large company partition continued to be sampled using independent pps sampling.

In 1994 and 1995, total company payroll was the basis for partitioning the noncertainty frame. For each industry grouping, the largest companies representing the top 90 percent of the total payroll for the industry grouping were included in the pps frame. The balance, the smaller companies comprising the remaining 10 percent of payroll for the industry grouping, were included in the srs frame.

Beginning in 1996, total company employment became the basis for partitioning the frame. The total company employment levels defining the partitions were based on the relative contribution to total R&D expenditures of companies in different employment size groups in both the manufacturing and nonmanufacturing sectors. In the manufacturing sector, all companies with total employment of 50 or more were included in the large company partition. In the nonmanufacturing sector, all companies with total employment of 15 or more were included in the large company partition. Companies in the respective sectors with employment below these values were included in the small company partition. In the 1998 survey, the large company partition contained almost 550,000 companies and the small company partition contained approximately 1.3 million companies. These counts were comparable to those in the 1997 survey (540,000 and 1.3 million, respectively).

Identifying "Zero" Industries

One final modification in the frame development for 1996, which was repeated for subsequent surveys, was the designation of "zero industries" in the large company partition. Zero industries were those three-digit SIC industries having no R&D expenditures reported in survey years 1992-1994—the years when estimates by three-digit SIC industry were formed. These industries remained within the scope of the survey, but only a limited sample was drawn from them because it was unlikely that these industries conducted R&D. Simple random sampling was used to control the number of companies selected from these industries.

Sample Selection

In 1996 a significant revision in the procedure for selecting samples from the partitions led to a change in the development and presentation of estimates. The revised procedure was repeated for subsequent surveys. In 1995 the sample of companies from the large company partition was selected using probability proportionate to size sampling (see below) in each of the 40 strata (discussed previously under "Defining Sampling Strata"). Likewise, the simple random sampling of the small company partition was done for each of the 40 strata. However, beginning in 1996, the number of strata established for the small company partition was reduced to two. One stratum consisted of small companies classified in manufacturing industries and the second stratum consisted of small companies classified in nonmanufacturing industries. Simple random sampling continued as the selection method for these two strata.

The purpose of selecting the small company panel from these two strata was to reduce the variability in industry

estimates largely attributed to the random year-to-year selection of small companies by industry and the high sampling weights that sometimes occurred. As a consequence of this change, estimates for industry groups within manufacturing and nonmanufacturing were not possible from these two strata as noted on affected tables. The statistics for the detailed industry groups were based only on the sample from the large company partition. Estimates from the small company partition were included in statistics for total manufacturing, total nonmanufacturing, and all industries. For completeness, in the affected tables the estimates also were added to the categories "other manufacturing" and "other nonmanufacturing".

Probability Proportionate to Size

For this survey it would have been ideal if company size could have been determined by its R&D expenditures. Unfortunately, except for the companies that were in a previous survey or for which there was information from external sources, it was impossible to know the R&D expenditures for every firm in the universe. Consequently, the probability of selection for most companies was based on estimated R&D expenditures.

Since total payroll was known for each company in the universe, it was possible to estimate R&D from payroll using relationships derived from 1997 survey data. Imputation factors relating these two variables were derived for each industry grouping. To impute R&D for a given company, the imputation factors were applied to the company payroll in each industry grouping. A final measure was obtained by adding the industry grouping components. The effect, in general, was to give firms with large payrolls higher probabilities of selection in agreement with the assumption that larger companies were more likely to perform R&D.

Estimated R&D values were computed for companies in the small company partition as well. The aggregate of reported and estimated R&D from each company in both the large and small company partitions represented a total universe measure of 1997 R&D expenditures. However, assigning R&D to every company resulted in an overstatement of this measure. To adjust for the overstatement, the universe measure was scaled down using factors developed from the relationship between the frame measure of 1997 R&D and the final 1997 survey estimates. These factors, computed at levels corresponding to published industry levels, were used to adjust the originally imputed R&D values so that the new frame total for R&D at these levels approximated the 1997 published values. This adjustment provided for better allocation of the sample among these levels.

For 1998, the distribution of companies by payroll and estimated R&D in the large company partition was skewed as in earlier frames (i.e., the correleation of payroll and R&D was high because R&D had been estimated based on payroll). Because of this skewness, pps sampling remained the appropriate selection technique for this group except for the zero industries (discussed previously). That is, large companies had higher probabilities of selection than did small companies. However, a different approach to pps sampling was introduced for the 1998 survey. Historically, pps sampling had been accomplished using an independent sampling methodology, i.e., the selection (or nonselection) of a given company was independent of the sampling result (select or nonselect) of any other company. This implied that over repeated samplings in a given stratum, different size samples would result. This added more variability to the sample estimates. For 1998, a fixed sample size pps method was introduced. This method ensured that the sample size desired for a given stratum was achieved, thus eliminating error because of sample size variation from the sample estimates. For a given sample size, the fixed sample size method will produce more precise estimates on average than the independent method.

Simple Random Sampling

As described earlier, only two major strata were defined for samples in the small company partition, manufacturing and nonmanufacturing. The use of srs implied that each company within a stratum had an equal probability of selection. The total sample allocated to the small company partition was dependent upon the total sample specified for the survey and upon the total sample necessary to satisfy criteria established for the large partition. Once determined, the allocation of this total by stratum was made proportionate to the stratum's payroll contribution to the entire partition.

Sample Stratification and Relative Standard Error Constraints

The particular sample selected was one of a large number of samples of the same type and size that by chance might have been selected. Statistics resulting from the different samples would differ somewhat from each other. These differences are represented by estimates of sampling error or variance. The smaller the sampling error, the more precise the statistic.

Controlling Sampling Error. Historically, it has been difficult to achieve control over the sampling error of survey estimates. Efforts were confined to controlling the amount of error due to sample size variation, but this was only one component of the overall sampling error. The other component depended on the correlation between the data from the sampling frame used to assign probabilities (namely R&D values either imputed or reported in the previous survey) and the actual current year reported data. The nature of R&D is such that these correlations could not be predicted with any reliability. Consequently, precise controls on overall sampling error were difficult to achieve.

For recent surveys, primary concern was placed on controlling error for the large company partition since nearly all of the R&D activity was identified from that portion of the sample. In 1998, with the introduction of the fixed sample size sampling procedure, the component of sampling error due to sample size variation was eliminated. However, the amount of error attributable to the remaining component of the sample remained. Since there was still no way to predict how well the data from the sampling frame would correlate with actual survey data, the sample was allocated across the 40 strata in the same manner as in the past when independent sampling was used. The probabilities resulting from this allocation technique determined the sample sizes to be selected from each stratum subject to the overall sample size constraint dictated by the survey budget. Although the actual survey sampling errors could not be predicted, the parameters used to assign probabilities, and the use of the minimum probability rule resulted in a desirable number of companies being sampled from the large company partition (see "Sample Size" below).

Sampling Strata and Standard Error Estimates. A limitation of the sample allocation process for the large company partition should be noted. The constraints used to control the sample size in each stratum were based on a universe total that, in large part, was improvised. That is, as previously noted, an R&D value was assigned to every company in the frame, even though most of these companies actually may not have had R&D expenditures. The value assigned was imputed for the majority of companies in the frame and, as a consequence, the estimated universe total and the distribution of individual company values, even after scaling, did not necessarily reflect the true distribution. Assignment of sampling probability was nevertheless based on this distribution. The presumption was that actual variation in the sample design would be less than that estimated, because many of the sampled companies have true R&D values of zero, not the widely varying values that were imputed using total payroll as a predictor of R&D. Previous sample selections indicate that in general this presumption held, but exceptions have occurred when companies with large sampling weights have reported large amounts of R&D spending. See table B-2 for a list by industry of the standard error estimates for selected items.

Nonsampling Error. In addition to sampling error, estimates are subject to nonsampling error. Errors are grouped in five categories: specification, coverage, response, nonresponse, and processing. For detailed discussions on the sources, control, and measurement of each of these types of error, see U.S. Bureau of the Census (1994b and 1994f).

Sample Size

The parameters set to control sampling error discussed above resulted in a sample size of 18,344 companies from the large company partition. For the small company partition, two strata (manufacturing and nonmanufacturing) were identified. Also included was a separate stratum of small companies that could not be classified into an SIC because of incomplete industry identification in the SSEL. In 1998, as in the 1994 through 1997 surveys, a small number of companies was selected from this group in the hope that an accurate industry identification could be obtained at a later point. Ultimately, a final sample of 6,465 companies was selected from the small company partition. The sample initially allocated to the two strata was proportionate to its share of total payroll for the small company partition. The total sample size finally determined for the 1998 survey was 24,809. This total included an adjustment to the sample size based on a minimum probability rule and changes in the operational status of some companies. With the use of fixed sample size pps sampling for the large company partition and simple random sampling for the small company partition and the zero-industry stratum, the target sample size was met.

Minimum Probability Rule. A minimum probability rule was imposed for both partitions. As noted earlier, for the large partition, probabilities of selection proportionate to size were assigned to each company, where size was the reported or imputed R&D value assigned to each company. Selected companies received a sample weight which was the inverse of their probability. Selected companies that ultimately report R&D expenditures vastly larger than their assigned values can have adverse effects

on the statistics, which were based on the weighted value of survey responses. To lessen the effects on the final statistics, the maximum weight of a company was controlled by specifying a minimum probability that could be assigned to the company. If the probability, based on company size, was less than the minimum probability, then it was reset to this minimum value. The consequence of raising these original probabilities to the minimum probability was to raise the sample size. Similarly, a maximum weight for each stratum was established for the simple random sampling of the small company partition. If the sample size initially allocated to a stratum resulted in a stratum weight above this maximum value, then the sample size was increased until the maximum weight was achieved.

Changes in Operational Status. Between the time that the frame was created and the survey was prepared for mailing, the operational status of some companies changed. That is, they were merged with or acquired by another company, or they were no longer in business. Before preparing the survey for mailing, the operational status was updated to identify these changes. As a result, the number of companies mailed a survey form was somewhat smaller than the number of companies initially selected for the survey.

Weighting and Maximum Weights

Weights were applied to each company record to produce national estimates. Within the pps partitions of the sample, company records were given weights up to a maximum of 50; for companies within the srs partitions, company records were given weights up to a maximum of 250.

Survey Questionnaires

Two questionnaires are used each year to collect data for the survey. Known large R&D performers are sent a detailed questionnaire, Form RD-1.[11] The Form RD-1 requests data on sales or receipts, total employment, employment of scientists and engineers, expenditures for R&D performed within the company with Federal funds and with company and other funds, character of work (basic research, applied research, and development), company-sponsored R&D expenditures in foreign countries, R&D performed under contract by others, federally funded R&D by contracting agency, R&D costs by type of expense, domestic R&D expenditures by State, energy-related R&D and foreign R&D by country. Because companies receiving the Form RD-1 have participated in previous surveys, computer-imprinted data reported by the company for the previous year are supplied for reference. Companies are encouraged to revise or update this imprinted data if they have more current information, however prior-year statistics that had been previously published were revised only if large disparities were reported.

Small R&D performers and firms included in the sample for the first time were sent Form RD-1A. This form collects the same information as Form RD-1 except for five items: Federal R&D support to the firm by contracting agency, R&D costs by type of expense, domestic R&D expenditures by State, energy-related R&D, and foreign R&D by country. It also includes a screening item that allows respondents to indicate that they do not perform R&D. No prior-year information is made available since the majority of the companies that receive the Form RD-1A have not been surveyed in the previous year.

Questionnaire Content Changes

For the 1996 survey year, data on federally-funded and total R&D performed under contract to others (or "contracted-out") were collected to better measure the amount of R&D performed both within and between companies. For earlier years, data were collected only on non-federally funded contracted-out R&D.

Based on information obtained from telephone interviews with a sample of respondents, a new item, R&D depreciation costs, was added to the 1998 Form RD-1. In prior years R&D depreciation was included in the "other costs" category of R&D expenditures.

Also beginning with the 1998 survey, items used to collect detailed information on the allocation of R&D expenditures by field of science and engineering and by product class, and R&D expenditures for pollution abatement were eliminated. Further, the amount of detail requested for energy-related R&D was reduced. Item nonresponse on each of these items were unacceptably high relative to their response burden.

Number of Questionnaires Sent

Form RD-1 was mailed to companies that reported R&D expenditures of $5 million dollars or more in the 1997

[11]Form RD-1 is a revised version of the Form RD-1L, formerly used to collect data from large R&D performers for odd-numbered years. For even-numbered years, an abbreviated questionnaire, Form RD-1S was used. Beginning in 1998 the Form RD-1L was streamlined and the odd/even-numbered year cycle abandoned.

survey. Nearly 1,700 companies received Form RD-1 and approximately 23,000 received Form RD-1A. Both questionnaires and the instructions provided to respondents are reproduced in section C, Survey Documents.

Follow-up for Survey Nonresponse

The 1998 survey questionnaires were mailed in March 1999. Recipients of Form RD-1A were asked to respond within 30 days, while Form RD-1 recipients were given 60 days. A follow-up form and letter were mailed to RD-1A recipients every thirty days if their completed questionnaire had not been received; a total of five follow-up mailings were conducted for delinquent RD-1A recipients.

A letter was mailed to Form RD-1 recipients thirty days after the initial mailing, reminding them that their completed questionnaires were due within the next 30 days. A second form and reminder letter were mailed to Form RD-1 respondents after 60 days. Two additional follow-up mailings were conducted for delinquent RD-1 recipients.

In addition to the mailings, telephone follow-up was used to encourage response from those firms ranked among the 300 largest R&D performers, based on total R&D expenditures reported in the previous survey. Table B-3 shows the number of companies in each industry or industry group that received a questionnaire and the percentage that responded to the survey.

Imputation for Item Nonresponse

For various reasons, many firms chose to return the survey questionnaires with one or more blank items.[12] For some firms, internal accounting systems and procedures may not have allowed quantification of specific expenditures. Others may have refused to answer any voluntary questions as a matter of company policy.[13]

When respondents did not provide the requested information, estimates for the missing data were made using imputation algorithms. In general, the imputation algorithms computed values for missing items by applying the average percentage change for the target item in the nonresponding firm's industry to the item's prior-year value for that firm, reported or imputed. This approach, with minor variation, was used for most items.[14] Table B-4 contains imputation rates for the principal survey items.

Response Rates and Mandatory Versus Voluntary Reporting

Current survey reporting requirements divide survey items into two groups: mandatory and voluntary. Response to four data items on the questionnaires, total R&D expenditures, Federal R&D funds, net sales, and total employment, was mandatory, whereas response to the remaining items was voluntary. During the 1990 survey cycle, NSF conducted a test of the effect of reporting on a completely voluntary basis to determine if combining both mandatory and voluntary items on one questionnaire influences response rates. For this test, the 1990 sample was divided into two panels of approximately equal size. One panel, the mandatory panel, was asked to report as usual on four mandatory items with the remainder voluntary; and the other panel was asked to report all items on a completely voluntary basis. The result of the test was a decrease in the overall survey response rate to 80 percent from levels of 88 percent in 1989 and 89 percent in 1988. The response rates for the mandatory and voluntary panels were 89 percent and 69 percent, respectively. Detailed results of the test were published in *Research and Development in Industry: 1990*. For firms that reported R&D expenditures in 1998, table B-5 shows the percentage that also reported data for other selected items.

Character of Work Estimates

Response to questions about character of work (basic research, applied research, and development) declined in the mid-1980s, and, as a result, imputation rates increased. The general imputation procedure described above became increasingly dependent upon information imputed in prior years, thereby distancing current year estimates from any reported information. Because of the increasing dependence on imputed data, NSF chose not to publish character of work estimates in 1986. The imputation procedure used to develop these estimates was revised in 1987 for use with later data and differs from the general imputation approach. The new method calculated the

[12]For detailed discussions on the sources, control, and measurement of error resulting from item nonresponse, see U.S. Bureau of the Census (1994b).

[13]All but four items—total R&D, Federal R&D, net sales, and total employment, which are included in the Census Bureau's annual mandatory statistical program—are voluntary. See further discussion under "Response Rates and Mandatory Versus Voluntary Reporting" later in this section.

[14]For detailed descriptions and analyses of the imputation methods and algorithms used, see U.S. Bureau of the Census (1994c).

character of work distribution for a nonresponding firm only if that firm reported a distribution within a 5-year period, extending from 2 years before to 2 years after the year requiring imputation. Imputation for a given year was initially performed in the year the data were collected and was based on a character of work distribution reported in either of the 2 previous years, if any. It was again performed using new data collected in the next 2 years. If reported data followed no previously imputed or reported data, previous period estimates were inserted based on the currently reported information. Similarly, if reported data did not follow 2 years of imputed data, the 2 years of previously imputed data were removed. Thus, character of work estimates were revised as newly reported information became available and were not final for 2 years following their initial publication.

Beginning with 1995, previously estimated values were not removed for firms that did not report in the third year, nor were estimates made for the 2 previous years for firms reporting after 2 years of nonresponse. This process was changed because, in the prior period, revisions were minimal. Estimates continued to be made for 2 consecutive years of nonresponse and discontinued if the firm did not report character of work in the third year. If no reported data were available for a firm, character of work estimates were not imputed. As a consequence, only a portion of the total estimated R&D expenditures were distributed at the firm level. Those expenditures not meeting the requirements of the new imputation methodology were placed in a "not distributed" category. Table B-6 shows the character of work estimates along with the "not distributed" component for 1998.

NSF's objective in conducting the survey has always been to provide estimates for the entire population of firms performing R&D in the United States. However, the revised imputation procedure would no longer produce such estimates because of the "not distributed" component. A baseline estimation method thus was developed to allocate the "not distributed" amounts among the character of work components. In the baseline estimation method, the "not distributed" expenditures were allocated by industry group to basic research, applied research, and development categories using the percentage splits in the distributed category for that industry. The allocation was done at the lowest level of published industry detail only; higher levels were derived by aggregation, just as national totals were derived by aggregation of individual industry estimates, and result in higher performance shares for basic and applied research and lower estimates for development's share than would have been calculated using the previous method. The estimates of basic research, applied research, and development provided in the tables in section A were calculated using the baseline estimation method.

State Estimates

Form RD-1 requested data on the cost of R&D performed for states in which a company's R&D facilities were located. An independent source, the *Directory of American Research and Development*, published by the Data Base Publishing Group of the R. R. Bowker Company, was used in conjunction with survey results to estimate R&D expenditures by state for companies that did not provide this information. The information on scientists and engineers published in the directory was used as a proxy indicator of the proportion of R&D expenditures within each state. R&D expenditures by state were estimated by applying the distribution of scientists and engineers by state from the directory to total R&D expenditures for these companies. These estimates were included with reported survey data to arrive at published estimates of R&D expenditures for each state.

Comparability of Statistics

This section summarizes survey procedures and practices that may have affected the comparability of statistics produced from the Survey of Industrial Research and Development over time and with other statistical series.[15]

Revisions to Historical and Immediate Prior Year Statistics

Revisions to historical statistics usually have been made because of changes in the industry classification of companies caused by changes in payroll composition detected when a new sample was drawn. Various methodologies have been adopted over the years to revise, or backcast, the data when revisions to historical statistics have become necessary. Documented revisions to the historical statistics from post-1967 surveys through 1992 are summarized in NSF (1994) and in annual reports for subsequent surveys. Detailed descriptions of the specific revisions made to the statistics from pre-1967 surveys are scarce, but U.S. Bureau of the Census (1995) summarizes some of the major revisions.

Changes to reported data can come from three sources: respondents, analysts involved in survey and statistical processing, and the industry reclassification process. Prior to 1995, routine revisions were made to prior year statistics based on information from all three sources. Consequently, results from the current year survey were used not only to develop current year statistics, but also to revise immediate prior year statistics. Beginning with the 1995 survey, this practice was discontinued. The reasons for discontinuation of this practice were annual sampling, continual strengthening of sampling methodology, and improvements in data verification, processing, and nonresponse follow-up. Moreover, it was not clear that respondents or those who processed the survey results had any better information a year after the data were first reported. Thus, it was determined that routinely revising published survey statistics increased the potential for error and often confused users of the statistics. Revisions are now made to historical and immediate prior year statistics only if substantive errors are discovered.

[15]See also U.S. Bureau of the Census (1995).

Year-to-Year Changes

Comparability from year to year may be affected by new sample design, annual sample selection, and industry shifts.

Sample Design

By far the most profound influence on statistics from recent surveys occurred when the new sample design for the 1992 survey was introduced. Revisions to the 1991 statistics were dramatic (see *Research and Development in Industry: 1992* for a detailed discussion). While the allocation of the sample was changed somewhat, the sample designs used for subsequent surveys were comparable to the 1992 sample design in terms of size and coverage.

Annual Sample Selection

With the introduction of annual sampling in 1992, more year-to-year change has resulted than when survey panels were used. There are two reasons why this was so. First, changes in classification of companies not surveyed were not reflected in the year-to-year movement. Prior to annual sampling, a wedging operation—which was performed when a new sample was selected—was a means of adjusting the data series to account for the changes in classification that occurred in the frame (see the discussion on wedging later under "Time Series Analyses"). Second, yearly correlation of R&D data was lost when independent samples were drawn each year.

Industry Shifts

The industry classification of companies is redefined each year with the creation of the sampling frame. By redefining the frame, the sample reflects current distributions of companies by size and industry. A company may move from one industry to another because of either changes in its payroll composition, which is used to determine the industry classification code (see previous discussion under "Frame Creation"); changes in the industry classification system itself; or changes in the way the industry classification code was assigned or revised during survey processing.

A company's payroll composition can change because of the growth or decline of product or service lines, the merger of two or more companies, the acquisition of one

company by another; divestitures; or the formation of conglomerates. Although an unlikely occurrence, a company's industry designation could be reclassified yearly with the introduction of annual sampling in 1992. The result is that a downward movement in R&D expenditures in one industry is balanced by an upward movement in another industry from one year to the next.

From time to time, the SIC coding system, which is used by most Federal agencies that publish industry statistics, is revised to reflect the changing composition of U.S. industry. For statistics developed for 1988–91 from the 1988–91 surveys, companies retained the industry classifications assigned for the 1987 sample. These classifications were based on the 1977 SIC system. The last major revision of the SIC system was in 1987. This new system has been used to classify companies in all of the post-1991 surveys.

The method used to classify firms during survey processing was revised slightly in 1992. Research has shown that the impact on individual industry estimates was minor.[16] The current method used to classify firms was discussed previously under "Frame Creation." Methods used for past surveys are discussed in U.S. Bureau of the Census (1995).

Capturing Small and Nonmanufacturing R&D Performers[17]

Before the 1992 survey, the sample of firms surveyed was selected at irregular intervals.[18] In intervening years, a panel of the largest firms known to perform R&D was surveyed. For example, a sample of about 14,000 firms was selected for the 1987 survey. For the 1988–91 studies, about 1,700 of these firms were resurveyed annually; the other firms did not receive questionnaires, and their R&D data were estimated. This sample design was adequate during the survey's early years because R&D performance was concentrated in relatively few manufacturing industries. However, as more and more firms began entering the R&D arena, the old sample design proved increasingly deficient because it did not capture births of new R&D-performing firms. The entry of fledgling R&D performers into the marketplace was completely missed during panel years. Additionally, beginning in the early 1970s, the need for more detailed R&D information for nonmanufacturing industries was recognized. At that time, the broad industry classifications "miscellaneous business services" and "miscellaneous services" were added to the list of industry groups for which statistics were published. By 1975, about 3 percent of total R&D was performed by firms in nonmanufacturing industries.

During the mid-1980s, there was evidence that a significant amount of R&D was being conducted by an increasing number of nonmanufacturing firms; again, the number of industries used to develop the statistics for nonmanufacturers was increased. Consequently, since 1987 the annual reports in this series have included separate R&D estimates for firms in the communication, utility, engineering, architectural, research, development, testing, computer programming, and data processing service industries; hospitals; and medical labs. Approximately 9 percent of the estimated industrial R&D performance during 1987 was undertaken by nonmanufacturing firms.

After the list of industries for which statistics were published was expanded, it became clear that the sample design itself should be changed to reflect the widening population of R&D performers among firms in the nonmanufacturing industries[19] and small firms in all industries so as to account better for births of R&D-performing firms and to produce more reliable statistics. Beginning with the 1992 survey, NSF decided to (1) draw new samples with broader coverage annually, and (2)

[16]The effects of changes in the way companies were classified during survey processing are discussed in detail in U.S. Bureau of the Census (1994e and 1994a).

[17]See also NSF (1994, 1995, and 1996a).

[18]Until 1967, samples were selected every 5 years. Subsequent samples were selected for 1971, 1976, 1981, and 1987.

[19]For the 1992 survey, 25 new nonmanufacturing industry and industry groups were added to the sample frame: agricultural services (SIC 07); fishing, hunting, and trapping (09); wholesale trade–nondurables (51); stationery and office supply stores (5112); industrial and personal service paper (5113); groceries and related products (514); chemicals and allied products (516); miscellaneous nondurable goods (519); home furniture, furnishings, and equipment stores (57); radio, TV, consumer electronics, and music stores (573); eating and drinking places (581); miscellaneous retail (59); nonstore retailers (596); real estate (65); holding and other investment offices (67); hotels, rooming houses, camps, and other lodging places (70); automotive repair, services, and parking (75); miscellaneous repair services (76); amusement and recreation services (79); health services (80); offices and clinics of medical doctors (801); offices and clinics of other health practitioners (804); miscellaneous health and allied services not elsewhere classified (809); engineering, accounting, research, management, and related services (87); and management and public relations services (874).

increase the sample size to approximately 25,000 firms.[20] As a result of the sample redesign, for 1992 the reported nonmanufacturing share was (and has continued to be) 25-30 percent of total R&D.[21]

Time-Series Analyses

As discussed earlier, the statistics resulting from this survey are better indicators of changes in, rather than absolute levels of, R&D spending and personnel. Nevertheless, the statistics are often taken to be a continuous time series prepared using the same collection, processing, and tabulation methods. Such uniformity has not been the case. Since the survey was first fielded, improvements have been made to increase the reliability of the statistics and to make the survey results more useful. To that end, past practices have been changed and new procedures instituted. Preservation of the comparability of the statistics has, however, been an important consideration in making these improvements. Nonetheless, changes to survey definitions, the industry classification system, and the procedure used to assign industry codes to multi-establishment companies have had some, though not substantial, effects on the comparability of statistics.[22]

The aspect of the survey that had the greatest effect on comparability was the selection of samples at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987, and 1992) and the use of a subset or panel of the last sample drawn to develop statistics for intervening years. As discussed earlier, this practice introduced cyclical deterioration of the statistics. As compensation for this deterioration, periodic revisions were made to the statistics produced from the panels surveyed between sample years. Early in the survey's history, various methods were used to make these revisions.[23] After 1976 and until the 1992 advent of annual sampling, a linking procedure called wedging was used.[24] In wedging, the 2 sample years on each end of a series of estimates served as benchmarks in the algorithms used to adjust the estimates for the intervening years.

For a full discussion of the mathematical algorithm used for the wedging process that linked statistics from the 1992 survey with those from the 1987 survey, see U.S. Bureau of the Census (1994g). In general, wedging

> *takes full advantage of the fact that in the first year of a new panel [when a new sample is selected], both current year and prior-year estimates are derived. Thus, two independent estimates exist for the prior year. The estimates from the new panel are treated as superior primarily because the new panel is based on updated classifications [the industry classifications in the prior panel are frozen] and is more fully representative of the current universe (the prior panel suffers from panel deterioration, especially a lack of birth updating). The limitations in the prior panel caused by these factors are naturally assumed to increase with time, so that in the revised series, we desire a gradual increase in the level or revision over time which culminates in the real difference observed between the two independent sample estimates of the prior year. At the same time, we desire that the annual movement of the original series be preserved to the degree possible in the revised series (U.S. Bureau of the Census, 1994).*

To that end, the wedging algorithm does not change estimates from sample years and adjusts estimates from panel years, recognizing that deterioration of the panel is progressive over time. One of the primary reasons for deciding to select a new sample annually rather than at irregular intervals was to avoid applying global revision processes such as wedging. Consequently, the 1992 survey was intended to be the last one affected by the wedging procedure.

Comparisons to Other Statistical Series

NSF collects data on federally financed R&D from both Federal funding agencies—using the Survey of Federal Funds for Research and Development—and from performers of the work-industry, Federal labs, universities, and other nonprofit organizations—using the Survey of Industrial Research and Development and other surveys. As reported by Federal agencies, NSF publishes data on Federal R&D budget authority and outlays, in addition to Federal obligations. These terms are defined below:[25]

[20]Annual sampling also remedies the cyclical deterioration of the statistics that results from changes in a company's payroll composition because of product line and corporate structural changes.

[21]See also NSF (1997a and 1998a).

[22]For discussions of each of these changes, see U.S. Bureau of the Census (1994g); for considerations of comparability, see U.S. Bureau of the Census (1994e and 1993).

[23]See U.S. Bureau of the Census (1995).

[24]The process was dubbed wedging because of the wedgelike area produced on a graph that compares originally reported statistics with the revised statistics that resulted after linking.

[25]See also NSF (1997b).

- *Budget authority* is the primary source of legal authorization to enter into financial obligations that will result in outlays. Budget authority most commonly is granted in the form of appropriations laws enacted by Congress with the approval of the president (NSF 1998b).

- *Obligations* represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated or when future payment of money is required.

- *Outlays* represent the amounts for checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated.

National R&D expenditure totals in NSF's *National Patterns of R&D Resources* report series are primarily constructed with data reported by performers and include estimates of Federal R&D funding to these sectors. But until performer-reported survey data on Federal R&D expenditures are available from industry and academia, data collected from the Federal agency funders of R&D were used to project R&D performance. When survey data from the performers subsequently are tabulated, as they were for this report, these statistics replace the projections based on funder expectations. Historically, the two survey systems have tracked fairly closely. For example, in 1980, performers reported using $29.5 billion in Federal R&D funding, and Federal agencies reported total R&D funding between $29.2 billion in outlays and $29.8 billion in obligations (NSF 1996b). In recent years, however, the two series have diverged considerably. The difference in the Federal R&D totals appears to be concentrated in funding of industry, primarily aircraft and missile firms, by the Department of Defense. Overall, industrial firms have reported significant declines in Federal R&D support since 1990 (see table A-1), while Federal agencies have reported level or slightly increased funding of industrial R&D (NSF 1996b). NSF is identifying and examining the factors behind these divergent trends.

Table B-1. Number of companies in the target population and selected for the sample, by industry: 1998

Industry	SIC code	Companies in target population	1998 survey			Companies with reported or imputed R&D expenditures for 1998		Companies that reported no R&D expenditures for 1998	Other companies[3]
			Companies selected for 1998 sample	Noncertainties[1]	Certainties[2]	Greater than or equal to $5 million	Less than $5 million		
All industries		1,817,225	24,809	23,175	1,634	1,655	1,671	18,028	3,455
Manufacturing		182,064	4,836	3,837	999	1,011	1,042	2,167	616
Food, kindred, and tobacco products	20,21	2,657	234	192	42	40	77	87	30
Textiles and apparel	22,23	3,468	186	172	14	13	54	87	32
Lumber, wood products, and furniture	24,25	3,342	225	211	14	19	54	121	31
Paper and allied products	26	1,233	74	47	27	28	20	22	4
Chemicals and allied products	28	1,288	210	61	149	151	31	13	15
Industrial chemicals	281–82,286	315	63	8	55	56	2	2	3
Drugs and medicines	283	295	60	5	55	53	3	2	2
Other chemicals	284–85,287–89	678	87	48	39	42	26	9	10
Petroleum refining and extraction	13,29	1,935	62	46	16	18	4	34	6
Rubber products	30	2,711	241	198	43	46	93	69	33
Stone, clay, and glass products	32	1,292	60	45	15	12	20	20	8
Primary metals	33	1,288	125	99	26	29	43	37	16
Ferrous metals and products	331–32,3398–99	684	72	58	14	16	25	22	9
Nonferrous metals and products	333–36	604	53	41	12	13	18	15	7
Fabricated metal products	34	4,808	456	421	35	37	171	176	72
Machinery	35	4,841	491	323	168	171	152	97	71
Office, computing, and accounting machines	357	313	83	32	51	50	16	6	11
Other machinery, except electrical	351–56,358–59	4,528	408	291	117	121	136	91	60
Electrical equipment	36	2,883	367	156	211	211	68	39	49
Radio and TV receiving equipment	365	105	16	12	4	5	9	1	1
Communication equipment	366	365	68	8	60	58	2	1	7
Electronic components	367	1,289	156	62	94	92	29	17	18
Other electrical equipment	361–64,369	1,124	127	74	53	56	28	20	23

See explanatory information and SOURCE at end of table.

Table B-1. Number of companies in the target population and selected for the sample, by industry: 1998

Industry	SIC code	Companies in target population	1998 survey			Companies with reported or imputed R&D expenditures for 1998		Companies that reported no R&D expenditures for 1998	Other companies[3]
			Companies selected for 1998 sample	Noncertainties[1]	Certainties[2]	Greater than or equal to $5 million	Less than $5 million		
Transportation equipment	37	1,526	89	32	57	56	11	18	4
Motor vehicles and motor vehicles equipment	371	809	42	17	25	25	7	8	2
Other transportation equipment	373–75,379	472	18	10	8	8	4	5	1
Aircraft and missiles	372,376	245	29	5	24	23	0	5	1
Professional and scientific instruments	38	1,371	252	101	151	149	54	23	26
Scientific and mechanical measuring instruments	381–82	692	137	58	79	75	35	11	16
Optical, surgical, photographic, and other instruments	384–87	679	115	43	72	74	19	12	10
Other manufacturing industries[4]	27,31,39	147,421	1,764	1,733	31	32	190	1,324	218
Nonmanufacturing		1,635,161	19,973	19,338	635	644	629	15,861	2,839
Transportation and utilities	40–42,44–49	29,102	882	845	37	34	54	685	109
Communications	48	3,514	87	71	16	14	2	59	12
Telephone communications	481	1,206	34	24	10	10	1	20	3
Other communications	482–484,489	2,308	53	47	6	4	1	39	9
Electric, gas, and sanitary services	49	1,343	85	68	17	15	31	28	11
Other transportation and utilities	40–42,44–47	24,245	710	706	4	5	21	598	86
Trade	50–59	228,409	4,644	4,563	81	80	90	3,773	701
Finance, insurance, and real estate	60–65,67	36,459	956	931	25	29	21	808	98
Services	701,72,73,75–81, 83,84,87,89	177,150	7,332	6,851	481	486	399	5,468	979
Business services	73	42,510	1,397	1,180	217	225	159	752	261
Computer and data processing services	737	8,907	675	473	202	211	138	191	135
Other business services	731–736,738	33,603	722	707	15	14	21	561	126

See explanatory information and SOURCE at end of table.

Table B-1. Number of companies in the target population and selected for the sample, by industry: 1998

Industry	SIC code	Companies in target population	1998 survey			Companies with reported or imputed R&D expenditures for 1998		Companies that reported no R&D expenditures for 1998	Other companies[3]
			Companies selected for 1998 sample	Noncertainties[1]	Certainties[2]	Greater than or equal to $5 million	Less than $5 million		
Health services	80	39,597	2,517	2,514	3	6	25	2,185	301
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	19,828	416	415	1	2	11	363	40
Other health services	802–805,808–809	19,769	2,101	2,099	2	4	14	1,822	261
Engineering and management services	87	23,997	2,102	1,851	251	245	189	1,442	226
Engineering, architectural, and surveying	871	9,069	821	771	50	56	117	579	69
Research, development, and testing	873	2,864	268	73	195	176	34	33	25
Other engineering and management services	872,874	12,064	1,013	1,007	6	13	38	830	132
Other services	701,72,75–79,81, 83,84,89	71,046	1,316	1,306	10	10	26	1,089	191
Other nonmanufacturing industries[4]	07–12,14,15, 161–162,17	1,164,041	6,159	6,148	11	14	65	5,127	953

[1] Noncertainties are companies whose probability of selection is less than one.

[2] Certainties are companies whose probability of selection is one. This includes companies whose 1997 R&D expenditures were equal to or greater than $5 million.

[3] Includes companies that reported they were out of scope, out of business, or had merged with another company. Also includes companies that did not respond to the survey or that did not indicate any information about R&D performance on a returned questionnaire.

[4] Beginning in 1996 manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries." As a result, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" after 1995 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table B-2. Relative standard error for selected estimates, by industry and by size of company: 1998

Industry and size of company	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D	Company-financed R&D performed outside of U.S.	Company-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
			[Percent]										
Distribution by industry:													
All industries		3,326	4.7	2.2	1.6	1.7	1.8	1.1	4.6	3.3	6.1	3.9	2.1
Manufacturing		2,054	6.3	1.9	1.4	1.5	1.6	0.3	1.7	1.1	3.1	4.4	1.7
Food, kindred, and tobacco products	20,21	117	2.5	6.5	3.0	1.6	1.6	0.9	1.4	0.0	13.9	2.2	1.7
Textiles and apparel	22,23	67	5.6	7.0	4.1	6.1	6.1	NA	43.6	NA	19.7	45.4	2.1
Lumber, wood products, and furniture	24,25	73	3.5	4.4	4.8	4.0	3.6	NA	NA	31.6	10.0	5.2	3.2
Paper and allied products	26	48	9.6	8.9	17.1	7.7	7.9	0.7	79.9	NA	56.8	17.4	6.3
Chemicals and allied products	28	182	3.5	3.8	5.4	7.5	7.1	0.2	0.6	25.1	1.8	13.6	8.3
Industrial chemicals	281–82,286	58	8.9	9.4	18.1	23.5	23.3	0.0	0.0	27.0	7.6	33.8	27.8
Drugs and medicines	283	56	1.2	3.0	1.4	0.4	0.4	0.3	0.4	0.0	NA	0.4	0.4
Other chemicals	284–85, 287–89	68	2.8	4.8	3.0	2.0	2.1	0.4	4.8	NA	5.3	3.5	2.2
Petroleum refining and extraction	13,29	22	4.4	14.8	5.5	1.9	1.9	0.0	16.0	20.6	2.2	3.9	2.6
Rubber products	30	139	5.9	6.3	6.2	3.2	3.6	0.3	5.5	NA	8.9	3.8	5.2
Stone, clay, and glass products	32	32	20.7	20.2	3.4	1.1	1.1	0.0	6.3	NA	3.6	3.0	0.9
Primary metals	33	72	4.6	5.1	5.5	4.7	6.2	36.8	87.6	NA	1.2	4.2	7.8
Ferrous metals and products	331–32, 3398–99	41	3.9	6.8	8.3	6.7	10.3	72.1	89.0	NA	17.0	4.7	9.4
Nonferrous metals and products	333–36	31	10.9	7.6	3.7	4.6	4.7	NA	0.0	NA	0.7	9.6	10.2

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and by size of company: 1998

Industry and size of company	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D	Company-financed R&D performed outside of U.S.	Company-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
			[Percent]										
Distribution by industry:													
Fabricated metal products	34	208	3.2	3.4	9.9	2.8	2.9	0.3	20.2	4.6	8.1	14.6	3.4
Machinery	35	323	2.3	3.0	2.3	1.3	1.2	2.6	3.6	7.5	7.0	2.4	2.3
Office, computing, and accounting machines	357	66	1.7	2.0	1.9	1.3	1.2	2.5	3.8	14.3	7.4	0.2	3.5
Other machinery, except electrical	351–56, 358–59	257	3.3	3.8	4.1	2.5	2.5	4.2	4.9	8.7	9.7	8.5	3.1
Electrical equipment	36	279	2.3	2.2	1.5	1.6	1.3	1.0	5.2	8.0	16.4	5.3	2.1
Radio and TV receiving equipment	365	14	2.2	2.5	0.7	0.9	0.9	NA	NA	0.0	0.0	4.7	1.1
Communication equipment	366	60	7.8	1.2	0.7	1.1	1.2	0.0	NA	NA	NA	15.2	NA
Electronic components	367	121	3.4	6.1	3.4	2.7	2.7	0.2	26.1	12.5	33.3	6.9	2.2
Other electrical equipment	361–64,369	84	1.8	2.6	6.3	5.9	3.7	3.9	0.2	23.8	4.1	0.5	8.0
Transportation equipment	37	67	25.9	7.7	2.0	1.0	1.5	NA	0.4	0.0	1.8	0.7	1.4
Motor vehicles and motor vehicles equipment	371	32	33.3	12.7	4.2	1.9	2.0	NA	0.4	NA	10.5	1.0	3.2
Other transportation equipment	373–75,379	12	7.2	12.8	12.1	10.3	17.7	NA	NA	NA	16.0	10.9	19.8
Aircraft and missiles	372,376	23	0.0	0.0	0.0	0.0	0.0	NA	NA	0.0	NA	0.0	0.0
Professional and scientific instruments	38	203	1.6	2.1	2.1	1.5	2.3	0.5	10.7	NA	2.7	6.0	2.8
Scientific and mechanical measuring instruments	381–82	110	2.5	2.8	2.9	1.2	2.9	2.5	16.9	NA	9.2	16.6	2.9
Optical, surgical, photographic, and other instruments	384–87	93	2.1	3.1	2.9	3.1	3.2	0.2	13.4	0.0	2.4	4.9	4.1

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and by size of company: 1998

Industry and size of company	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D	Company-financed R&D performed outside of U.S.	Company-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
			[Percent]										
Distribution by industry:													
Other manufacturing industries[1]	27,31,39	222	9.8	6.0	16.2	13.9	14.0	8.3	51.7	78.6	18.1	24.7	18.7
Nonmanufacturing		1,272	5.7	5.2	4.0	4.5	4.7	5.3	14.5	12.8	15.5	8.4	5.5
Transportation and utilities	40–42, 44–49	88	4.0	2.6	1.9	1.1	1.4	NA	3.4	NA	24.1	4.4	0.6
Communications	48	16	0.3	0.3	1.8	1.2	1.4	NA	NA	NA	29.6	5.0	NA
Telephone communications	481	11	0.0	0.1	2.7	1.0	1.1	NA	NA	NA	NA	5.7	NA
Other communications	482–484, 489	5	6.5	3.6	1.0	5.4	17.0	0.0	0.0	NA	81.2	NA	NA
Electric, gas, and sanitary services	49	46	10.2	11.8	10.1	6.0	6.9	NA	7.2	NA	8.7	5.4	8.9
Other transportation and utilities	40–42, 44–47	26	1.7	1.0	12.7	4.3	4.3	NA	11.0	NA	54.1	7.4	4.0
Trade	50–59	170	10.5	17.1	5.1	5.7	5.7	2.0	1.6	0.0	14.2	4.2	6.9
Finance, insurance, and real estate	60–65,67	50	19.8	14.1	8.7	7.4	7.4	NA	49.0	NA	78.9	12.7	3.8
Services	701,72,73, 75–81,83, 84,87,89	885	3.0	3.3	4.6	6.2	6.8	9.1	24.9	14.5	21.2	11.3	9.0
Business services	73	384	3.1	3.6	4.0	3.4	3.4	3.5	24.2	23.5	18.1	7.4	4.2
Computer and data processing services	737	349	3.0	4.6	3.9	3.4	3.4	3.5	24.3	24.0	18.3	7.6	4.3
Other business services	731–736, 738	35	10.3	5.7	35.4	21.9	22.6	0.2	16.0	0.0	72.2	0.1	24.0

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and by size of company: 1998

Industry and size of company	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D	Company-financed R&D performed outside of U.S.	Company-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
			[Percent]										
Distribution by industry:													
Health services	80	31	5.8	9.1	21.7	42.5	43.7	NA	0.1	66.2	95.6	20.9	35.8
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806, 807	13	6.4	11.3	23.7	46.7	47.6	NA	NA	90.3	98.8	48.1	61.2
Other health services	802–805, 808–809	18	13.7	12.3	49.4	27.1	26.8	NA	0.9	87.7	78.5	20.8	40.8
Engineering and management services	87	434	8.4	6.5	10.3	13.0	18.4	52.5	40.9	7.8	8.7	17.1	22.6
Engineering, architectural, and surveying	871	173	14.1	9.2	6.7	5.1	12.2	0.0	0.9	1.2	8.5	9.1	9.3
Research, development, and testing	873	210	8.4	9.4	16.7	16.7	22.1	54.9	45.4	11.5	11.9	21.9	28.8
Other engineering and management services	872,874	51	14.1	14.8	10.7	15.9	14.0	0.0	58.9	86.0	7.6	23.6	26.3
Other services	701,72, 75–79,81, 83,84,89	36	8.8	14.8	65.8	64.6	17.9	NA	NA	95.9	70.0	26.7	73.7
Other nonmanufacturing industries[1]	07–12, 14,15, 161–162,17	79	7.4	11.1	21.7	25.3	27.7	56.7	94.0	52.9	45.1	46.9	28.2

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error for selected estimates, by industry and by size of company: 1998

Industry and size of company	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D	Company-financed R&D performed outside of U.S.	Company-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
			[Percent]										
Distribution by size of company: [Number of employees]													
Total		3,326	4.7	2.2	1.6	1.7	1.8	1.1	4.6	3.3	6.1	3.9	2.1
Fewer than 500		1,541	6.1	4.8	6.9	9.2	9.6	25.8	30.1	23.0	18.7	15.9	10.9
500 to 999		430	14.2	12.0	5.5	4.2	4.5	16.9	12.0	0.6	8.0	5.8	5.5
1,000 to 4,999		803	10.5	7.7	2.2	1.2	1.2	0.8	5.9	0.0	6.2	1.1	1.6
5,000 to 9,999		260	26.6	4.3	0.8	1.1	1.2	0.1	1.4	0.0	0.0	0.6	1.7
10,000 to 24,999		177	4.7	2.1	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1
25,000 or more		115	1.2	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: NA = Not available.

NOTE: The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentages shown by the associated estimates. For example, the relative standard error of estimate for company-funded R&D performance by the stone, clay, and glass products industry (SIC 32) is shown as 1.1 percent, and the associated company-funded R&D estimate for this industry is shown as $592 million in table A-7. The standard error of estimate is 0.011 times 592 or $6.5 million.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table B-3. Unit response rates—percentage of companies that responded to the survey, by industry and survey form: 1998

Industry and form received	SIC code	Number of companies that received questionnaire[1]	Response rate[2]
			[Percent]
All industries		24,729	86.6
Manufacturing		4,817	85.7
Food, kindred, and tobacco products	20,21	233	86.3
Textiles and apparel	22,23	185	82.7
Lumber, wood products, and furniture	24,25	225	86.2
Paper and allied products	26	73	91.8
Chemicals and allied products	28	208	86.6
Industrial chemicals	281–82,286	62	90.3
Drugs and medicines	283	60	81.7
Other chemicals	284–85,287–89	86	87.4
Petroleum refining and extraction	13,29	62	87.3
Rubber products	30	239	86.6
Stone, clay, and glass products	32	60	86.7
Primary metals	33	125	89.6
Ferrous metals and products	331–32,3398–99	72	90.3
Nonferrous metals and products	333–36	53	88.7
Fabricated metal products	34	454	85.0
Machinery	35	489	82.0
Office, computing, and accounting machines	357	82	82.9
Other machinery, except electrical	351–56,358–59	407	81.9
Electrical equipment	36	365	76.4
Radio and TV receiving equipment	365	16	93.8
Communication equipment	366	68	70.6
Electronic components	367	156	76.3
Other electrical equipment	361–64,369	125	77.6
Transportation equipment	37	89	89.9
Motor vehicles and motor vehicles equipment	371	42	92.9
Other transportation equipment	373–75,379	18	83.3
Aircraft and missiles	372,376	29	89.7
Professional and scientific instruments	38	246	85.4
Scientific and mechanical measuring instruments	381–82	133	85.7
Optical, surgical, photographic, and other instruments	384–87	113	85.0
Other manufacturing industries[3]	27,31,39	1,764	88.6
Nonmanufacturing		19,912	86.8
Transportation and utilities	40–42,44–49	879	88.4
Communications	48	87	87.4
Telephone communications	481	34	91.2
Other communications	482–484,489	53	84.9
Electric, gas, and sanitary services	49	84	86.9
Other transportation and utilities	40–42,44–47	708	88.7

See explanatory information and SOURCE at end of table.

Table B-3. Unit response rates—percentage of companies that responded to the survey, by industry and survey form: 1998

Industry and form received	SIC code	Number of companies that received questionnaire[1]	Response rate[2]
			[Percent]
Trade	50–59	4,639	86.1
Finance, insurance, and real estate	60–65,67	953	90.9
Services	701,72,73,75–81, 83,84,87,89	7,323	87.0
Business services	73	1,395	80.4
Computer and data processing services	737	673	77.9
Other business services	731–736,738	722	82.7
Health services	80	2,515	89.0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	415	91.4
Other health services	802–805,808–809	2,100	88.5
Engineering and management services	87	2,097	88.8
Engineering, architectural, and surveying	871	820	90.6
Research, development, and testing	873	266	85.3
Other engineering and management services	872,874	1,011	88.2
Other services	701,72,75–79,81, 83,84,89	1,316	87.1
Other nonmanufacturing industries[3]	07–12,14,15, 161–162,17	6,118	86.2
All companies receiving Form RD-1			
All industries		1,621	83.0
Manufacturing		991	84.9
Food, kindred, and tobacco products	20,21	41	82.9
Textiles and apparel	22,23	14	71.4
Lumber, wood products, and furniture	24,25	14	92.9
Paper and allied products	26	27	88.9
Chemicals and allied products	28	147	87.2
Industrial chemicals	281–82,286	54	90.9
Drugs and medicines	283	55	80.0
Other chemicals	284–85,287–89	38	92.1
Petroleum refining and extraction	13,29	16	94.1
Rubber products	30	42	90.5
Stone, clay, and glass products	32	15	100.0
Primary metals	33	26	96.2
Ferrous metals and products	331–32,3398–99	14	100.0
Nonferrous metals and products	333–36	12	91.7
Fabricated metal products	34	35	91.4
Machinery	35	167	82.6
Office, computing, and accounting machines	357	51	86.3
Other machinery, except electrical	351–56,358–59	116	81.0

See explanatory information and SOURCE at end of table.

Table B-3. Unit response rates—percentage of companies that responded to the survey, by industry and survey form: 1998

Industry and form received	SIC code	Number of companies that received questionnaire[1]	Response rate[2]
			[Percent]
All companies receiving Form RD-1			
Electrical equipment	36	210	79.1
Radio and TV receiving equipment	365	4	100.0
Communication equipment	366	60	76.7
Electronic components	367	94	77.7
Other electrical equipment	361–64,369	52	82.7
Transportation equipment	37	57	89.5
Motor vehicles and motor vehicles equipment	371	25	96.0
Other transportation equipment	373–75,379	8	75.0
Aircraft and missiles	372,376	24	87.5
Professional and scientific instruments	38	149	85.2
Scientific and mechanical measuring instruments	381–82	77	87.0
Optical, surgical, photographic, and other instruments	384–87	72	83.3
Other manufacturing industries[1]	27,31,39	31	80.7
Nonmanufacturing		630	80.0
Transportation and utilities	40–42,44–49	36	86.1
Communications	48	16	87.5
Telephone communications	481	10	100.0
Other communications	482–484,489	6	66.7
Electric, gas, and sanitary services	49	16	81.3
Other transportation and utilities	40–42,44–47	4	100.0
Trade	50–59	81	79.0
Finance, insurance, and real estate	60–65,67	24	79.2
Services	701,72,73,75–81, 83,84,87,89	478	79.7
Business services	73	216	75.9
Computer and data processing services	737	201	77.1
Other business services	731–736,738	15	60.0
Health services	80	3	100.0
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	1	100.0
Other health services	802–805,808–809	2	100.0
Engineering and management services	87	249	82.7
Engineering, architectural, and surveying	871	50	72.0
Research, development, and testing	873	193	85.0
Other engineering and management services	872,874	6	100.0
Other services	701,72,75–79,81, 83,84,89	10	80.0
Other nonmanufacturing industries[3]	07–12,14,15, 161–162,17	11	81.8

See explanatory information and SOURCE at end of table.

Table B-3. Unit response rates—percentage of companies that responded to the survey, by industry and survey form: 1998

Industry and form received	SIC code	Number of companies that received questionnaire[1]	Response rate[2]
			[Percent]
All companies receiving Form RD-1A			
All industries		23,108	86.8
Manufacturing		3,826	85.9
Food, kindred, and tobacco products	20,21	192	87.0
Textiles and apparel	22,23	171	83.6
Lumber, wood products, and furniture	24,25	211	85.8
Paper and allied products	26	46	93.5
Chemicals and allied products	28	61	85.3
Industrial chemicals	281–82,286	8	85.7
Drugs and medicines	283	5	100.0
Other chemicals	284–85,287–89	48	83.7
Petroleum refining and extraction	13,29	46	84.8
Rubber products	30	197	85.8
Stone, clay, and glass products	32	45	82.2
Primary metals	33	99	87.9
Ferrous metals and products	331–32,3398–99	58	87.9
Nonferrous metals and products	333–36	41	87.8
Fabricated metal products	34	419	84.5
Machinery	35	322	81.7
Office, computing, and accounting machines	357	31	77.4
Other machinery, except electrical	351–56,358–59	291	82.2
Electrical equipment	36	155	72.9
Radio and TV receiving equipment	365	12	91.7
Communication equipment	366	8	25.0
Electronic components	367	62	74.2
Other electrical equipment	361–64,369	73	74.0
Transportation equipment	37	32	90.6
Motor vehicles and motor vehicles equipment	371	17	88.2
Other transportation equipment	373–75,379	10	90.0
Aircraft and missiles	372,376	5	100.0
Professional and scientific instruments	38	97	85.6
Scientific and mechanical measuring instruments	381–82	56	83.9
Optical, surgical, photographic, and other instruments	384–87	41	87.8
Other manufacturing industries[3]	27,31,39	1,733	88.8

See explanatory information and SOURCE at end of table.

Table B-3. Unit response rates—percentage of companies that responded to the survey, by industry and survey form: 1998

Industry and form received	SIC code	Number of companies that received questionnaire[1]	Response rate[2]
			[Percent]
All companies receiving Form RD-1A			
Nonmanufacturing		19,282	87.0
Transportation and utilities	40–42,44–49	843	88.5
Communications	48	71	87.3
Telephone communications	481	24	87.5
Other communications	482–484,489	47	87.2
Electric, gas, and sanitary services	49	68	88.2
Other transportation and utilities	40–42,44–47	704	88.7
Trade	50–59	4,558	86.2
Finance, insurance, and real estate	60–65,67	929	91.2
Services	701,72,73,75–81, 83,84,87,89	6,845	87.5
Business services	73	1,179	81.3
Computer and data processing services	737	472	78.3
Other business services	731–736,738	707	83.2
Health services	80	2,512	88.9
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	414	91.4
Other health services	802–805,808–809	2,098	88.5
Engineering and management services	87	1,848	89.6
Engineering, architectural, and surveying	871	770	91.8
Research, development, and testing	873	73	86.3
Other engineering and management services	872,874	1,005	88.2
Other services	701,72,75–79,81, 83,84,89	1,306	87.1
Other nonmanufacturing industries[3]	07–12,14,15, 161–162,17	6,107	86.3

[1] The total number of companies is generally less than the number of "compaines selected for the sample" in table B-1 because some companies selected for the survey went out of business or were merged with other companies during the time between sampling and mailout of the questionnaires.

[2] The calculation of this response rate, essentially a contact rate, was based on all companies that responded to the survey, including those that reported they were out of scope, out of business, or had merged with another company. Mathematically, the rate was calculated by dividing the number of companies that received a questionnaire (indicated in the previous column) into the number of companies that returned a response or questionnaire regardless of the data or information supplied in the response or on the questionnaire.

[3] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table B-4. Imputation rates for survey items, by industry: 1998

Industry	SIC code	Net Sales	Total employment	R&D scientists/ engineers	Total R&D			R&D by cost				Company-funded	
					Total	Company	Federal	Wages	Materials	Depreciation	Other costs	R&D outside company	Foreign R&D
		[Percent]											
All industries		6.5	8.8	35.2	6.4	5.6	16.3	56.0	54.6	7.1	54.1	3.2	1.9
Manufacturing		6.4	7.8	41.0	4.7	5.1	3.4	58.9	54.6	7.0	55.5	2.6	2.1
Food, kindred, and tobacco products	20,21	7.5	13.3	36.9	8.5	8.6	0.0	49.1	49.3	0.0	49.4	0.3	0.0
Textiles and apparel	22,23	9.3	10.0	48.7	23.1	23.1	0.0	89.9	91.9	NA	83.9	0.0	NA
Lumber, wood products, and furniture	24,25	3.7	2.5	40.5	5.4	5.6	0.0	37.8	54.8	0.0	36.4	NA	2.0
Paper and allied products	26	12.9	15.6	55.3	42.1	40.6	99.6	83.6	84.9	NA	86.8	0.0	0.0
Chemicals and allied products	28	5.2	6.1	24.9	4.7	3.7	64.7	54.4	52.5	0.0	57.1	1.7	1.2
Industrial chemicals	281–82,286	6.5	8.2	16.7	9.4	5.2	69.4	70.5	75.9	NA	71.3	10.8	3.9
Drugs and medicines	283	4.6	4.9	26.5	2.6	2.6	28.5	50.2	44.4	0.0	55.3	1.7	0.5
Other chemicals	284–85, 287–89	4.1	4.9	34.7	2.2	5.9	0.0	34.4	32.2	NA	38.1	0.1	0.0
Petroleum refining and extraction	13,29	5.8	20.3	26.8	2.8	2.8	2.7	63.3	52.4	21.6	79.3	9.7	4.3
Rubber products	30	4.4	8.0	27.2	3.2	3.6	0.0	70.0	60.3	NA	81.7	0.0	0.0
Stone, clay, and glass products	32	0.0	0.0	47.0	NA	0.0	NA	56.6	27.7	NA	38.3	NA	NA
Primary metals	33	1.9	5.0	47.3	31.6	17.5	NA	39.5	45.5	10.3	72.9	0.0	2.5
Ferrous metals and products	331–32, 3398–99	0.0	0.0	53.1	45.9	27.6	NA	57.1	49.6	45.4	75.5	0.0	0.0
Nonferrous metals and products	333–36	5.6	13.1	37.0	4.4	4.6	NA	16.6	39.1	NA	58.1	0.0	5.1

See SOURCE at end of table.

Table B-4. Imputation rates for survey items, by industry: 1998

Industry	SIC code	Net Sales	Total employ-ment	R&D scientists/ engineers	Total R&D			R&D by cost				Company-funded	
					Total	Company	Federal	Wages	Materials	Depre-ciation	Other costs	R&D outside company	Foreign R&D
		[Percent]											
Fabricated metal products	34	1.3	3.6	17.3	1.6	2.1	0.0	49.7	54.0	0.0	52.9	0.0	0.0
Machinery	35	10.4	8.1	24.0	8.5	8.5	6.3	45.6	37.8	3.6	24.6	15.7	5.7
Office, computing, and accounting machines	357	16.8	11.6	10.9	8.5	8.5	0.0	49.2	40.3	0.0	20.6	49.6	5.6
Other machinery, except electrical	351–56, 358–59	7.2	7.2	35.9	8.6	8.6	7.9	41.0	36.2	8.6	38.3	1.3	5.8
Electrical equipment	36	13.0	14.3	52.1	5.4	5.7	1.0	58.1	65.3	2.9	61.8	0.2	2.7
Radio and TV receiving equipment	365	0.0	28.8	0.0	0.0	0.0	0.0	24.9	55.4	32.3	41.9	NA	NA
Communication equipment	366	12.1	9.4	61.4	5.0	5.4	0.4	54.8	67.7	NA	55.1	NA	5.3
Electronic components	367	25.3	24.2	53.4	6.8	6.7	13.9	68.2	69.8	2.9	72.6	0.2	0.6
Other electrical equipment	361–64,369	4.9	10.0	20.8	3.7	4.1	0.1	46.2	45.9	3.4	51.2	0.6	1.5
Transportation equipment	37	2.4	0.6	52.0	0.2	0.6	0.1	53.2	46.0	0.0	54.5	NA	NA
Motor vehicles and motor vehicles equipment	371	0.0	0.1	38.7	NA	0.3	NA	39.6	37.4	NA	43.3	NA	NA
Other transportation equipment	373–75,379	3.5	4.2	50.6	2.8	4.8	0.0	63.6	37.2	NA	32.4	100.0	NA
Aircraft and missiles	372,376	11.4	1.1	64.6	0.3	1.2	0.1	66.2	57.1	0.0	62.9	NA	NA
Professional and scientific instruments	38	4.2	5.2	58.3	2.9	4.1	0.2	82.0	80.1	2.7	79.7	0.0	0.4
Scientific and mechanical measuring instruments	381–82	3.7	4.6	64.0	1.8	4.2	NA	85.6	82.5	6.9	85.7	0.0	1.5
Optical, surgical, photographic, and other instruments	384–87	4.7	5.8	50.3	4.4	4.0	14.3	76.5	77.1	0.0	71.1	0.0	0.2
Other manufacturing industries[1]	27,31,39	3.2	2.8	11.7	1.6	1.7	0.0	54.3	42.9	89.6	47.3	0.0	0.0

See SOURCE at end of table.

Table B-4. Imputation rates for survey items, by industry: 1998

Industry	SIC code	Net Sales	Total employment	R&D scientists/ engineers	Total R&D			R&D by cost				Company-funded	
					Total	Company	Federal	Wages	Materials	Depreciation	Other costs	R&D outside company	Foreign R&D
		[Percent]											
Nonmanufacturing		6.6	10.6	24.0	10.5	6.8	51.9	47.4	54.5	NA	48.9	4.8	1.5
Transportation and utilities	40–42, 44–49	5.4	10.6	60.3	16.5	20.1	NA	64.3	66.9	NA	67.8	4.7	NA
Communications	48	0.9	6.9	67.0	16.6	20.9	NA	60.7	67.0	NA	68.2	NA	NA
Telephone communications	481	0.9	7.3	55.6	19.5	22.2	NA	55.0	63.1	NA	62.4	NA	NA
Other communications	482–484, 489	0.0	0.0	88.1	NA	0.0	NA	96.8	96.6	NA	98.3	0.0	0.0
Electric, gas, and sanitary services	49	8.0	8.5	21.3	9.2	10.4	NA	52.1	42.1	NA	32.4	10.0	NA
Other transportation and utilities	40–42, 44–47	11.0	16.1	16.5	21.7	21.7	NA	96.8	100.0	NA	99.6	NA	NA
Trade	50–59	2.7	2.7	14.1	4.5	4.2	61.4	32.8	40.4	0.0	40.9	3.8	0.7
Finance, insurance, and real estate	60–65,67	7.3	14.4	27.0	5.1	5.1	0.0	59.4	94.8	0.0	52.9	0.0	NA
Services	701,72,73, 75–81, 83,84,87,89	11.2	16.6	22.4	13.4	7.3	43.6	52.4	59.5	0.0	48.9	3.3	2.0
Business services	73	12.6	19.6	23.1	8.6	8.5	13.3	49.9	62.7	0.0	51.1	3.3	1.6
Computer and data processing services	737	10.4	11.0	23.1	7.8	7.7	12.4	49.4	62.9	NA	50.5	3.3	1.5
Other business services	731–736, 738	21.9	35.7	24.0	36.8	36.4	48.9	75.3	52.3	NA	73.0	0.0	28.3

See SOURCE at end of table.

Table B-4. Imputation rates for survey items, by industry: 1998

Industry	SIC code	Net Sales	Total employment	R&D scientists/ engineers	Total R&D			R&D by cost				Company-funded	
					Total	Company	Federal	Wages	Materials	Depreciation	Other costs	R&D outside company	Foreign R&D
		[Percent]											
Health services	80	10.5	0.9	0.8	0.4	0.4	0.0	96.1	97.9	0.0	0.0	NA	NA
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	11.9	1.2	1.1	0.4	0.4	0.0	100.0	100.0	0.0	0.0	NA	NA
Other health services	802–805, 808–809	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA
Engineering and management services	87	8.8	13.3	23.9	21.8	6.4	56.4	53.7	53.6	0.0	48.5	4.3	3.3
Engineering, architectural, and surveying	871	6.8	12.6	38.8	26.8	13.5	36.2	63.3	68.0	0.0	57.7	12.8	10.6
Research, development, and testing	873	18.0	22.4	13.3	22.2	6.0	68.3	49.4	50.3	0.0	45.7	4.6	2.9
Other engineering and management services	872,874	0.3	0.0	43.6	0.0	0.0	0.0	81.0	100.0	0.0	97.1	0.0	0.0
Other services	701,72, 75–79,81, 83,84,89	10.6	14.8	11.3	2.2	6.2	0.0	42.9	33.4	0.0	48.1	0.2	9.7
Other nonmanufacturing industries[1]	07–12, 14,15, 161–162,17	9.4	5.0	30.1	1.1	1.2	0.0	25.0	36.8	0.0	27.9	0.0	4.5

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: NA = Not available.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table B-5. Reported items—percentage of R&D-performing companies that reported non-zero data for major survey items: 1998

Data item	Form RD-1[1, 2]	Form RD-1A[1, 2]
Sales[3]	98.6	98.9
Total employment[3]	98.1	99.0
Scientist and engineers	76.3	81.7
Federal R&D[3, 4]	100.0	100.0
Department of Defense	6.8	NA
NASA	2.3	NA
Department of Energy	2.1	NA
Other Federal agencies	6.3	NA
Company R&D[3, 4]	100.0	100.0
Foreign R&D	33.7	6.3
Contracted-out R&D	20.3	12.0
Total R&D[3]	100.0	100.0
Wages and salaries	66.7	NA
Materials and supplies	60.7	NA
R&D depreciation	29.1	NA
Other costs	64.0	NA
Energy R&D	4.3	NA

[1] Percentages are based on reported data for companies that reported total R&D expenditures. Imputed data are not included. Companies that reported they were out of scope, out of business, merged with another company, or had no R&D expenditures for 1998 were excluded from the calculations.

[2] See technical notes for descriptions of the survey questionnaire forms.

[3] Response to four data items on the questionnaires, total R&D expenditures, Federally-funded R&D expenditures, net sales, and total employment, was mandatory. Response to all other items was voluntary.

[4] "Federal R&D" and "Company R&D" are considered together; companies that report "Total R&D" and either of these expenditures implicitly report both company and Federal R&D, since these two items sum to total R&D.

KEY: NA = not asked.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Table B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998

Industry and size of company	SIC code	Total			Basic research			Applied research		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]								
Distribution by industry:										
All industries		169,180	24,164	145,016	10,612	1,357	9,255	23,439	1,971	21,468
Manufacturing		120,401	18,189	102,211	(D)	(D)	5,930	(D)	(D)	15,901
Food, kindred, and tobacco products	20,21	1,711	0	1,711	84	0	84	520	0	520
Textiles and apparel	22,23	(D)	(D)	543	38	(D)	(D)	66	0	66
Lumber, wood products, and furniture	24,25	374	14	359	44	0	44	(D)	(D)	33
Paper and allied products	26	(D)	(D)	1,583	211	0	211	112	0	112
Chemicals and allied products	28	21,764	(S) 483	21,282	(D)	(D)	2,628	5,053	148	4,905
Industrial chemicals	281–82,286	(D)	(D)	6,467	(D)	(D)	629	2,028	124	1,904
Drugs and medicines	283	12,571	5	12,566	(D)	(D)	1,878	(D)	(D)	2,349
Other chemicals	284–85,287–89	(D)	(D)	2,249	121	0	121	(D)	(D)	652
Petroleum refining and extraction	13,29	1,808	6	1,802	56	2	54	(D)	(D)	542
Rubber products	30	(D)	(D)	1,607	129	0	129	(D)	(D)	197
Stone, clay, and glass products	32	(D)	(D)	592	(D)	(D)	(D)	191	0	191
Primary metals	33	(D)	(D)	720	(D)	(D)	(D)	(D)	(D)	179
Ferrous metals and products	331–32,3398–99	(D)	(D)	405	(D)	(D)	5	(D)	(D)	116
Nonferrous metals and products	333–36	(D)	(D)	315	(D)	(D)	(D)	63	0	63
Fabricated metal products	34	1,595	43	1,551	63	0	63	(D)	(D)	188
Machinery	35	14,919	73	14,846	(D)	(D)	449	(D)	(D)	2,311
Office, computing, and accounting machines	357	8,905	15	8,890	(D)	(D)	146	(D)	(D)	1,668
Other machinery, except electrical	351–56,358–59	6,014	58	5,956	(D)	(D)	303	(D)	(D)	643
Electrical equipment	36	25,990	1,613	24,378	(D)	(D)	897	4,300	99	4,202
Radio and TV receiving equipment	365	155	0	155	34	0	34	11	0	11
Communication equipment	366	(D)	(D)	10,173	(D)	(D)	(D)	779	0	779
Electronic components	367	(D)	(D)	9,776	(D)	(D)	(D)	(D)	(D)	2,781
Other electrical equipment	361–64,369	4,811	538	4,273	(D)	(D)	272	(D)	(D)	631
Transportation equipment	37	29,279	10,330	18,948	(D)	(D)	(D)	(D)	(D)	968
Motor vehicles and motor vehicles equipment	371	(D)	(D)	13,502	(D)	(D)	(D)	(D)	(D)	702
Other transportation equipment	373–75,379	(D)	(D)	339	(D)	0	(D)	(D)	(D)	44
Aircraft and missiles	372,376	14,449	9,341	5,108	(D)	(D)	148	(D)	(D)	223

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998

Industry and size of company	SIC code	Total			Basic research			Applied research		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]								
Distribution by industry:										
Professional and scientific instruments	38	(D)	(D)	9,625	(D)	(D)	624	1,087	39	1,047
Scientific and mechanical measuring instruments	381–82	(D)	(D)	3,614	130	0	130	317	(S) 16	301
Optical, surgical, photographic, and other instruments	384–87	6,085	74	6,011	(D)	(D)	494	770	23	746
Other manufacturing industries[1]	27,31,39	2,795	131	2,664	(D)	(D)	187	549	109	440
Nonmanufacturing		48,780	5,975	42,805	(D)	(D)	3,325	(D)	(D)	5,567
Transportation and utilities	40–42,44–49	(D)	(D)	2,219	(D)	(D)	(D)	(D)	(D)	347
Communications	48	(D)	(D)	1,768	(D)	(D)	(D)	(D)	(D)	291
Telephone communications	481	(D)	(D)	1,665	(D)	(D)	(D)	(D)	(D)	(D)
Other communications	482–484,489	(D)	(D)	103	22	(D)	(D)	(D)	(D)	(D)
Electric, gas, and sanitary services	49	(D)	(D)	182	12	0	12	40	0	40
Other transportation and utilities	40–42,44–47	(D)	(D)	269	(D)	(D)	(D)	16	0	16
Trade	50–59	11,336	(S) 64	11,273	(D)	(D)	620	(D)	(D)	1,502
Finance, insurance, and real estate	60–65,67	(D)	(D)	1,623	(D)	(D)	133	32	0	32
Services	701,72,73,75–81, 83,84,87,89	29,281	4,889	24,392	(D)	(D)	2,151	3,848	741	3,106
Business services	73	15,222	540	14,682	(D)	(D)	(D)	1,252	159	1,092
Computer and data processing services	737	(D)	(D)	14,297	(D)	(D)	(D)	1,224	159	1,065
Other business services	731–736,738	(D)	(D)	385	60	0	60	27	0	27
Health services	80	1,207	33	1,173	535	11	524	(D)	(D)	78
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	1,096	21	1,074	518	0	518	(D)	(D)	25
Other health services	802–805,808–809	111	12	99	17	11	6	54	1	53
Engineering and management services	87	11,835	(S) 3,652	8,182	(D)	(D)	1,044	(D)	(D)	(D)
Engineering, architectural, and surveying	871	2,025	1,190	835	(D)	(D)	45	(D)	(D)	(D)
Research, development, and testing	873	9,169	(S) 2,388	6,780	(D)	(D)	810	1,921	271	1,650
Other engineering and management services	872,874	641	74	567	(D)	(D)	190	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998

Industry and size of company	SIC code	Total			Basic research			Applied research		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]								
Distribution by industry:										
Other services	701,72,75–79,81, 83,84,89	1,017	663	354	(D)	(D)	(D)	(D)	(D)	(D)
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	3,830	532	3,298	507	155	352	681	102	580
Distribution by size of company: [Number of employees]										
Total		169,180	24,164	145,016	10,612	1,357	9,255	23,439	1,971	21,468
Fewer than 500		30,175	3,436	26,739	3,393	522	2,871	5,772	828	4,944
500 to 999		5,495	363	5,132	(D)	(D)	836	(D)	(D)	986
1,000 to 4,999		21,525	620	20,905	(D)	(D)	1,712	(D)	(D)	3,823
5,000 to 9,999		14,053	536	13,517	(D)	(D)	639	(D)	(D)	2,738
10,000 to 24,999		24,876	(S) 955	23,921	(D)	(D)	2,106	(D)	(D)	4,685
25,000 or more		73,055	18,253	54,802	(D)	(D)	1,090	(D)	(D)	4,293

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998

Industry and size of company	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]						[Percent]		
Distribution by industry:										
All industries		95,912	11,337	84,575	39,217	9,498	29,718	23	39	20
Manufacturing		64,875	8,814	56,061	31,926	7,607	24,319	27	42	24
Food, kindred, and tobacco products	20,21	972	0	972	136	0	136	8	0	8
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	18	(D)	(D)
Lumber, wood products, and furniture	24,25	(D)	(D)	250	33	0	33	9	0	9
Paper and allied products	26	(D)	(D)	303	(D)	(D)	(S) 957	61	100	60
Chemicals and allied products	28	(D)	(D)	10,985	(D)	(D)	2,764	(D)	(D)	13
Industrial chemicals	281–82,286	(D)	(D)	3,061	(D)	(D)	872	13	1	13
Drugs and medicines	283	6,585	0	6,585	(D)	(D)	1,754	(D)	(D)	14
Other chemicals	284–85,287–89	(D)	(D)	1,338	138	0	138	(D)	(D)	6
Petroleum refining and extraction	13,29	(D)	(D)	(D)	(D)	0	(D)	(D)	0	(D)
Rubber products	30	977	0	977	305	0	305	(D)	(D)	19
Stone, clay, and glass products	32	294	(D)	(D)	(D)	(D)	(D)	9	(D)	(D)
Primary metals	33	(D)	(D)	(D)	76	(D)	(D)	(D)	2	(D)
Ferrous metals and products	331–32,3398–99	(D)	(D)	235	(D)	(D)	49	(D)	(D)	12
Nonferrous metals and products	333–36	94	(D)	(D)	27	(D)	(D)	(D)	37	(D)
Fabricated metal products	34	(D)	(D)	712	(D)	(D)	588	(D)	(D)	38
Machinery	35	6,904	42	6,862	(D)	(D)	5,225	(D)	(D)	35
Office, computing, and accounting machines	357	2,881	3	2,878	4,198	0	4,198	47	0	47
Other machinery, except electrical	351–56,358–59	4,023	39	3,984	(D)	(D)	1,027	(D)	(D)	17
Electrical equipment	36	13,822	534	13,287	(D)	(D)	5,992	(D)	(D)	25
Radio and TV receiving equipment	365	110	0	110	0	0	0	0	0	0
Communication equipment	366	(D)	(D)	6,590	(D)	(D)	(D)	32	94	(D)
Electronic components	367	(D)	(D)	3,532	(D)	27	(D)	31	(D)	(D)
Other electrical equipment	361–64,369	3,512	456	3,056	314	0	314	7	0	7
Transportation equipment	37	19,062	7,241	11,821	(D)	2,061	(D)	(D)	20	(D)
Motor vehicles and motor vehicles equipment	371	(D)	(D)	7,773	(D)	(D)	(D)	34	1	(D)
Other transportation equipment	373–75,379	(D)	(D)	200	(D)	(D)	(D)	37	61	(D)
Aircraft and missiles	372,376	10,326	6,478	3,848	(D)	(D)	890	(D)	(D)	17

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998

Industry and size of company	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]						[Percent]		
Distribution by industry:										
Professional and scientific instruments	38	6,848	478	6,370	(D)	(D)	1,583	42	90	16
Scientific and mechanical measuring instruments	381–82	(D)	(D)	2,214	(D)	(D)	969	64	91	27
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	4,156	(D)	(D)	614	(D)	(D)	10
Other manufacturing industries[1]	27,31,39	1,884	21	1,863	(D)	(D)	173	(D)	(D)	7
Nonmanufacturing		31,037	2,523	28,514	7,291	(S) 1,892	5,399	15	32	13
Transportation and utilities	40–41,44–49	1,958	398	1,560	243	(D)	(D)	(D)	(D)	11
Communications	48	(D)	(D)	1,408	(D)	(D)	(D)	1	(D)	(D)
Telephone communications	481	(D)	(D)	(D)	(D)	(D)	(D)	1	(D)	(D)
Other communications	482–484,489	(D)	(D)	(D)	(D)	(D)	0	(D)	(D)	0
Electric, gas, and sanitary services	49	(D)	(D)	(D)	(D)	(D)	(D)	8	(D)	(D)
Other transportation and utilities	40–42,44–47	38	(D)	(D)	(D)	(D)	(D)	79	(D)	(D)
Trade	50–59	(D)	(D)	8,944	(D)	(D)	207	(D)	(D)	2
Finance, insurance, and real estate	60–65,67	1,416	0	1,416	(D)	(D)	42	3	100	3
Services	701,72,73,75–81, 83,84,87,89	(D)	(D)	14,875	(D)	(D)	4,260	(D)	(D)	17
Business services	73	(D)	(D)	9,765	3,390	84	3,306	22	16	23
Computer and data processing services	737	9,720	250	9,471	(D)	(D)	3,302	(D)	(D)	23
Other business services	731–736,738	(D)	(D)	294	(D)	(D)	4	(D)	(D)	1
Health services	80	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Offices and clinics of medical doctors, hospitals, medical and dental labs	801,806,807	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other health services	802–805,808–809	39	0	39	0	0	0	0	0	0
Engineering and management services	87	5,975	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Engineering, architectural, and surveying	871	962	(D)	(D)	(D)	(D)	149	(D)	(D)	18
Research, development, and testing	873	4,662	551	4,110	(D)	(D)	(S) 210	(D)	(D)	3
Other engineering and management services	872,874	351	(D)	(D)	(D)	3	(D)	(D)	3	(D)

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of industrial basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry, by size of company, and by source of funds: 1998

Industry and size of company	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[In millions of dollars]						[Percent]		
Distribution by industry:										
Other services	701,72,75–79,81, 83,84,89	701	522	179	69	0	69	7	0	19
Other nonmanufacturing industries[1]	07–12,14,15, 161–162,17	1,932	213	1,720	710	62	647	19	12	20
Distribution by size of company: [Number of employees]										
Total		95,912	11,337	84,575	39,217	9,498	29,718	23	39	20
Fewer than 500		18,517	1,929	16,588	2,494	157	2,336	8	5	9
500 to 999		3,071	162	2,909	(D)	(D)	401	(D)	(D)	8
1,000 to 4,999		13,622	174	13,448	(D)	(D)	1,921	(D)	(D)	9
5,000 to 9,999		9,339	(S) 264	9,075	1,095	31	1,064	8	6	8
10,000 to 24,999		11,789	(S) 677	11,111	(D)	(D)	6,019	(D)	(D)	25
25,000 or more		39,574	8,131	31,443	26,803	8,827	17,976	37	48	33

[1] Manufacturing companies with fewer than 50 employees and nonmanufacturing companies with fewer than 15 employees were sampled separately without regard to industry classification to minimize year-to-year variation in survey estimates. Estimates for manufacturing companies in this group are combined with those for companies in "Other manufacturing industries." Estimates for nonmanufacturing companies in this group are combined with those for companies in "Other nonmanufacturing industries."

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTE: The R&D in this table is the industrial R&D performed within company facilities funded from all sources except the Federal Government. The funds predominantly are the company's own, but also include funds from outside organizations such as other companies, research institutions, universities and colleges, nonprofit organizations, and State governments. Excluded from this table are company-funded R&D not performed within the company (e.g., R&D contracted out to other organizations) and company-funded R&D not performed in the U.S. (e.g., R&D not performed on U.S. soil by foreign subsidiaries or other foreign organizations).

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development: 1998

Survey Definitions

Employment, FTE R&D Scientists and Engineers

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 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.

Employment, Total

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

Federally Funded R&D Centers (FFRDCs)

R&D-performing organizations administered by industrial, academic, or other institutions on a nonprofit basis, and exclusively or substantially financed by the Federal Government. R&D expenditures of industry-administered FFRDCs were included with the Federal R&D data of the industry classification of each of the administering firms. The industry-administered FFRDCs included in the 1998 survey, their corporate administrators, and location are indicated below.

FFRDCs Supported by the Department of Energy

- Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID, administered by Lockheed Martin Idaho Technologies Co.
- Oak Ridge National Laboratory, Oak Ridge, TN, administered by Lockheed Martin Energy Research Co.
- Sandia National Laboratories, Albuquerque, NM, administered by Sandia Corporation a subsidiary of Lockheed Martin Corp.
- Savannah River Technology Center, Aiken, SC, administered by Westinghouse Corp.

FFRDC Supported by the Department of Health and Human Services, National Institutes of Health

- National Cancer Institute (NCI) Frederick Cancer Research Facility, Frederick, MD, administered by Science Applications International Corporation, Advanced Bioscience Laboratories, Inc., Charles River Laboratories, Inc., and Data Management Services, Inc.

Funds for R&D, Company and Other Non-Federal

The cost of R&D performed within the company and funded by the company itself or by other non-Federal sources; does not include the cost of R&D supported by the company but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or—to avoid double-counting—other companies.

Funds for R&D, Federal

The cost of R&D performed within the company under Federal R&D contracts or subcontracts and R&D portions of Federal procurement contracts and subcontracts; does not include the cost of R&D supported by the Federal Government but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or other companies.

Funds for R&D, Total

The cost of R&D performed within the company in its own laboratories or in other company-owned or company-operated facilities, including expenses for wages and salaries, materials and supplies, property and other taxes, maintenance and repairs, depreciation, and an

appropriate share of overhead; does not include capital expenditures or the cost of R&D contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or—to avoid double-counting—other companies.

Funds per R&D Scientist or Engineer

All costs associated with the performance of industrial R&D (salaries, wages, and fringe benefits paid to R&D scientists and engineers; materials and supplies used for R&D; depreciation on capital equipment and facilities used for R&D; and any other R&D costs) divided by the number of R&D scientists and engineers employed. To obtain a per person cost of R&D for a given year, the total R&D expenditures of that year were divided by an approximation of the number of full-time-equivalent (FTE) scientists and engineers engaged in the performance of R&D for that year. For accuracy, this approximation was the mean of the numbers of such FTE R&D-performing scientists and engineers as reported in January for the year in question and the subsequent year. For example, the mean of the numbers of FTE R&D scientists and engineers in January 1998 and January 1999 was divided into total 1998 R&D expenditures for a total cost per R&D scientist or engineer in 1998.

Industrial R&D

As used in this survey, R&D is the pursuit of a planned search for new knowledge or understanding of the subject under study. This search may have reference to a specific application (basic research); the acquisition of knowledge or understanding to meet a specific, recognized need (applied research); or the application of existing knowledge or understanding toward the improvement of a present product or process (development). In industry, *basic research* is the pursuit of new scientific knowledge or understanding that does not have specific immediate commercial objectives, although it may be in fields of present or potential commercial interest; *applied research* is investigation toward discovering new scientific knowledge that has specific commercial objectives with respect to products, processes, or services; and *development* is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes. The survey covers industrial R&D performed by people trained—either formally or by experience—in engineering or in the physical, biological, mathematical, statistical, or computer sciences and employed by a publicly or privately owned firm engaged in for-profit activity in the United States. Specifically excluded from the survey were quality control, routine product testing, market research, sales promotion, sales service, and other nontechnological activities; routine technical services; and research in the social sciences or psychology.

Net Sales and Receipts

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 were excluded, but transfers to foreign subsidiaries and export sales to foreign companies were included.

REFERENCES

National Science Foundation (NSF). 1956. *Science and Engineering in American Industry: Final Report on a 1953-54 Survey*. NSF 56-16. Washington, DC: U.S. Government Printing Office.

———. 1960. *Science and Engineering in American Industry: 1956*. NSF 59-50. Washington, DC: U.S. Government Printing Office.

———. 1994. "1992 R&D Spending by U.S. Firms Rises, NSF Survey Improved." SRS Data Brief. NSF 94-325. Arlington, VA.

———. 1995. "1993 Spending Falls for U.S. Industrial R&D, Nonmanufacturing Share Increases." SRS Data Brief. NSF 95-325. Arlington, VA.

———. 1996a. "1994 Company Funding of U.S. Industrial R&D Rises as Federal Support Continues to Decline." SRS Data Brief. NSF 96-310. Arlington, VA.

———. 1996b. *National Patterns of R&D Resources: 1996*. NSF 96-333. Arlington, VA.

———. 1997a. "1995 U.S. Industrial R&D Rises, NSF Survey Statistics Expanded to Emphasize Role of Nonmanufacturing Industries." SRS Data Brief. NSF 97-332. Arlington, VA.

———. 1997b. *Federal Funds for Research and Development: Fiscal Years 1995–97, Volume 45*. NSF 97-327. Arlington, VA.

———. 1998a. "1996 U.S. Industrial R&D: Firms Continue to Increase Their Investment." SRS Data Brief. NSF 98-317. Arlington, VA.

———. 1998b. *Federal Research and Development Funding by Budget Function: Fiscal Years 1996–98*. NSF 98-301. Arlington, VA.

———. 1999. *National Patterns of R&D Resources: 1998*. NSF 99-335. Arlington, VA.

U.S. Bureau of the Census. 1993. "Effects of the 1987 SIC Revision on Company Classification in the Survey of Industrial Research and Development (R&D)." Technical Memorandum. December 6.

———. 1994a. "Comparison of Company Coding Between 1992 and 1993 for the Survey of Industrial Research and Development." Technical Memorandum. November 3. Washington, DC.

———. 1994b. *Documentation of Nonsampling Issues in the Survey of Industrial Research and Development*. RR94/03. Washington, DC.

———. 1994c. *An Evaluation of Imputation Methods for the Survey of Industrial Research and Development*. ESMD-9404. Washington, DC.

———. 1994d. "Evaluation of Total Employment Cut-Offs in the Survey of Industrial Research and Development." Technical Memorandum. November 3. Washington, DC.

———. 1994e. "Reclassification of Companies in the 1992 Survey of Industrial Research and Development (R&D) for the Generation of the 'Analytical' Series." Technical Memorandum. October 25. Washington, DC.

———. 1994f. *A Study of Processing Errors in the Survey of Industrial Research and Development*. ESMD-9403. Washington, DC.

———. 1994g. "Wedging Considerations for the 1992 Research and Development (R&D) Survey." Technical Memorandum. June 10. Washington, DC.

———. 1995. *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective*. Washington, DC.

Section C. Survey Documents

Page

National Science Foundation Cover Letter 183

Bureau of the Census Cover Letter 184

Survey Questionnaire, Form RD-1 185

Form RD-1 Instructions 189

Survey Questionnaire, Form RD-1A 196

Form RD-1A Instructions 201

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

FROM THE DIRECTOR
NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) requests your company's participation in the 1998 Survey of Industrial Research and Development that the Bureau of the Census is conducting for us. This annual survey is the only source of detailed information on U.S. industry's research and development (R&D) performance.

Your company's participation is vital to the accuracy of the resulting information. Because R&D expenditures are concentrated in relatively few companies, a completed response is needed from each surveyed firm — *there is no substitute for the information that you can provide.* Your company can be assured of complete confidentiality. Survey data will be released only in aggregate form so that responses of individual companies cannot be identified. We have enclosed a data brief from the 1996 survey to show you how these results are used.

If you have questions concerning the operation of this survey, please direct them to the Census Bureau on (301) 457–1339. In addition to the data brief, survey results also are made available in an annual report entitled *Research and Development in Industry.* If you would like to receive a copy of the most recent report, please call the NSF publication clearinghouse on (301) 947–2722 or send an e-mail message to paperpubs@nsf.gov.

Thank you for your assistance in this important effort.

Sincerely,

Rita R. Colwell

Rita R. Colwell
Director

Enclosures

RD-1-CL

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, D.C. 20233

OFFICE OF THE DIRECTOR

FROM THE DIRECTOR
BUREAU OF THE CENSUS

We have enclosed your company's report form and instructions for the 1998 "Survey of Industrial Research and Development (R&D)." We also have enclosed a Computerized Self-Administered Questionnaire diskette as an alternative to the report form, along with instructions for installing it. If you have any questions about installing or using the diskette, please contact the Electronic Reporting Staff on 1-301-457-4125.

The diskette and Form RD-1 contain information from the previous report for your company. **Please review the instructions, complete the diskette or the form, and return it within 60 days.** Federal law requires your response to four items identified on the form. Your voluntary response to all other items is needed to assure useful results.

This survey provides information for examining R&D tax credits, which may allow some businesses to reduce their Federal tax burden. The data assist public officials in allocating research funding by state, which may well benefit companies like yours. Analysts also use the results to compare R&D spending in this country with other countries to ensure that U.S. businesses are not at a competitive disadvantage.

Information you report should cover the domestic operations of your consolidated enterprise for calendar year 1998. We recognize that providing this information is a burden, and we have worked hard to minimize it. For example, if you do not have book records for any item, **you may provide carefully prepared estimates.** The law that authorizes this survey (Title 13, United States Code) requires that we keep your report in full confidence. Only sworn Census Bureau employees will see your information, and they will use it only for statistical purposes.

We conduct this survey with National Science Foundation (NSF) support. We have enclosed a letter from the Director of NSF encouraging your response to the survey. If you have any questions, please call my staff on 1-301-457-1339. Thank you in advance for your cooperation.

Sincerely,

Kenneth Prewitt

Kenneth Prewitt

Enclosures

PLEASE RETURN BY:

OMB No. 3145-0027: Approval Expires 12/31/2001

NOTICE – Your report to the Census Bureau is **confidential** by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

RETURN TO

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

Name of person who supplied 1997 data

MANDATORY REPORTING REQUIREMENTS

Data supplied in items 1A and 1B and in item 3A, line 3, columns 4 and 6, for 1998 on this form will satisfy the mandatory reporting requirements. (Title 13, U.S. Code.)

PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM.

CENSUS USE ONLY

SURVEY CODE

4001

INDUSTRY CODE

WEIGHT

STATE

ADDRESS

SIC CODE

FORM **RD-1**
(12-21-98)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1998

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)**

(Please correct any error in name and address, including ZIP Code.)

THIS REPORT SHOULD COVER YOUR ENTIRE CONSOLIDATED DOMESTIC ENTERPRISE, INCLUDING ALL U.S. SUBSIDIARIES AND DIVISIONS.

The term "company" on this form refers to the consolidated domestic enterprise.

- Please complete this form by the date printed at the top of this page and return it in the envelope provided. Make a copy for your records.
- Please read the enclosed instructions before completing this form.
- Report figures in thousands of dollars. Reasonable estimates are acceptable.
- Explain significant changes in year-to-year data in the remarks section.

COVERAGE REVIEW

Was this company owned or controlled by another company on December 31, 1998?

1303 ☐ Yes – *See instructions for Coverage Review.*

1304 ☐ No – *Continue with item 1*

Section I - GENERAL COMPANY DATA

Item 1 - RECEIPTS AND EMPLOYMENT FOR THE COMPANY

A. Net sales, operating receipts and revenues of domestic operations of this company (Report in thousands of dollars)

EXCLUDE domestic intra-company transfers and sales by foreign subsidiaries.

INCLUDE receipts for sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries.

1997			1998		
Bil.	Mil.	Thou.	Bil.	Mil.	Thou.
101			102		

B. Domestic company employment in all activities during the pay period which includes the 12th of March 1998 (Item 1 of I.R.S. Form 941, if one Form 941 was filled for the entire company.)

Number	Number
111	112

Item 2 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Apportion on a full-time equivalent basis. *See page 4 of the instruction booklet for more detail.*

	January 1998	January 1999
	Number	Number
A. Federal research and development	503	504
B. Company and other research and development	505	506
C. TOTAL – *Sum of lines 2A and 2B* →	501	502

PLEASE CONTINUE ON REVERSE.

Section I – GENERAL COMPANY DATA – Continued

Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT
(Report in thousands of dollars)

	1997 Federal funds (1) Bil.	Mil.	Thou.	1997 Company and other (2) Bil.	Mil.	Thou.	1997 Total ((1)+(2)) (3) Bil.	Mil.	Thou.	1998 Federal funds (4) Bil.	Mil.	Thou.	1998 Company and other (5) Bil.	Mil.	Thou.	1998 Total ((4)+(5)) (6) Bil.	Mil.	Thou.
A. Performed within the company **1.** Basic research	301			302			303			304			305			306		
2. Applied research and development **a.** Applied research	311			312			313			314			315			316		
b. Development	321			322			323			324			325			326		
c. Total – *Sum of lines a and b*	331			332			333			334			335			336		
3. Total – *Sum of lines 1 and 2.c.*	341			342			343			344			345			346		
B. Outside the company – **Federal** funds and **company** funds for research and development **performed by others** outside the company **within the United States** *(Exclude from 3A.3. above)*	351			352			353			354			355			356		
C. Foreign – **Company** funds for research and development **performed by foreign subsidiaries** or other organizations **outside the United States** *(Exclude from 3A.3. and 3B. above)*				362									365					
D. TOTAL – Company and other funds, except Federal (This line represents company sponsored research and development with the exception of "other funds.") – ***Sum of 3A.3, B, and C, (column 5)*** →				372									375					

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1999

(Comparable to the 1998 figure reported in Item 3A.3., column (5).)

1999 Bil.	Mil.	Thou.
401		

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

Item 5 – COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY PRINCIPAL GOVERNMENT AGENCY

Allocate the total reported in Item 3A., line 3, column (4), Federal funds, into the following principal agencies:

	Key code 5	1997 (1) Bil.	Mil.	Thou.	1998 (2) Bil.	Mil.	Thou.
1. Department of Defense	01						
2. National Aeronautics and Space Administration	02						
3. Department of Energy	03						
4. Other Federal agencies	04						
5. TOTAL COSTS – ***Sum of lines 1 through 4*** →	05						

Item 6 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE OF EXPENSE

Allocate the total reported in Item 3A., line 3, column (6), total company research and development – *Exclude lines 3B. and 3C.*

	Key code 6	1997 (1) Bil.	Mil.	Thou.	1998 (2) Bil.	Mil.	Thou.
1. Wages and salaries of research and development personnel – *Include scientists and engineers, technicians, secretaries, and other personnel.*	01						
2. Costs of materials and supplies consumed – *Do not include in this item components, models, and other materials supplied by other research organizations.*	02						
3. R & D depreciation	05						
4. Other costs – *Include service and supporting costs, and share of overhead.*	03						
5. TOTAL COSTS – ***Sum of lines 1 through 4*** →	04						

PLEASE CONTINUE ON PAGE 3.

FORM **RD-1 (Item 7)**
(12-21-98)

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1998

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

Refer to this CENSUS FILE NUMBER in any correspondence pertaining to this report

Section II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY — Continued

Item 7 — COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY STATE

Allocate the total reported in Item 3.A., line 3, columns (4) and (6), by the States in which your various research and development laboratories or facilities are located. Estimate the costs associated with each State. If necessary, you may report up to 10 percent of your total as "Not distributed by State."

Key code	State	1997						1998						Key code	State	1997						1998					
		Federal funds (1)			Total funds (2)			Federal funds (1)			Total funds (2)					Federal funds (1)			Total funds (2)			Federal funds (1)			Total funds (2)		
9		Bil.	Mil.	Thou	Bil.	Mil.	Thou	Bil.	Mil.	Thou	Bil.	Mil.	Thou	9		Bil.	Mil.	Thou	Bil.	Mil.	Thou	Bil.	Mil.	Thou	Bil.	Mil.	Thou
01	AL													27	MT												
02	AK													28	NE												
03	AZ													29	NV												
04	AR													30	NH												
05	CA													31	NJ												
06	CO													32	NM												
07	CT													33	NY												
08	DE													34	NC												
09	DC													35	ND												
10	FL													36	OH												
11	GA													37	OK												
12	HI													38	OR												
13	ID													39	PA												
14	IL													40	RI												
15	IN													41	SC												
16	IA													42	SD												
17	KS													43	TN												
18	KY													44	TX												
19	LA													45	UT												
20	ME													46	VT												
21	MD													47	VA												
22	MA													48	WA												
23	MI													49	WV												
24	MN													50	WI												
25	MS													51	WY												
26	MO													52	*												
53	**TOTAL COSTS** — ***Sum of lines 1 through 52*** →															953						954					

PLEASE CONTINUE ON REVERSE.

Section II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY — Continued

Item 8 - ENERGY RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

- Report expenditures for energy research and development by type of energy sources. Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. These expenditures should be included in Item 3.A., line 3, columns (4) and (6).
- Estimate expenditures for energy research by energy source for 1999.

	Key code	1997						1998						1999					
		Federal funds (1)			Total funds (2)			Federal funds (1)			Total funds (2)			Projected Federal funds (3)			Projected total funds (4)		
	10	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.
A. Nuclear	03																		
B. Fossil fuels	12																		
C. Geothermal, solar, conservation and utilization	16																		
D. All other energy	17																		
E. TOTAL – *Sum of lines A through D* →	18																		

Section III - RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

Item 9 - FOREIGN RESEARCH AND DEVELOPMENT BY COUNTRY

Report the amount of total foreign research and development, Item 3.C., column (5), for the countries with the largest expenditures. If necessary, write in countries not listed. Report the balance of foreign research and development on line 9.

	Key code	1997 (1)			1998 (2)		
	12	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.
1. Canada	01						
2. Germany	02						
3. France	03						
4. Japan	04						
5. United Kingdom	05						
6. Puerto Rico	06						
7. Other — *Specify*	07						
8. Other — *Specify*	08						
9. Balance not distributed	09						
10. TOTAL – *Sum of lines 1 through 9* →	10						

Item 10 - COVERAGE AND OPERATIONAL STATUS

Are research and development expenditures for the entire domestic enterprise, including subsidiaries, reported on this form?

1301 ☐ Yes 1302 ☐ No – *Please explain in the "Remarks" section below*

Item 11 - CERTIFICATION - This report is substantially accurate and has been prepared in accordance with instructions

Name of person to contact regarding this report	Telephone	Area code	Number	Extension

Signature of authorized official	Title	701 Date

801 Remarks

THANK YOU FOR YOUR RESPONSE.

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1998 FORM RD-1

Page

General Instructions 2

Definition of Research and Development 3

Item by Item Instructions 4

Section 1 – General Company Data 4

Item 1 – Receipts and Employment for the Company 4

Item 2 – Number of Research and Development Scientists and Engineers 4

Item 3 – Costs Incurred for Research and Development 4

Item 4 – Company and Other Funds, Except Federal, for Research and Development Performed Within the Company Budgeted for the Year 1999 6

Section II – Research and Development Performed Within the Domestic Company 6

Item 5 – Costs Incurred for Federal Research and Development Performed Within the Company by Principal Government Agency 6

Item 6 – Costs Incurred for Research and Development Performed Within the Company by Major Type of Expense 6

Item 7 – Cost of Research and Development Performed Within the Company by State 7

Item 8 – Energy Research and Development Performed Within the Company 7

Section III – Research and Development Performed Outside the Domestic Company With Company Funds . . 7

Item 9 – Foreign Research and Development by Country 7

Item 10 – Coverage and Operational Status 7

Item 11 – Certification 7

GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is assured.

DUE DATE – Please complete and return this form in the envelope provided within 60 days. Make a copy for your records.

SURVEY SCOPE – This report covers publicly traded and privately-owned, nonfarm business firms in all sectors of the United States economy. It does not include operations owned by Federal, state or local governments, nonprofit organizations, or trust or pension plans.

If your company is owned by a Federal, state or local government, is a nonprofit organization, or is a trust or pension plan which performs no activity other than investments, do not report. Please note in the remarks section on the back page of the form and return it.

REPORTING ENTITY – Report research and development activities for all domestic operations of your **entire consolidated domestic enterprise**, including subsidiaries and divisions. The term "company" in these instructions refers to the consolidated domestic enterprise. Report for all parts of the company located in the 50 states and the District of Columbia. Report net receipts and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

If you report separately for a component of this company based upon an arrangement with the Census Bureau, please continue to do so.

COVERAGE REVIEW – Check the appropriate box if this company was owned or controlled by another company on December 31, 1998. If yes, follow the instructions below:

- If you have been reporting separately for this component of the company based upon an arrangement with the Census Bureau, please complete the form.
- If your company is owned by a foreign company, please complete the form and fill out the new owner information in the remarks section, page 4.
- If your company was purchased by another company on or prior to March 31, 1998, please write the name and address of the new owner in the remarks section, page 4, sign the form in Item 11, and fax the form to (301) 457–1318.
- If your company was purchased after March 31, 1998, please complete the form for the months prior to the purchase of your company, write the name and address of the new owner in the remarks section, page 4, and return the form in the envelope provided.

If you have questions, please call the R&D Survey staff at (301) 457-4677 to determine whether you are required to complete the form.

PERIOD COVERED BY THE REPORT – Report figures for calendar year 1998. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September 1998 and March 1999. Please report employment figures (Items 1B and 2) for the specific times indicated for these items.

HOW TO REPORT – Report all value figures in thousands of dollars. If you cannot answer a question from your company records, please estimate the answer carefully.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.
Report	$1	123	679

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124

	Bil.	Mil.	Thou.
Report	$1	124	000

FIGURES FOR 1997 PRINTED ON THE FORM – If your company reported for 1997, entries from that form have been printed on the present form. If these figures are incorrect, please revise them. Please describe in the "Remarks" section the reasons for any substantial increase or decrease in the 1998 figures entered on this form when compared to corresponding 1997 figures or changes in the 1997 figures. Examples of such reasons are new government contracts, acquisitions and divestitures, and revised accounting method. If you acquired or disposed of a unit performing an important amount of research and development during the 2-year period, please identify the unit in "Remarks," and give the total amount of research and development accounted for by that unit.

ADDITIONAL FORMS – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 218–3331.

GENERAL INSTRUCTIONS – Continued

FILING EXTENSIONS – If you cannot complete the form in 60 days, request an extension of time by:

- calling the Census Touchtone Data Entry System on 1-800-851-2014 (have your 10-digit Census File Number, "CFN", available. The CFN is printed on the form above your address.)

OR

- writing to the address below (Please include your 10-digit Census File Number):

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

ALTERNATIVE REPORTING FORMATS – Along with the survey form, some companies received a computer diskette. Reporting your company information on the diskette is an alternative means of completing the survey. **If you do report on the diskette do not mail in the paper form.**

Receiving your data on diskette benefits us through reduced processing costs. Please refer questions concerning operation of the diskette to the Electronic Reporting Staff at (301) 457–4125.

BURDEN HOUR ESTIMATE – Public reporting burden for this collection of information is estimated to average 20 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information, including suggestions for reducing this burden, to Suzanne H. Plimpton, National Science Foundation, 4201 Wilson Boulevard, Room 485, Arlington, VA 22230.

Direct **QUESTIONS** regarding this form to the Bureau of the Census, Manufacturing and Construction Division, ATTN.: Special Studies Branch, Room 2135/4, Washington, DC 20233–6900, call (301) 457–1339 or E-mail to ronald.w.taylor@ccmail.census.gov. (Please see the instructions for Item 11 on page 7 for E-mail warning.)

DEFINITION OF RESEARCH AND DEVELOPMENT

R&D includes basic and applied research in the sciences and engineering. It also includes design and development of new products and processes and enhancement of existing products and processes.

R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences such as chemistry and physics, the biological sciences such as medicine, and engineering and computer science. R&D includes these activities if the purpose is to do one or more of the following things:

1. Pursue a planned search for **new knowledge**, whether or not the search has reference to a specific application. (Basic research)
2. Apply **existing knowledge** to problems involved in the **creation of a new product or process**, including work required to evaluate possible uses. (Applied research)
3. Apply **existing knowledge** to problems involved in the **improvement of a present product or process**. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of your responses.

Activities to be **excluded** from R&D:

- Routine product testing
- Geological and geophysical exploration activities
- Technical services such as:
  - quality and quantity control
  - technical plant sanitation control
  - trouble-shooting in connection with breakdowns in full-scale production
- Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development.
- Social Science R&D which is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
  - Personnel R&D
  - Economic R&D
  - Artificial intelligence and expert systems R&D
  - Consumer, market, and opinion R&D
  - Engineering psychology R&D
  - Management and organization R&D
  - Actuarial and demographic R&D
  - Educational processes and applications R&D
  - R&D in law

ITEM BY ITEM INSTRUCTIONS

Section I – GENERAL COMPANY DATA

Item 1 – RECEIPTS AND EMPLOYMENT FOR THE COMPANY

Item 1A – Net Sales, Operating Receipts and Revenues

Include:

- Sales, operating receipts and revenues from all domestic operations of the company. This includes receipts from sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries.
- Net selling value of shipments, f.o.b. plant, after discounts and allowances minus freight charges and excise taxes
- Revenue from investments, rents, and royalties only if it is the principal business of the company. Finance, Insurance and Real Estate companies should include interest, dividends, commissions and rental income as part of revenues.
- Value of assets sold under a capital lease agreement
- Export transfers to your foreign subsidiaries

Exclude:

- Sales and other taxes collected and paid directly to government taxing agencies
- Domestic intra-company transfers
- Receipts from sale of products and services provided by your foreign subsidiaries
- Income from interest, dividends and commissions, except for Finance, Insurance and Real Estate companies
- Other nonoperating income (e.g., royalties)

Item 1B – Domestic Company Employment

Include:

- The number of full and part-time employees of the company as defined on Treasury Form 941, Employer's Quarterly Federal Tax Return, and Circular E, Employer's Tax Guide, if filed for the entire company.
- The number of employees in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1998.
- Persons on paid sick leave, paid holidays, and paid vacations during the pay period which includes March 12, 1998.

Report the number of employees, not payroll.

Item 2 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics. Their experience is equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers employed in January, 1999.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1999 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

▶ Source of Funds for Research and Development Costs

Federal funds

Include:

- Federally-sponsored research and development performed within the company. Include only the amount of work done on Federal R&D contracts or subcontracts in the current year.
- R&D portion of procurement contracts or subcontracts

Exclude:

- For Item 3A exclude Federal R&D contracts and R&D portions of procurement contracts that your company subcontracted to other R&D organizations. Including these funds would cause duplication in the statistical totals, which include data on work actually performed by each company. Report subcontracted costs in Item 3B.
- Expenditures for independent research and development (IR&D). These are included in company funds. (See definition below.)

Company and other funds

Include:

- Company-sponsored research and development performed within the company and R&D performed under contract from non-Federal sources

Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT – Continued

Company and other funds – Continued

Include:

- Costs for independent research and development (IR&D). We define IR&D funds as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services. Qualified projects usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are excluded from federal funds received for federally-sponsored research and development contracts.
- Costs for which you anticipate reimbursement as company funds. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

Item 3A – PERFORMED WITHIN THE COMPANY

▶ Types of R&D Costs

Include as R&D costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation
- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as R&D costs:

- Capital expenditures
- Patent expenses
- Income taxes and interest
- R&D performed abroad (see Item 3C), such as in Canada and Puerto Rico
- R&D performed by non-company R&D organizations of any kind (see Item 3B)
- Portion of company-held R&D contracts that are subcontracted outside the reporting company (see Item 3B)
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Item 3A.1 – Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

Item 3A.2a – Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3A.2b – Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research into products or processes.

Include:

- Software development
- Design and operation of pilot plants and semi-work plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models including test models for defense contracts
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

Item 3A.2c – Total Costs for Applied Research and Development

Add line 3A.2a and line 3A.2b.

Item 3A.3 – Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3A.1 and line 3A.2c.

▶ Estimating basic, applied, and development expenditures

If your company does not keep records that can be allocated to these specific categories, estimate by the following:

1. Isolate projects that clearly fall into the development category of R&D costs. If your company fabricates products, development activity will include the design, construction, and testing of prototypes and models. If your company's R&D involves the development of a "process" as in chemicals and petroleum, this development activity would primarily include the design and operation of pilot plants or semi-work plants.
2. Isolate the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. R&D work performed in production units as well as in various laboratories is generally classified as development R&D.
3. Distribute the balance of R&D costs on the basis of individual projects or on the basis of other summaries of the work.

Item 3B – OUTSIDE THE COMPANY

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations.

Federal Funds (column 4): Report R&D activities that your company subcontracted to other organizations using **federal funds** you received for R&D contracts and R&D portions of procurement contracts.

Company and Other Funds (column 5): Report R&D activities that your company subcontracted to other organizations using **company or other nonfederal funds**.

Item 3C – FOREIGN

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Foreign subsidiaries are those outside the 50 States and the District of Columbia.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

Item 3D – TOTAL

With the exception of "Other funds," this number represents company-sponsored R&D. It is comparable to information reported on Form 10K, if you report to the Securities and Exchange Commission.

Add line 3A.3 (column 5), line 3B (column 5) , and line 3C.

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1999

Report the estimated cost of company and other nonfederally sponsored R&D that will be performed within the 50 states and the District of Columbia in 1999. This item is comparable to the 1998 figure reported in Item 3A.3, column 5.

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

Item 5 – COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY PRINCIPAL GOVERNMENT AGENCY

Distribute the cost of Federal research and development work (Item 3A, line 3, columns 1 and 4) by Federal agency – If exact figures are not available by agency, please estimate or apportion according to the number of scientists and engineers working on the Federal projects and/or the costs of Federal programs.

Item 6 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE OF EXPENSE

If most R&D is performed in units where summaries are regularly prepared by element of cost, base the breakdown of research and development costs upon the records of such units. If existing records do not yield figures for this item, the item may be estimated.

Item 6.1 – Wages and Salaries

Report the gross earnings paid in calendar year 1998 to employees engaged in R&D (follow the definition of salaries and wages that is used for calculating the withholding tax). Include salaries of officers in the research establishment(s) if a corporation; exclude payments to proprietor or partners if an unincorporated concern. (Scientists and engineers are defined in item 2.) Exclude employee fringe benefits which are to be reported in Item 6.3 – Other Costs.

Item 6.2 – Materials and Supplies

Report the delivered cost for all purchased materials consumed, whether received from other companies, withdrawn from inventory, or received from other establishments of this company. Include all work that was done for your laboratories and other technical units by non-company organizations (for example, model construction by a non-company model shop). Exclude purchases from other R&D organizations.

Item 6.3 – Depreciation

Report depreciation on items related to your R&D activities. This category is new for the 1998 survey.

Item 6.4 – Other Costs

Include items related to your R&D activities and not included in Items 6.1, 6.2, and 6.3. Include utilities, books and periodicals, property and other taxes, employee fringe benefits, and company overhead.

Item 7 – COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY STATE

Report the cost of R&D for each State in which your company has research and development laboratories or facilities. It is not necessary to calculate separately individual assignments which may be made outside the home State of a particular research staff.

As much as 10 percent of the total may, if desired, be reported in line 52 as "Not distributed by State."

Item 8 – ENERGY RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

Include all spending for R&D to increase energy resources or capabilities, including the development of energy equipment. Energy research and development can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy. Record energy R&D spending according to type of energy in Items 8A through 8D.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be estimated, include the total cost of the R&D project when the primary purpose of the project is energy research and development. If the project is not primarily for energy research and development then exclude all of the project cost.

Item 8B – "Fossil Fuels" Include "Synthetic Fuels" and "Mining"

"Synthetic fuels" includes programs designed to convert coal to gaseous and liquid products. "Mining" is composed of programs for developing equipment and techniques to improve the productivity and recovery rates of coal mining.

Item 8C – "Conservation and Utilization"

Includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, and conversion of energy. Examples of such are R&D undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

Item 8D – "All Other Energy"

Includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot be readily classified in Items 8A through 8C.

Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

This section of the report form covers the R&D reported in item 3.C of section I, on page two.

Item 9 – FOREIGN RESEARCH AND DEVELOPMENT BY COUNTRY

Allocate the totals reported in Item 3.C., column 5 by the country in which your various research and development takes place. Estimate the costs associated with each country. If necessary, you may write in countries not listed.

Item 10 – COVERAGE AND OPERATIONAL STATUS

Check the appropriate box if the domestic company expenditures on this form, including all subsidiaries, have R&D. If no, please explain in remarks section or in a transmittal letter.

Item 11 – CERTIFICATION

Report the name and telephone number of the person to contact regarding this report. Please sign and date the form.

If you wish to correspond by E-mail, please provide your E-mail address in the "Remarks" section.

WARNING CONCERNING ELECTRONIC MAIL – The Internet is NOT a secure means of transmitting information unless it is encrypted. If you choose to communicate with the Census Bureau via electronic mail, the Census Bureau cannot guarantee the privacy of the information while transmitted, but will safeguard it in accordance with Title 13. Be advised that making inquires regarding this survey via electronic mail may divulge your participation in this survey.

PLEASE RETURN BY:

OMB No. 3145-0027: Approval Expires 12/31/2001

NOTICE — Your report to the Census Bureau is **confidential** by law (title 13, U.S. Code).

The instructions and definitions on this form are not complete. Please read the enclosed instruction sheet before completing this form.

RETURN TO

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

MANDATORY REPORTING REQUIREMENTS

Data supplied in items 2A and B and in item 3.A.3, columns 1 and 3 for 1998 on this form will satisfy the mandatory reporting requirements (title 13, U.S. Code).

FORM **RD-1A**
(12-07-98)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1998

FROM THE DIRECTOR
BUREAU OF THE CENSUS

We have enclosed your company's report form and instructions for the 1998 "Survey of Industrial Research and Development" (R&D). **Please read the definition of R&D on page 2 of the form** and review Item 1. If your company does not conduct R&D, please call the Touchtone Data Entry system to report on 1–800–851–2014.

If your company conducted R&D in 1998, please review the instructions, complete the form, and return it within 30 days. Federal law requires your response to four items identified on the form. Your voluntary response to all other items is needed to assure useful results.

This survey provides information for examining R&D tax credits which may allow some businesses to reduce their Federal tax burden. The data assist public officials in allocating research funding by state which may well benefit companies like yours. Analysts also use the results to compare R&D spending in this country with others to ensure that U.S. businesses are not at a competitive disadvantage.

Information you report should cover the domestic operations of your consolidated enterprise for calendar year 1998. We recognize that providing this information is a burden, and we have worked hard to minimize it. For example, if you do not have book records for any item, **you may provide carefully prepared estimates.** The law that authorizes this survey (Title 13, United States Code) requires that we keep your report in full confidence. Only sworn Census Bureau employees will see your information, and they will use it only for statistical purposes.

We conduct this survey with National Science Foundation (NSF) support. We have enclosed a letter from the Director of the NSF encouraging your response to the survey. If you have any questions, please call my staff on 301–457–1339. Thank you in advance for your cooperation.

Sincerely,

Kenneth Prewitt

Enclosures

PLEASE OPEN AND BEGIN THE SURVEY WITH ITEM 1.

RESEARCH AND DEVELOPMENT

R&D includes basic and applied research in the sciences and engineering. It also includes design and development of new products and processes and enhancement of existing products and processes.

R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences such as chemistry and physics, the biological sciences such as medicine, and engineering and computer science. R&D includes these activities if the purpose is to do one or more of the following things:

1. Pursue a planned search for **new knowledge**, whether or not the search has reference to a specific application. (Basic Research)
2. Apply **existing knowledge** to problems involved in the **creation of a new product or process** including work required to evaluate possible uses. (Applied Research)
3. Apply **existing knowledge** to problems involved in the **improvement of a present product or process**. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of your responses.

Activities to be **excluded** from R&D are as follows: research in social sciences or psychology, routine product testing, geological and geophysical exploration activities and technical services.

See instructions for more detail.

Item 1 – CHECK FOR RESEARCH AND DEVELOPMENT

Mark (X) the appropriate box.

201 ☐ Company had R&D in 1998 – *Complete form, enter zeros where applicable, and return this form.*

203 ☐ Company does not conduct R&D – *Call TDE to report (1–800–851–2014).*

NOTE – After reviewing Item 1 if you need further assistance please call (301) 457–1339.

Item 2 – RECEIPTS, EMPLOYMENT AND NUMBER OF SCIENTISTS AND ENGINEERS FOR COMPANY

	1998			
	Bil.	Mil.	Thou.	Dol.
A. Net sales, operating receipts and revenues of domestic operations of this company. (Report in thousands of dollars) **INCLUDE** receipts for sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries from all domestic operations of your company.	102 $			000

	1998
	Number
B. Report domestic company employment in all activities during the pay period which includes the 12th of March 1998. (Item 1 of I.R.S. Form 941, if Form 941 was filed for the entire company.)	112

	January 1999
	Number
C. Report the full-time equivalent number of R&D scientists and engineers employed in January 1999. For employees whose activities are not solely devoted to research and development, report the proportion of their time that is devoted to research and development. *(See instructions for examples)*	502

Item 3 - COSTS INCURRED FOR RESEARCH AND DEVELOPMENT IN 1998

		Source of funds								Total ((1) + (2))			
		Federal (1)				Company and other (2)				(3)			
		Bil.	Mil.	Thou.	Dol.	Bil.	Mil.	Thou.	Dol.	Bil.	Mil.	Thou.	Dol.
A. Performed within the company													
1. Basic research		304 $			000	305 $			000	306 $			000
2. Applied research and development	**a.** Applied research	314 $			000	315 $			000	316 $			000
	b. Development	324 $			000	325 $			000	326 $			000
	c. Total *(Sum of lines a and b)* →	334 $			000	335 $			000	336 $			000
3. TOTAL ***(Sum of lines 1 and 2c)*** →		344 $			000	345 $			000	346 $			000
B. Outside the company – **Federal** funds and **company** funds for research and development **performed by others** outside the company **within the United States** *(Exclude from 3A.3 above)*		354 $			000	355 $			000	356 $			000
C. Foreign – **Company** funds for research and development **performed by foreign subsidiaries** or other organizations **outside the United States** *(Exclude from 3A.3 and 3B above)*						365 $			000				
D. TOTAL – Company and other funds, except Federal *(This line represents company sponsored research and development with the exception of "other funds.") (Sum of 3A.3 (column 2), B, and C)* →						375 $			000				

Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1999

Bil.	Mil.	Thou.	Dol.
401 $			000

Item 5A – COVERAGE AND OPERATIONAL STATUS

Are research and development costs for the entire consolidated domestic enterprise, including subsidiaries, reported on this form?

☐ Yes ☐ No – *Please explain in remarks below.*

Was this company owned or controlled by another company on December 31, 1998?

☐ Yes – *Complete 5B.* Date acquired → 601 | Month | Year |

☐ No

Item 5B – NEW OWNER INFORMATION (See instructions for Coverage Review)

602 Name	603 Address	
604 City	605 State	606 ZIP Code

CHECK ITEM Please complete the check list below BEFORE returning this questionnaire. By checking these items you will reduce the likelihood of our calling you to resolve an error or inconsistency.

	Yes	No
In item 2A:		
1. Sales is reported in **thousands** of dollars	☐	☐
In item 2B:		
2. Your answer describes the number of **employees**, NOT company payroll	☐	☐
In item 3:		
3. Verify that **Federal funds** (column 1) plus **Company funds** (column 2) equals **Total funds** (column 3) for: Basic research (3A.1), applied research (3A.2a), development (3A.2b), total applied research and development (3A.2c), and total costs within the company (3A.3)	☐	☐

IF THE ANSWER TO ANY OF THE ABOVE CHECKS IS "NO", PLEASE MAKE THE NECESSARY CORRECTIONS IN THE APPROPRIATE ITEM(S) OR PROVIDE AN EXPLANATION IN THE REMARKS SECTION.

Item 6 – CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report	Area code	Number	Extension
Signature of authorized official	Title	701 Date	

801 Remarks (If you wish to correspond by E-mail, please place your E-mail address here.)

FORM RD-1A(I)
(10-15-98)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION
WASHINGTON, DC 20233

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1998
FORM RD-1A

Page

General Instructions 2

Definition of Research and Development 3

Item by Item Instructions 3

Item 1 – Check for Research and Development 3

Item 2 – Receipts, Employment and Number of Scientists and Engineers for Company 3

Item 3 – Costs Incurred for Research and Development 4

Item 4 – Company and other Funds, Except Federal, for Research and Development Performed Within the Company Budgeted for the Year 1999 6

Item 5 – Coverage and Operational Status 6

Item 6 – Certification 6

GENERAL INSTRUCTIONS

Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is assured.

DUE DATE – Please complete and return this form in the envelope provided within 30 days. Make a copy for your records.

SURVEY SCOPE – This report covers publicly traded and privately-owned, nonfarm business firms in all sectors of the United States economy. It does not include operations owned by Federal, state or local governments, nonprofit organizations, or trust or pension plans.

If your company is owned by a Federal, state or local government, is a nonprofit organization, or is a trust or pension plan which performs no activity other than investments, do not report. Please note in the remarks section on the back page of the form and return it.

REPORTING ENTITY – Report research and development activities for all domestic operations of your **entire consolidated domestic enterprise**, including subsidiaries and divisions. The term "company" in these instructions refers to the consolidated domestic enterprise. Report for all parts of the company located in the 50 states and the District of Columbia. Report net receipts and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

COVERAGE REVIEW – Check the appropriate box if this company was owned or controlled by another company on December 31, 1998. If yes, follow the instructions below:

- If your company is owned by a foreign company, please complete the form and fill out the new owner information on the back page of the form.
- If your company was purchased by another company on or prior to March 31, 1998, please complete the new owner information on the back page of the form, sign the form in Item 6, and fax the form to (301) 457–1318.
- If your company was purchased after March 31, 1998, please complete the form for the months prior to the purchase of your company, fill out the new owner information on the back page of the form, and return the form in the envelope provided.

If you have questions, please call the R&D Survey staff at (301) 457-4677 to determine whether you are required to complete the form.

PERIOD COVERED BY THE REPORT – Report figures for calendar year 1998. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September 1998 and March 1999. Please report employment figures (Items 2B and 2C) for the specific times indicated for these items.

HOW TO REPORT – Report all value figures in thousands of dollars. If you cannot answer a question from your company records, please estimate the answer carefully.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.	Dol.
Report	$1	123	679	000

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124

	Bil.	Mil.	Thou.	Dol.
Report	$1	124	000	000

ADDITIONAL FORMS – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 218–3331.

FILING EXTENSIONS – If you cannot complete the form in 30 days, request an extension of time by:

- calling the Census Touchtone Data Entry System on 1-800-851-2014 (have your 10-digit Census File Number, "CFN", available. The CFN is printed on the form above your address.)

OR

- writing to the address below (Please include your 10-digit Census File Number):

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

BURDEN HOUR ESTIMATE – Public reporting burden for this collection of information is estimated to average 1 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Gail A. McHenry, National Science Foundation, 4201 Wilson Boulevard, Room 485, Arlington, VA 22230.

Direct **QUESTIONS** regarding this form to the Bureau of the Census, Manufacturing and Construction Division, ATTN.: Special Studies Branch, Room 2135/4, Washington, DC 20233–6900, call (301) 457–1339 or E-mail to ronald.w.taylor@ccmail.census.gov. (Please see the instructions for Item 6 on page 6 for E-mail warning.)

DEFINITION OF RESEARCH AND DEVELOPMENT

R&D includes basic and applied research in the sciences and engineering. It also includes design and development of new products and processes and enhancement of existing products and processes.

R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences such as chemistry and physics, the biological sciences such as medicine, and engineering and computer science. R&D includes these activities if the purpose is to do one or more of the following things:

1. Pursue a planned search for **new knowledge**, whether or not the search has reference to a specific application. (Basic research)

2. Apply **existing knowledge** to problems involved in the **creation of a new product or process**, including work required to evaluate possible uses. (Applied research)

3. Apply **existing knowledge** to problems involved in the **improvement of a present product or process**. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of your responses.

Activities to be **EXCLUDED** from R&D:

- Routine product testing
- Geological and geophysical exploration activities
- Technical services such as:
  - quality and quantity control
  - technical plant sanitation control
  - trouble-shooting in connection with breakdowns in full-scale production
- Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development.
- Social Science R&D which is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
  - Personnel R&D
  - Economic R&D
  - Artificial intelligence and expert systems R&D
  - Consumer, market, and opinion R&D
  - Engineering psychology R&D
  - Management and organization R&D
  - Actuarial and demographic R&D
  - Educational processes and applications R&D
  - R&D in law

ITEM BY ITEM INSTRUCTIONS

Item 1 – CHECK FOR RESEARCH AND DEVELOPMENT

Check the box that best describes the R&D activities of your company. If your company performed R&D in 1998 then check box 201 and continue with Item 2.

If your company did **not** conduct R&D in 1998 then **call the Census Touchtone Data Entry system at 1–800–851–2014 to complete the survey.** Have your 10-digit Census File Number (CFN) ready before calling. The CFN is located above the address. This system will allow you to report that your company performed no R&D in 1998. Do not mail in the form.

Alternatively, check the appropriate box, 203, on the form. Do not complete the data items. Go to Item 6, sign and return the form in the envelope provided. **You must call or mail in the form to complete your reporting requirements for the survey.**

Item 2 – RECEIPTS, EMPLOYMENT AND NUMBER OF SCIENTISTS AND ENGINEERS FOR COMPANY

Item 2A – Net Sales, Operating Receipts and Revenues

Include:

- Sales, operating receipts and revenues from all domestic operations of the company. This includes receipts from sales of products and services provided to other companies, individuals, U.S. Government agencies, and foreign countries.

- Net selling value of shipments, f.o.b. plant, after discounts and allowances minus freight charges and excise taxes

- Revenue from investments, rents, and royalties only if it is the principal business of the company. Finance, Insurance and Real Estate companies should include interest, dividends, commissions and rental income as part of revenues.

- Value of assets sold under a capital lease agreement

- Export transfers to your foreign subsidiaries

ITEM BY ITEM INSTRUCTIONS – Continued

Item 2A – Net Sales, Operating Receipts and Revenues – Continued

Exclude:

- Sales and other taxes collected and paid directly to government taxing agencies
- Domestic intra-company transfers
- Receipts from sale of products and services provided by your foreign subsidiaries
- Income from interest, dividends and commissions, except for Finance, Insurance and Real Estate companies
- Other nonoperating income (e.g., royalties)

Item 2B – Domestic Company Employment

Include:

- The number of full/part-time employees of the company as defined on Treasury Form 941, Employer's Quarterly Federal Tax Return, and Circular E, Employer's Tax Guide, if filed for the entire company.
- The number of employees in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1998.
- Persons on paid sick leave, paid holidays, and paid vacations during the pay period which includes March 12, 1998.

Report the number of employees, not payroll.

Item 2C – Number of Research and Development Scientists and Engineers

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics. Their experience is equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers employed in January, 1999.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1999 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 3 – COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

▶ Source of Funds for Research and Development Costs

Federal funds

Include:

- Federally-sponsored research and development performed within the company. Include only the amount of work done on Federal R&D contracts or subcontracts in the current year.
- R&D portion of procurement contracts or subcontracts

Exclude:

- For Item 3A exclude Federal R&D contracts and R&D portions of procurement contracts that your company subcontracted to other R&D organizations. Including these funds would cause duplication in the statistical totals, which include data on work actually performed by each company. Report subcontracted costs in Item 3B.
- Expenditures for independent research and development (IR&D). These are included in company funds. (See definition below.)

Company and other funds

Include:

- Company-sponsored research and development performed within the company and R&D performed under contract from non-Federal sources
- Costs for independent research and development (IR&D). We define IR&D funds as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services. Qualified projects usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are excluded from federal funds received for federally-sponsored research and development contracts.
- Costs for which you anticipate reimbursement as company funds. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

Item 3A – PERFORMED WITHIN THE COMPANY

▶ Types of R&D Costs

Include as R&D costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation

Item 3A – PERFORMED WITHIN THE COMPANY – Continued

▶ Types of R&D Costs – Continued

Include as R&D costs – Continued:

- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as R&D costs:

- Capital expenditures
- Patent expenses
- Income taxes and interest
- R&D performed abroad (see Item 3C), such as in Canada and Puerto Rico
- R&D performed by non-company R&D organizations of any kind (see Item 3B)
- Portion of company-held R&D contracts that are subcontracted outside the reporting company (see Item 3B)
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Item 3A.1 – Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

Item 3A.2a – Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3A.2b – Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research into products or processes.

Include:

- Software development
- Design and operation of pilot plants and semi-work plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models including test models for defense contracts
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

Item 3A.2c – Total Costs for Applied Research and Development

Add line 3A.2a and line 3A.2b.

Item 3A.3 – Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3A.1 and line 3A.2c.

▶ Estimating basic, applied, and development expenditures

If your company does not keep records that can be allocated to these specific categories, estimate by the following:

1. Isolate projects that clearly fall into the development category of R&D costs. If your company fabricates products, development activity will include the design, construction, and testing of prototypes and models. If your company's R&D involves the development of a "process" as in chemicals and petroleum, this development activity would primarily include the design and operation of pilot plants or semi-work plants.
2. Isolate the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. R&D work performed in production units as well as in various laboratories is generally classified as development R&D.
3. Distribute the balance of R&D costs on the basis of individual projects or on the basis of other summaries of the work.

Item 3A – PERFORMED WITHIN THE COMPANY – Continued

▶ Types of R&D Costs – Continued

Include as R&D costs – Continued:

- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as R&D costs:

- Capital expenditures
- Patent expenses
- Income taxes and interest
- R&D performed abroad (see Item 3C), such as in Canada and Puerto Rico
- R&D performed by non-company R&D organizations of any kind (see Item 3B)
- Portion of company-held R&D contracts that are subcontracted outside the reporting company (see Item 3B)
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering

Item 3A.1 – Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

Item 3A.2a – Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3A.2b – Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research into products or processes.

Include:

- Software development
- Design and operation of pilot plants and semi-work plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models including test models for defense contracts
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

Item 3A.2c – Total Costs for Applied Research and Development

Add line 3A.2a and line 3A.2b.

Item 3A.3 – Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3A.1 and line 3A.2c.

▶ Estimating basic, applied, and development expenditures

If your company does not keep records that can be allocated to these specific categories, estimate by the following:

1. Isolate projects that clearly fall into the development category of R&D costs. If your company fabricates products, development activity will include the design, construction, and testing of prototypes and models. If your company's R&D involves the development of a "process" as in chemicals and petroleum, this development activity would primarily include the design and operation of pilot plants or semi-work plants.
2. Isolate the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. R&D work performed in production units as well as in various laboratories is generally classified as development R&D.
3. Distribute the balance of R&D costs on the basis of individual projects or on the basis of other summaries of the work.

ITEM BY ITEM INSTRUCTIONS – Continued

Item 3B – OUTSIDE THE COMPANY

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations.

Federal Funds (column 1): Report R&D activities that your company subcontracted to other organizations using **federal funds** you received for R&D contracts and R&D portions of procurement contracts.

Company and Other Funds (column 2): Report R&D activities that your company subcontracted to other organizations using **company or other nonfederal funds**.

Item 3C – FOREIGN

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Foreign subsidiaries are those outside the 50 States and the District of Columbia.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

Item 3D – TOTAL

With the exception of "Other funds," this number represents company-sponsored R&D. It is comparable to information reported on Form 10K, if you report to the Securities and Exchange Commission.

Add line 3A.3 (column 2), line 3B (column 2) , and line 3C.

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1999

Report the estimated cost of company and other nonfederally sponsored R&D that will be performed within the 50 states and the District of Columbia in 1999. This item is comparable to the 1998 figure reported in Item 3A.3, column 2.

Item 5A – COVERAGE AND OPERATIONAL STATUS

Check the appropriate box indicating whether or not R&D costs for the entire consolidated domestic enterprise, including subsidiaries were reported on this form. If no, please explain in the remarks section.

Check the appropriate box whether this company was owned or controlled by another company on December 31, 1998. If yes, please report the month and year your company was acquired and fill out the new owner information in Item 5B. Please see "COVERAGE REVIEW" in the General Instructions for a description of how to proceed in filling out the form.

Item 5B – NEW OWNER INFORMATION

If the company was owned or controlled by another company on December 31, 1998, provide the name and address of the new owner. In the "Remarks" section, specify the change or correction, e.g., wholly-owned subsidiary of ABC Company", "merger with XYZ Company", "acquired by 123 Corporation".

CHECK ITEM

Mark "Yes" or "No" as appropriate for each of the checks in this item. If the answer is "No" provide an explanation in the remarks section.

Item 6 – CERTIFICATION

Report the name and telephone number of the person to contact regarding this report. Please sign and date the form.

If you wish to correspond by E-mail, please put your E-mail address in the remarks section.

WARNING CONCERNING ELECTRONIC MAIL: The Internet is not a secure means of transmitting information unless it is encrypted. If you choose to communicate with the Census Bureau via electronic mail, the Census Bureau cannot guarantee the privacy of the information while transmitted, but will safeguard it in accordance with Title 13. Be advised that making inquiries regarding this survey via electronic mail may divulge your participation in this survey.

☆U.S. GOVERNMENT PRINTING OFFICE: 1999 - 750-134/80048

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants for research and education in the sciences, mathematics and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Web site at:

http://www.nsf.gov

Location:	4201 Wilson Blvd. Arlington, VA 22230
For General Information (NSF Information Center):	(703) 292-1111
TDD (for the hearing-impaired):	(703) 292-5090
To Order Publications or Forms:	
Send an e-mail to:	paperpubs@nsf.gov
or telephone:	(301) 947-2722
To Locate NSF Employees:	(703) 292-8183

The Foundation provides awards for research and education in the sciences and engineering. The awardee is wholly responsible for the conduct of such research and preparation of the results for publication. The Foundation, therefore, does not assume responsibility for the research findings or their interpretation.

The Foundation welcomes proposals from all qualified scientists and engineers and strongly encourages women, minorities, and persons with disabilities to compete fully in any of the research and education related programs described here. In accordance with Federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF projects. See the program announcement or contact the program coordinator at 703-292-8636.

The National Science Foundation has TDD (Telephonic Device for the Deaf) capability, which enables individuals with hearing impairment to communicate with the Foundation about NSF programs, employment, or general information. To access NSF TDD dial 703-292-5090; for FIRS, 1-800-877-8339.