



National Center for Science and
Engineering Statistics

Business Enterprise Research and Development: 2022

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General Notes

The Business Enterprise Research and Development (BERD) Survey is the primary source of information on domestic and global research and development (R&D) expenditures and the R&D workforce for companies operating in the 50 U.S. states and the District of Columbia. The survey is conducted annually by the Census Bureau in accordance with an interagency agreement with the National Center for Science and Engineering Statistics (NCSES) within the U.S. National Science Foundation. NCSES has cosponsored an annual business R&D survey since 1953. The Survey of Industrial Research and Development (SIRD) collected data for 1953–2007, and its successor, the Business R&D and Innovation Survey (BRDIS), collected data for 2008–16. Beginning with 2017, the collection of innovation data was moved to the Annual Business Survey, another survey cosponsored with the Census Bureau, and the 2017 and 2018 business R&D data collections reported in this report series were renamed the Business Research and Development Survey (BRDS). Beginning with the data collection for 2019, the survey was renamed for international comparability. BERD Survey [questionnaires, reports, and data](https://nces.nsf.gov/surveys/business-enterprise-research-development/) can be found at <https://nces.nsf.gov/surveys/business-enterprise-research-development/>.

The results of the survey are used to assess trends in the performance and funding of R&D. Government agencies, corporations, and research organizations use the data to investigate productivity, formulate tax policy, and compare individual company performance with industry averages. Individual researchers in industry and academia use the data to investigate a variety of topics and to prepare professional papers, dissertations, and books. Total R&D expenditure statistics are used by the Bureau of Economic Analysis for inclusion in its System of National Accounts and Foreign Direct Investment programs.

Further, statistics from the BERD Survey make it possible to evaluate more fully the status of R&D in the United States and to compare the R&D activities of the United States with those of other nations. The usefulness of the information collected in this survey is enhanced by linking it to the Census Bureau's Longitudinal Establishment and Enterprise Microdata file, which contains information on the outputs and inputs of companies' manufacturing plants. Response to this survey is mandatory and confidential under Title 13 of the U.S. Code.

For the BERD Survey, data are collected from a probability sample of for-profit companies, which are classified in select manufacturing and nonmanufacturing industries. The BERD Survey is administered both to companies known to have performed R&D and to companies with no known history of R&D activity. The survey is sent to a single coordinator within each company, but it is organized into sections that help the coordinator collect specific types of information from different experts in the company (human resources, accounting, R&D managers, etc.). Foreign-owned companies are instructed to report only for company operations owned by the U.S. subsidiary and, for purposes of the survey, to treat the foreign owners as if they were unrelated third parties.

The target population for the BERD Survey consists of all for-profit companies that have 10 or more paid employees in the United States, that have at least one establishment located in the United States in business during the survey year, and that are classified in certain industries, with a particular focus on those companies that perform R&D in the United States. A company is defined as one or more establishments under common domestic ownership or control.

The Census Bureau's Business Register contains information on more than 8.5 million establishments with paid employees. It serves as the primary input to the sampling frame from which the sample is selected. For companies with more than one establishment, data are summed to the company level to assign an industry classification code and a measure of size, which are used in designing the sample. Companies are excluded from the frame if they are classified in an industry that is outside the scope of the BERD Survey or if they have fewer than 10 employees, based on their prior year aggregated annual payroll and employment data.

In addition to single-year tables for 2022 ([table 1](#) through [table 57](#), and [table 66](#) through [table 73](#)), this report includes tables containing statistics for multiple years ([table 58](#) through [table 65](#)). In these tables, most prior year statistics have been revised since they were originally published. Revised statistics include adjustments based on information obtained after the original statistics were prepared. For any given year, after the tables are published, the statistical file used to produce the tables stays open for about 1 year before it is permanently closed. During that year, respondents may provide updated data; also, information from other Census Bureau surveys or publicly available sources may become available. The new data and information are evaluated and tested; if appropriate, revisions are made to the statistical file. The multiyear tables in this report were prepared using the statistical files for the 2022 BERD Survey, the revised 2021 BERD Survey, and the revised BRDIS and BRDS statistical files for 2008–20.

Disclosure avoidance for survey years 2017–21 was handled differently than it had been in prior years' tables. Cell suppression is a disclosure avoidance technique that protects the confidentiality of individual survey units by withholding cell values from release and replacing the cell value with a data code. This technique was used in SIRD, BRDIS, and BRDS tables; data in affected cells were replaced with a "D." For most of the tables in survey years 2017–21, disclosure avoidance was accomplished by replacing cells with an estimate range. Confidentiality was maintained while the usefulness of the statistics was enhanced because most of the completely suppressed cells in past years' tables have been eliminated. For cases where confidentiality cannot be maintained even with the new estimate range technique, a "D" was substituted. Beginning in survey year 2022, estimate ranges were discontinued and all suppressed values were published with a "D."

Terms used in business accounting and incorporated throughout the tables are defined in the section "[Technical Notes](#)." The information and statistics in this report supersede information and statistics in previously published reports.

NCSES has reviewed this product for unauthorized disclosure of confidential information and approved its release (NCSES-DRN24-042).

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Domestic R&D paid for by the company and others and performed by the company

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TABLE 1

Business Enterprise Research and Development Survey aggregate estimates, by questionnaire reference: 2022

(Millions of U.S. dollars and thousands of employees)

Question	Survey item	Aggregate amount
Company and financial information (US\$millions)		
1.12	Worldwide net sales and operating revenues	18,865,332
1.13	Net sales and operating revenues from domestic operations	14,184,308
R&D paid for by the company and performed by the company and others		
2.1	Worldwide R&D paid for by the company (expense), total	847,676
2.3	Worldwide R&D paid for by the company (expense), adjustments	48,522
2.4/ 2.7c	Worldwide R&D paid for by the company and performed by the company and others	799,154
2.7a	Domestic R&D paid for by the company and performed by the company and others	653,547
2.7b	Foreign R&D paid for by the company and performed by the company and others	145,608
2.5	Indirect R&D charges to be recouped from the U.S. federal government (independent R&D [IR&D]) ^a	7,511
2.8m(1)	Domestic R&D paid for by the company and performed by the company and others	653,547
2.8a(1)	Salaries, wages, and fringe benefits	323,313
2.8b(1)	Stock-based compensation	70,482
2.8c(1)	Leased or temporary staffing, including on-site contractors, working on R&D	28,058
2.8d(1)	Expensed equipment (not capitalized)	10,260
2.8e(1)	Materials and supplies	36,945
2.8f(1)	Leased facilities and equipment	9,732
2.8g(1)	Depreciation and amortization on R&D property, plant, equipment, and intangible assets	20,232
2.8h(1)	Royalties and licensing fees	3,580
2.8i(1)	Collaborative R&D payments	8,781
2.8j(1)	Contract R&D	36,708
2.8k(1)	Other purchased services	18,775
2.8l(1)	All other costs	86,682
2.9(3)	Worldwide R&D paid for by the company and performed by others	56,087
2.9(1)	Domestic R&D paid for by the company and performed by others	45,489
2.9(2)	Foreign R&D paid for by the company and performed by others	10,598
2.10(3)	Worldwide R&D paid for and performed by the company	743,067
2.10(1)	Domestic R&D paid for and performed by the company	608,058
2.10(2)	Foreign R&D paid for and performed by the company	135,009
2.9(3) + 2.10(3) + 3.4(3) + 3.5(3)	Worldwide R&D paid for by the company and others and performed by the company and others	906,644
2.10(3) + 3.5(3)	Worldwide R&D paid for by the company and others and performed by the company	841,131
2.9(1) + 2.10(1) + 3.4(1) + 3.5(1)	Domestic R&D paid for by the company and others and performed by the company and others	745,699
2.10(1) + 3.5(1)	Domestic R&D paid for by the company and others and performed by the company	691,547
Domestic R&D paid for and performed by the company		
2.14	Performed at largest domestic location	367,673
2.16	Performed at second-largest domestic location	55,782
2.18	Domestic R&D paid for by foreign operations or subsidiaries and performed by the company ^a	30,161
2.19	Foreign R&D paid for by domestic operations or subsidiaries and performed by the company ^a	26,924
Projected worldwide R&D expense paid for and performed by the company in 2023		
2.20(3)	Worldwide R&D to be paid for and performed by the company	860,437
2.20(1)	Domestic R&D to be paid for and performed by the company	705,424
2.20(2)	Foreign R&D to be paid for and performed by the company	155,013
2.21	Projected R&D services and projected payments for collaborative R&D	50,728
3.1j/ 3.2c	Worldwide R&D paid for by others and performed by the company and others	107,490
3.1a	R&D reimbursed by the company's foreign parent or owner	18,758
3.1b	Collaborative R&D reimbursed by business partners	10,597
3.1c	R&D paid for by grants (government or private foundation)	8,950

TABLE 1

Business Enterprise Research and Development Survey aggregate estimates, by questionnaire reference: 2022

(Millions of U.S. dollars and thousands of employees)

Question	Survey item	Aggregate amount
3.1d	Defense R&D goods or services provided as a prime contractor or subcontractor to the federal government and/ or government contractors	23,829
3.1e	Medical clinical trial Phase I–III services provided to others not owned by the company	33,350 i
3.1f	Medical R&D services, other than clinical trials, provided to others not owned by the company	4,478
3.1g	Nondefense custom software development or computer systems designed for others not owned by the company	549
3.1h	Prototype development, production, and testing for customer's products	1,493
3.1i	All other R&D services provided to the federal government or to others not owned by the company	5,485
3.2c/ 3.1j	Worldwide R&D paid for by others and performed by the company and others	107,490
3.2a	Domestic R&D paid for by others and performed by the company and others	92,152
3.2b	Foreign R&D paid for by others and performed by the company and others	15,338 i
3.3m(1)	Domestic R&D paid for by others and performed by the company and others	92,152
3.3a(1)	Salaries, wages, and fringe benefits	46,597
3.3b(1)	Stock-based compensation	1,255
3.3c(1)	Leased or temporary staffing, including on-site contractors	2,923
3.3d(1)	Expensed equipment (not capitalized)	613 i
3.3e(1)	Materials and supplies	8,694
3.3f(1)	Leased facilities and equipment rental payments	1,179
3.3g(1)	Depreciation and amortization on R&D property, plant, equipment, and intangible assets	2,325
3.3h(1)	Royalties and licensing fees	280
3.3i(1)	Collaborative R&D payments	2,258
3.3j(1)	Contract R&D	6,405
3.3k(1)	Other purchased services	4,366 i
3.3l(1)	All other costs	15,257
3.4(3)	Worldwide R&D paid for and performed by others	9,425
3.4(1)	Domestic R&D paid for and performed by others	8,663
3.4(2)	Foreign R&D paid for and performed by others	762
3.5(3)	Worldwide R&D paid for by others and performed by the company	98,064
3.5(1)	Domestic R&D paid for by others and performed by the company	83,489
3.5(2)	Foreign R&D paid for by others and performed by the company	14,575 i
3.8a	Other companies in the United States	27,125 i
3.8b	Your company's foreign parent or owner	21,005
3.8c	Other companies outside the United States	2,599
3.8d/ 3.11j/ 3.12c	U.S. federal government agencies or laboratories	31,626
3.8e	U.S. state and local government agencies or laboratories	208
3.8f	Foreign government agencies or laboratories	104
3.8g	U.S. universities, colleges, and academic researchers	38
3.8h	Universities, colleges, and academic researchers outside the United States	10
3.8i	All other organizations in the United States	720
3.8j	All other organizations outside the United States	52
3.8d	Federally funded R&D performed by the company	31,626
3.9/ 3.8a + 3.8b + 3.8c	Domestic R&D paid for by other companies and performed by the company	50,729
3.10/ 3.8k - 3.8d	Domestic R&D paid for by nonfederal sources and performed by the company	51,863
3.13	Performed at largest domestic location	35,451
3.15	Performed at second-largest domestic location	7,339
3.16	Domestic R&D paid for by U.S. federal government agencies or laboratories and performed by others	1,847
Projected R&D to be paid for by others and performed by the company in 2023		
3.17	Worldwide R&D to be paid for by others and performed by the company	112,152 i
3.18	Domestic R&D to be paid for by others and performed by the company	89,551
3.19	Domestic R&D to be paid for by the U.S. federal government and performed by the company	33,668
4.1d	Total value of assets owned or leased	14,106,170

TABLE 1

Business Enterprise Research and Development Survey aggregate estimates, by questionnaire reference: 2022

(Millions of U.S. dollars and thousands of employees)

Question	Survey item	Aggregate amount
4.1a	Property, plant, and equipment	6,714,274
4.1b	Goodwill	4,494,155
4.1c	Identifiable intangible assets	2,897,741
4.2c	Accumulated depreciation and amortization on owned or leased assets	6,496,309
4.2a	Property, plant, and equipment	5,161,964
4.2b	Identifiable intangible assets	1,334,345
4.3d	Reduction in asset value due to impairment, changes, disposal, or retirement	359,245
4.3a	Property, plant, and equipment	165,981
4.3b	Goodwill	129,126
4.3c	Identifiable intangible assets	64,138
4.4d	Book value of assets acquired through mergers and acquisitions	583,517
4.4a	Property, plant, and equipment	71,503
4.4b	Goodwill	303,550
4.4c	Identifiable intangible assets	208,465
4.5c	Worldwide expenditures for capitalized assets	1,088,280
4.5a	Property, plant, and equipment	993,314
4.5b	Identifiable intangible assets	94,965
4.6c(1)	Domestic expenditures for capitalized assets	869,538
4.6a(1)	Property, plant, and equipment	789,492
4.6b(1)	Identifiable intangible assets	80,047
4.6c(2)	Foreign expenditures for capitalized assets	218,741
4.6a(2)	Property, plant, and equipment	203,823
4.6b(2)	Identifiable intangible assets	14,919
4.7c/ 4.8g	Domestic capital expenditures for R&D	36,069
4.7a	Property, plant, and equipment	31,655
4.7b	Identifiable intangible assets	4,414
4.8a	Land acquisition	155
4.8b	Buildings and land improvement	5,135
4.8c	Machinery and equipment	22,228
4.8d	Capitalized software	2,743
4.8e	Other intellectual property	3,726
4.8f	All other capital expenditures for R&D operations	2,082
5.1	Worldwide R&D paid for and performed by the company and others directed toward business areas or product lines new to the company	118,363
5.2/ 2.10(1)	Domestic R&D paid for and performed by the company	608,058
Type of R&D (character of work)		
5.4b	Basic research	35,918
5.4a	Applied research	80,834
5.3b	Development	491,307
Technology focus areas		
5.5	Software products and software embedded in other projects or products	276,644
5.6	Biotechnology	95,021
5.7	Nanotechnology	35,691
5.8	Artificial intelligence	33,416
5.10c/ 5.9	Foreign R&D paid for and performed by the company	135,009
5.10a	Research	21,019
5.10b	Development	113,991
5.11/ 3.5(1)	Domestic R&D paid for by others and performed by the company	83,489
Type of R&D (character of work)		
5.13b	Basic research	7,040

TABLE 1

Business Enterprise Research and Development Survey aggregate estimates, by questionnaire reference: 2022

(Millions of U.S. dollars and thousands of employees)

Question	Survey item	Aggregate amount	
5.13a	Applied research	19,821	i
5.12b	Development	56,629	
Technology focus areas			
5.14	Software products and software embedded in other projects or products	15,016	
5.15	Biotechnology	22,087	i
5.16	Nanotechnology	974	i
5.17	Artificial intelligence	3,598	i
5.18/ 3.8d	Federally funded R&D performed by the company	31,626	
Type of R&D (character of work)			
5.20b	Basic research	2,438	i
5.20a	Applied research	5,461	
5.19b	Development	23,727	
Technology focus areas			
5.21	Federally funded R&D performed by the company for software products and software embedded in other projects or products	5,141	
5.23c/ 5.22	Foreign R&D paid for by others and performed by the company	14,575	i
5.23a	Research	4,312	i
5.23b	Development	10,263	i
Employees (thousands)			
Worldwide			
1.8/ 1.9(3)/ 6.1c(3)	Total employees	36,453	
6.1b(3)	Non-R&D employees	33,267	
6.1a(3)	R&D employees	3,186	
6.4a(3)	Female	954	
6.4b(3)	Male	2,232	
6.5a(3)	Researchers	2,199	
6.5b(3)	Technicians	701	
6.5c(3)	Support staff	287	
Domestic			
1.9(1)/ 6.1c(1)	Total employees	24,092	
6.1b(1)	Non-R&D employees	21,982	
6.1a(1)	R&D employees	2,110	
6.4a(1)	Female	609	
6.4b(1)	Male	1,501	
6.5a(1)	Researchers	1,441	
6.5b(1)	Technicians	473	
6.5c(1)	Support staff	196	
Foreign			
1.9(2)/ 6.1c(2)	Total employees	12,361	
6.1b(2)	Non-R&D employees	11,285	
6.1a(2)	R&D employees	1,076	
6.4a(2)	Female	345	
6.4b(2)	Male	731	
6.5a(2)	Researchers	757	
6.5b(2)	Technicians	228	i
6.5c(2)	Support staff	91	
Researchers with PhD			
6.6(3)	Worldwide	184	
6.6(1)	Domestic	143	
6.6(2)	Foreign	42	i

TABLE 1

Business Enterprise Research and Development Survey aggregate estimates, by questionnaire reference: 2022

(Millions of U.S. dollars and thousands of employees)

Question	Survey item	Aggregate amount	
	Full-time equivalent		
6.7d	R&D employees	1,941	
6.7a	Full-time R&D employees	1,639	
6.7b	Full-time employees not solely working on R&D	275	
6.7c	Part-time employees working on R&D	27	i
6.8d	Researchers	1,316	
6.8a	Full-time R&D employees	1,152	
6.8b	Full-time employees not solely working on R&D	153	i
6.8c	Part-time employees working on R&D	11	i
6.9	Non-U.S. citizens employed as researchers under temporary visa ^a	68	
6.10d(1)	Total leased and temporary employees working on R&D	303	i
6.10a(1)	Researchers	179	i
6.10b(1)	Technicians	84	i
6.10c(1)	Support staff	41	i
U.S. patents (number) ^a			
7.1	Patents applied for, total	160,810	
7.2	Nonprovisional utility patents applied for	110,955	
7.3	Nonprovisional utility patent applications filed or planned in foreign jurisdictions	57,853	
7.4	Nonprovisional utility patent applications originated from organized R&D activities	90,432	
7.6	Utility patents issued	103,232	
U.S. patents (US\$millions) ^a			
	Revenue received		
7.7	From sale of utility patents	773	
7.8	From licensing utility patents	24,625	
	Amount paid		
7.10	To purchase patents	1,860	
7.11	To license patents	13,048	

i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

^a Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. These statistics include an adjustment to the weight to account for unit nonresponse.**Note(s):**

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 2
Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide R&D performance			Domestic R&D performance			Foreign R&D performance			
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	
All industries	21-23, 31-33, 42-81	841,131	743,067	98,064	691,547	608,058	83,489	149,584	135,009	14,575	i
Manufacturing industries	31-33	456,879	409,728	47,151	372,459	326,998	45,461	84,419	82,730	1,690	
Food	311	8,605	8,247	358	7,143	D	D	1,463	D	D	
Beverage and tobacco products	312	1,397	1,290	107	767	660	107	630	630	0	
Textile, apparel, and leather products	313-16	748	733	15	635	D	D	113	D	D	
Wood products	321	263	258	5	259	254	5	4	4	0	
Paper	322	1,086	1,085	*	1,005	1,004	*	81	81	*	i
Printing and related support activities	323	167	166	1	165	164	1	2	2	0	
Petroleum and coal products	324	1,107	1,098	9	860	856	4	247	242	5	
Chemicals	325	150,790	138,276	12,514	125,728	113,518	12,210	25,061	24,757	304	
Basic chemicals	3251	3,816	3,604	212	2,860	D	D	956	D	D	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	2,032	D	D	1,493	1,413	80	539	D	D	i
Pesticide, fertilizer, and other agricultural chemicals	3253	1,344	D	D	1,193	D	D	151	D	D	
Pharmaceuticals and medicines	3254	138,339	126,722	11,617	116,073	104,720	11,353	22,266	22,003	263	
Soap, cleaning compound, and toilet preparations	3256	3,803	3,564	238	2,886	D	D	917	D	D	
Paint, coating, adhesive, and other chemicals	3255, 3259	1,456	D	D	1,223	1,195	29	232	D	D	
Plastics and rubber products	326	4,151	3,903	248	3,470	3,251	219	682	652	29	
Nonmetallic mineral products	327	1,623	1,594	29	1,464	1,435	29	159	159	0	
Primary metals	331	1,139	1,117	22	1,120	1,099	20	19	18	2	r
Fabricated metal products	332	3,757	3,501	256	3,526	3,304	222	231	197	34	i
Machinery	333	25,378	24,024	1,354	19,464	18,246	1,218	5,914	5,778	136	
Agricultural implement	33311	3,277	3,132	145	2,287	D	D	990	D	D	
Semiconductor machinery	333242	7,074	7,008	66	5,438	5,390	48	1,636	1,618	18	
Engine, turbine, and power transmission equipment	3336	4,097	3,760	337	3,026	D	D	1,071	D	D	
Other machinery	other 333	10,930	10,124	806	8,713	7,987	725	2,217	2,137	81	
Computer and electronic products	334	140,254	134,627	5,627	104,718	99,234	5,483	35,536	35,392	144	
Communications equipment	3342	15,174	14,367	807	11,665	10,870	795	3,509	3,497	12	i
Semiconductor and other electronic components	3344	71,114	69,078	2,035	49,330	47,380	1,950	21,784	21,698	85	
Navigational, measuring, electromedical, and control instruments	3345	15,445	12,736	2,709	12,777	10,105	2,671	2,668	2,630	38	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	5,007	4,380	626	4,578	3,959	619	429	421	8	i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,473	2,475	1,998	4,146	2,170	1,976	327	305	22	
Other measuring and controlling devices	other 3345	5,965	5,880	85	4,053	3,976	77	1,912	1,905	8	
Other computer and electronic products	other 334	38,521	38,446	76	30,946	30,879	67	7,575	7,567	9	
Electrical equipment, appliances, and components	335	8,661	8,226	435	7,086	6,657	429	1,575	1,569	5	i

TABLE 2
Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide R&D performance			Domestic R&D performance			Foreign R&D performance		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
Transportation equipment	336	79,294	53,533	25,761	71,259	46,468	24,790	8,035	7,064	971
Motor vehicles, bodies, trailers, and parts	3361-63	38,916	36,269	2,647	32,881	30,722	2,159	6,035	5,547	487
Aerospace products and parts	3364	37,175	15,151	22,024	35,356	13,786	21,570	1,819	1,365	454
Aircraft, aircraft engine, and aircraft parts	336411-13	25,224	9,801	15,423	24,571	9,303	15,268	653	498	155
Guided missile, space vehicle, and related parts	336414-15, 336419	11,951	5,350	6,601	10,785	4,483	6,302	1,166	867	299
Military armored vehicle, tank, and tank components	336992	31	27	4	30	26	4	1	1	0
Other transportation	other 336	3,172	2,085	1,087	2,992	1,935	1,057	181	151	30
Furniture and related products	337	445	440	5	410	405	5	36	36	0
Miscellaneous	339	28,014	27,609	405	23,382	23,032	350	4,631	4,577	55
Medical equipment and supplies	3391	24,628	24,291	337	20,394	20,112	282	4,234	4,180	55
Other miscellaneous manufacturing	3399	3,385	3,317	68	2,989	2,921	68	397	397	0
Nonmanufacturing industries	21-23, 42-81	384,253	333,339	50,914	319,088	281,060	38,028	65,165	52,279	12,886
Mining, quarrying, oil and gas extraction, and support activities	21	1,008	952	55	D	D	D	D	D	D
Utilities	22	D	D	D	D	D	D	D	D	D
Wholesale trade	42	1,861	1,820	41	D	D	41	D	D	0
Electronic shopping and electronic auctions	454111-12	D	D	0	D	D	0	D	D	0
Transportation and warehousing	48-49	9,516	D	D	9,395	D	D	121	121	0
Information	51	219,288	218,176	1,112	182,340	181,392	947	36,948	36,784	164
Publishing	511	62,697	61,855	842	50,367	49,674	693	12,330	12,182	149
Newspaper, periodical, book, and directory publishers	5111	72	72	1	72	72	1	* i	* i	0
Software publishers	5112	62,625	61,783	841	50,295	49,602	693	12,330	12,182	149
Telecommunications	517	3,891	3,812	79	3,690	3,614	76	201	198	3
Data processing, hosting, and related services	518	61,649	61,500	149	49,407	49,270	137	12,242	12,229	13
Other information	other 51	91,051	91,010	42	78,876	78,834	42	12,176	12,176	0
Finance and insurance	52	19,834	19,735	99	17,222	17,173	49	2,612	2,562	50
Real estate and rental and leasing	53	2,500	2,500	0	2,398	2,398	0	102	102	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	5	0	5	5	0	1	1	0
Other real estate and rental and leasing	other 53	2,494	2,494	0	2,393	2,393	0	101	101	0
Professional, scientific, and technical services	54	93,801	45,005	48,795	74,773	38,633	36,139	19,028	6,372	12,656
Architectural, engineering, and related services	5413	3,919	2,942	977	3,883	2,912	971	36	30	6
Computer systems design and related services	5415	27,108	23,412	3,696	22,534	18,878	3,656	4,575	4,535	40
Scientific research and development services	5417	53,196	10,258	42,938	39,625	9,297	30,328	13,571	961	12,610
Research and development in nanotechnology	541713	311	202	109	282	179	102	30	23	6
Research and development in biotechnology (except nanobiotechnology)	541714	14,299	2,992	11,307	10,226	2,916	7,310	4,073	77	3,997

TABLE 2
Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide R&D performance			Domestic R&D performance			Foreign R&D performance			
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	37,886	i 7,037	30,849	i 28,420	i 6,176	22,244	i 9,466	i 861	8,605	i
Research and development in the social sciences and humanities	541720	700	27	673	698	27	672	2	0	2	
Other professional, scientific, and technical services	other 54	9,577	8,393	1,185	8,730	7,547	1,184	847	846	1	
Health care services	621-23	2,948	2,877	70	2,855	D	D	93	D	D	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,539	3,446	94	3,394	3,300	94	146	146	0	
All companies (number of domestic employees)	-	841,131	743,067	98,064	691,547	608,058	83,489	149,584	135,009	14,575	i
Small companies											
10-19 ^a	-	5,537	4,252	1,285	5,277	4,009	1,269	260	244	17	i
20-49	-	15,636	13,702	1,934	14,695	12,788	1,907	941	913	28	i
Medium companies											
50-99	-	16,227	14,201	2,026	15,265	13,274	1,990	962	927	36	
100-249	-	29,864	26,777	3,087	27,847	24,844	3,003	2,017	1,934	84	
Large companies											
250-499	-	33,789	30,553	3,236	29,549	26,469	3,080	4,240	4,083	157	
500-999	-	36,458	33,265	3,194	31,802	29,007	2,795	4,657	4,258	399	i
1,000-4,999	-	128,912	118,460	10,452	104,505	94,615	9,890	24,407	23,845	562	
5,000-9,999	-	72,325	67,222	5,103	58,709	54,018	4,692	13,616	13,204	412	
10,000-24,999	-	153,179	120,150	33,028	i 121,142	96,071	25,072	i 32,036	24,079	7,957	i
25,000 or more	-	349,204	314,486	34,717	282,756	252,964	29,792	66,448	61,523	4,925	i

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 3

Worldwide R&D paid for by the company and others and performed by the company, by industry, company size, and worldwide R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size					
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more
All industries	21–23, 31–33, 42–81	841,131	5,844	34,635	55,768	33,957	710,928
Manufacturing industries	31–33	456,879	2,924	14,215	27,946	20,939	390,853
Food	311	8,605	176	861	1,961	581	5,027
Beverage and tobacco products	312	1,397	40	140	84	356	776
Textile, apparel, and leather products	313–16	748	43	157	377	59	112
Wood products	321	263	17	82	165	0	0
Paper	322	1,086	13	112	186	185	591
Printing and related support activities	323	167	26	61	80	0	0
Petroleum and coal products	324	1,107	10	D	178	163	D
Chemicals	325	150,790	394	2,469	10,249	7,494	130,184
Basic chemicals	3251	3,816	78	324	915	552	1,947
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	2,032	D	231	333	D	1,342
Pesticide, fertilizer, and other agricultural chemicals	3253	1,344	12	52	218	0	1,062
Pharmaceuticals and medicines	3254	138,339	122	1,399	8,392	6,697	121,730
Soap, cleaning compound, and toilet preparations	3256	3,803	D	200	181	D	3,270
Paint, coating, adhesive, and other chemicals	3255, 3259	1,456	D	264	208	D	834
Plastics and rubber products	326	4,151	155	670	760	855	1,711
Nonmetallic mineral products	327	1,623	74	142	187	77	1,144
Primary metals	331	1,139	70	207	324	128	410
Fabricated metal products	332	3,757	454	1,384	733	650	536
Machinery	333	25,378	434	2,192	2,366	1,691	18,695
Agricultural implement	33311	3,277	D	137	207	D	2,840
Semiconductor machinery	333242	7,074	6	42	169	91	6,766
Engine, turbine, and power transmission equipment	3336	4,097	15	146	146	130	3,661
Other machinery	other 333	10,930	D	1,867	1,844	D	5,428
Computer and electronic products	334	140,254	476	1,931	4,777	3,288	129,782
Communications equipment	3342	15,174	67	284	532	901	13,391
Semiconductor and other electronic components	3344	71,114	84	443	2,586	1,054	66,946
Navigational, measuring, electromedical, and control instruments	3345	15,445	222	896	1,353	953	12,021
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	5,007	17	321	464	431	3,774
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,473	19	109	257	191	3,897
Other measuring and controlling devices	other 3345	5,965	187	466	632	331	4,350
Other computer and electronic products	other 334	38,521	103	308	305	380	37,425

TABLE 3

Worldwide R&D paid for by the company and others and performed by the company, by industry, company size, and worldwide R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size					
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more
Electrical equipment, appliances, and components	335	8,661	57	901	1,223	1,250	5,230
Transportation equipment	336	79,294	190	1,192	2,056	2,025	73,831
Motor vehicles, bodies, trailers, and parts	3361–63	38,916	88	582	1,245	1,195	35,806
Aerospace products and parts	3364	37,175	47	327	652	571	35,577
Aircraft, aircraft engine, and aircraft parts	336411–13	25,224	40	290	571	269	24,055
Guided missile, space vehicle, and related parts	336414–15, 336419	11,951	8	37	81	303	11,522
Military armored vehicle, tank, and tank components	336992	31	D	18	D	0	0
Other transportation	other 336	3,172	D	264	D	259	2,448
Furniture and related products	337	445	39	119	75	212	0
Miscellaneous	339	28,014	256	D	2,167	1,926	D
Medical equipment and supplies	3391	24,628	132	1,072	1,500	1,777	20,147
Other miscellaneous manufacturing	3399	3,385	124	D	668	148	D
Nonmanufacturing industries	21–23, 42–81	384,253	2,920	20,419	27,822	13,017	320,074
Mining, quarrying, oil and gas extraction, and support activities	21	1,008	i D	336	i 371	i D	D
Utilities	22	D	2	57	D	D	D
Wholesale trade	42	1,861	353	1,332	177	i 0	0
Electronic shopping and electronic auctions	454111–12	D	11	r 93	D	D	D
Transportation and warehousing	48–49	9,516	8	70	398	0	9,039
Information	51	219,288	443	5,948	12,061	6,441	194,395
Publishing	511	62,697	215	2,413	3,232	1,824	55,011
Newspaper, periodical, book, and directory publishers	5111	72	11	6	55	0	0
Software publishers	5112	62,625	205	2,407	3,177	1,824	55,011
Telecommunications	517	3,891	71	i 172	656	188	2,803
Data processing, hosting, and related services	518	61,649	108	2,971	7,479	3,797	47,294
Other information	other 51	91,051	48	392	695	630	89,286
Finance and insurance	52	19,834	7	1,777	r 1,141	792	16,116
Real estate and rental and leasing	53	2,500	i D	37	D	0	2,218
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i 3	i 3	i 0	0	0
Other real estate and rental and leasing	other 53	2,494	i D	34	D	0	2,218
Professional, scientific, and technical services	54	93,801	1,616	9,594	11,502	4,325	66,763
Architectural, engineering, and related services	5413	3,919	312	1,738	1,669	200	0
Computer systems design and related services	5415	27,108	733	3,398	4,148	1,493	17,337
Scientific research and development services	5417	53,196	i 137	3,437	3,908	1,930	43,784

TABLE 3

Worldwide R&D paid for by the company and others and performed by the company, by industry, company size, and worldwide R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size						
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more	
Research and development in nanotechnology	541713	311	13	187	43	68	0	
Research and development in biotechnology (except nanobiotechnology)	541714	14,299	33	844	877	682	11,864	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	37,886	i	91	2,381	2,915	1,180	31,318
Research and development in the social sciences and humanities	541720	700	1	24	73	0	602	
Other professional, scientific, and technical services	other 54	9,577	435	r	1,020	1,777	703	5,642
Health care services	621–23	2,948	56	286	575	585	1,445	
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,539	D	889	D	D	D	
All companies (number of domestic employees)	–	841,131	5,844	34,635	55,768	33,957	710,928	
Small companies								
10–19 ^a	–	5,537	1,616	3,217	650	55	0	
20–49	–	15,636	1,781	9,511	4,189	155	0	
Medium companies								
50–99	–	16,227	1,053	6,401	6,565	2,077	131	
100–249	–	29,864	946	7,183	12,379	5,539	3,818	
Large companies								
250–499	–	33,789	239	3,434	10,505	5,164	14,446	
500–999	–	36,458	133	2,367	7,677	7,242	19,039	
1,000–4,999	–	128,912	65	2,132	9,643	9,131	107,940	
5,000–9,999	–	72,325	7	163	2,054	2,592	67,510	
10,000–24,999	–	153,179	2	143	1,396	1,442	150,196	
25,000 or more	–	349,204	2	i	85	710	560	347,847

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. R&D program size classifications are based on R&D performance.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 4

Companies with worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by source of funds, industry, and company size: 2022

(Number of companies)

Industry and company size	NAICS code	Worldwide R&D performance			Domestic R&D performance			Foreign R&D performance			
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	
All industries	21–23, 31–33, 42–81	30,120	28,590	4,040	29,990	28,450	3,920	3,850	3,710	320	i
Manufacturing industries	31–33	14,910	14,380	1,870	14,850	14,310	1,780	1,730	1,640	230	i
Food	311	960	960	60	960	950	60	60	60	10	i
Beverage and tobacco products	312	160	160	10	160	160	10	20	20	0	
Textile, apparel, and leather products	313–16	260	260	20	260	260	20	40	30	10	i
Wood products	321	110	100	10	110	100	10	10	10	0	
Paper	322	100	100	10	100	100	10	10	10	10	i
Printing and related support activities	323	140	140	10	140	140	10	10	10	0	
Petroleum and coal products	324	80	80	10	80	80	10	10	10	10	i
Chemicals	325	2,320	2,240	410	2,320	2,240	380	450	440	50	i
Basic chemicals	3251	320	310	30	320	310	30	110	110	10	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	200	40	200	200	40	30	30	10	i
Pesticide, fertilizer, and other agricultural chemicals	3253	70	70	10	70	70	10	20	20	10	
Pharmaceuticals and medicines	3254	1,130	1,080	280	1,130	1,080	280	250	240	30	
Soap, cleaning compound, and toilet preparations	3256	270	270	10	270	270	10	20	20	10	
Paint, coating, adhesive, and other chemicals	3255, 3259	350	340	50	350	340	40	40	40	20	r
Plastics and rubber products	326	850	800	90	840	790	90	80	80	10	
Nonmetallic mineral products	327	270	260	30	260	250	30	30	30	0	
Primary metals	331	270	240	50	270	230	50	20	20	10	i
Fabricated metal products	332	1,870	1,780	150	1,870	1,780	150	70	60	10	i
Machinery	333	2,060	2,000	230	2,050	1,990	230	220	220	20	
Agricultural implement	33311	160	160	20	160	160	20	20	20	10	i
Semiconductor machinery	333242	50	50	10	50	50	10	20	20	10	
Engine, turbine, and power transmission equipment	3336	110	110	40	110	110	40	20	20	10	
Other machinery	other 333	1,750	1,690	180	1,740	1,680	180	180	180	10	i
Computer and electronic products	334	2,380	2,310	360	2,370	2,300	310	350	300	80	i
Communications equipment	3342	340	330	30	340	330	30	70	70	10	
Semiconductor and other electronic components	3344	510	490	80	510	490	70	100	100	10	
Navigational, measuring, electromedical, and control instruments	3345	1,040	1,000	240	1,030	990	200	160	110	60	r
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	190	170	70	190	170	70	30	30	10	i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	110	20	110	110	20	30	30	10	
Other measuring and controlling devices	other 3345	750	730	160	740	730	110	100	60	50	r
Other computer and electronic products	other 334	500	500	20	500	500	20	40	40	10	
Electrical equipment, appliances, and components	335	520	510	60	520	510	50	100	100	10	i

TABLE 4
Companies with worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by source of funds, industry, and company size: 2022
 (Number of companies)

Industry and company size	NAICS code	Worldwide R&D performance			Domestic R&D performance			Foreign R&D performance		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
Transportation equipment	336	1,100	1,040	260	1,100	1,040	260	170	160	50
Motor vehicles, bodies, trailers, and parts	3361-63	600	550	150	600	550	150	110	110	30
Aerospace products and parts	3364	270	250	100	270	250	100	40	40	20
Aircraft, aircraft engine, and aircraft parts	336411-13	230	220	80	230	220	80	40	40	20
Guided missile, space vehicle, and related parts	336414-15, 336419	40	40	20	40	40	20	10	10	10
Military armored vehicle, tank, and tank components	336992	10	10	10	10	10	10	10	10	0
Other transportation	other 336	230	230	30	230	230	30	20	10	20
Furniture and related products	337	210	210	10	210	210	10	10	10	0
Miscellaneous	339	1,330	1,290	170	1,330	1,280	170	160	160	20
Medical equipment and supplies	3391	820	790	120	820	790	120	110	110	20
Other miscellaneous manufacturing	3399	510	500	60	510	500	60	50	50	0
Nonmanufacturing industries	21-23, 42-81	15,230	14,220	2,170	15,150	14,150	2,150	2,130	2,070	100
Mining, quarrying, oil and gas extraction, and support activities	21	140	140	20	140	140	20	20	20	10
Utilities	22	50	50	10	50	50	10	10	10	10
Wholesale trade	42	1,610	1,570	90	1,600	1,560	90	130	130	0
Electronic shopping and electronic auctions	454111-12	120	120	0	120	120	0	20	20	0
Transportation and warehousing	48-49	70	70	10	70	60	10	10	10	0
Information	51	3,510	3,450	270	3,500	3,450	250	940	930	30
Publishing	511	1,450	1,430	120	1,440	1,430	110	310	310	20
Newspaper, periodical, book, and directory publishers	5111	40	40	10	40	40	10	10	10	0
Software publishers	5112	1,420	1,400	110	1,410	1,400	110	310	310	20
Telecommunications	517	270	260	80	270	260	80	30	30	10
Data processing, hosting, and related services	518	1,530	1,490	70	1,530	1,490	60	540	530	10
Other information	other 51	280	280	10	280	280	10	70	70	0
Finance and insurance	52	530	530	10	530	530	10	70	70	10
Real estate and rental and leasing	53	70	70	0	70	70	0	20	20	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	20	0	20	20	0	10	10	0
Other real estate and rental and leasing	other 53	50	50	0	50	50	0	20	20	0
Professional, scientific, and technical services	54	7,330	6,480	1,700	7,280	6,420	1,690	870	830	70
Architectural, engineering, and related services	5413	1,430	1,240	430	1,430	1,240	430	90	80	10
Computer systems design and related services	5415	3,400	3,200	410	3,360	3,150	410	550	540	10
Scientific research and development services	5417	1,460	1,080	760	1,450	1,070	750	140	120	50
Research and development in nanotechnology	541713	100	70	60	100	60	60	10	10	10
Research and development in biotechnology (except nanobiotechnology)	541714	340	280	130	340	280	130	40	40	20

TABLE 4

Companies with worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by source of funds, industry, and company size: 2022

(Number of companies)

Industry and company size	NAICS code	Worldwide R&D performance			Domestic R&D performance			Foreign R&D performance			
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,020	730	560	1,020	730	560	100	80	30	i
Research and development in the social sciences and humanities	541720	20	10	10	20	10	10	10	0	10	
Other professional, scientific, and technical services	other 54	1,050	980	120	1,050	980	110	100	100	10	i
Health care services	621-23	310	280	70	310	270	70	30	30	10	i
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,550	1,540	40	1,550	1,540	40	60	60	0	
All companies (number of domestic employees)	-	30,120	28,590	4,040	29,990	28,450	3,920	3,850	3,710	320	i
Small companies											
10-19 ^a	-	5,890	5,400	1,110	5,890	5,390	1,070	380	340	60	r
20-49	-	8,250	7,810	1,210	8,200	7,760	1,200	730	690	60	i
Medium companies											
50-99	-	5,140	4,910	560	5,110	4,880	550	530	510	30	i
100-249	-	5,210	5,030	470	5,190	5,010	460	560	550	30	
Large companies											
250-499	-	2,180	2,110	240	2,160	2,090	230	420	410	30	
500-999	-	1,420	1,370	150	1,410	1,370	130	350	340	40	i
1,000-4,999	-	1,440	1,400	180	1,440	1,400	170	570	570	40	
5,000-9,999	-	270	270	60	270	270	50	150	140	30	
10,000-24,999	-	220	210	70	220	210	60	120	120	30	
25,000 or more	-	140	140	40	140	140	40	80	80	30	

i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 5

Worldwide R&D paid for by the company and performed by the company and others, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Performed by the company	Performed by others
All industries	21–23, 31–33, 42–81	799,154	743,067	56,087
Manufacturing industries	31–33	458,721	409,728	48,993
Food	311	8,600	8,247	353
Beverage and tobacco products	312	1,555	1,290	265
Textile, apparel, and leather products	313–16	744	733	10
Wood products	321	281	258	22
Paper	322	1,094	1,085	8
Printing and related support activities	323	179	166	13
Petroleum and coal products	324	1,361	1,098	263
Chemicals	325	174,210	138,276	35,935
Basic chemicals	3251	3,691	3,604	87
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,981	D	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D
Pharmaceuticals and medicines	3254	161,890	126,722	35,167
Soap, cleaning compound, and toilet preparations	3256	4,026	3,564	462
Paint, coating, adhesive, and other chemicals	3255, 3259	D	D	D
Plastics and rubber products	326	3,977	3,903	74
Nonmetallic mineral products	327	1,613	1,594	19
Primary metals	331	1,140	1,117	23
Fabricated metal products	332	3,551	3,501	50
Machinery	333	24,494	24,024	470
Agricultural implement	33311	3,390	3,132	258
Semiconductor machinery	333242	7,021	7,008	12
Engine, turbine, and power transmission equipment	3336	3,789	3,760	29
Other machinery	other 333	10,295	10,124	170
Computer and electronic products	334	139,330	134,627	4,703
Communications equipment	3342	15,605	14,367	1,238
Semiconductor and other electronic components	3344	69,617	69,078	538
Navigational, measuring, electromedical, and control instruments	3345	13,085	12,736	350
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,493	4,380	112
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,489	2,475	15
Other measuring and controlling devices	other 3345	6,103	5,880	223
Other computer and electronic products	other 334	41,023	38,446	2,577
Electrical equipment, appliances, and components	335	8,319	8,226	93
Transportation equipment	336	58,854	53,533	5,321
Motor vehicles, bodies, trailers, and parts	3361–63	41,244	36,269	4,975
Aerospace products and parts	3364	15,428	15,151	277
Aircraft, aircraft engine, and aircraft parts	336411–13	9,904	9,801	103
Guided missile, space vehicle, and related parts	336414–15, 336419	5,523	5,350	173
Military armored vehicle, tank, and tank components	336992	28	27	1
Other transportation	other 336	2,154	2,085	69
Furniture and related products	337	447	440	7
Miscellaneous	339	28,972	27,609	1,363
Medical equipment and supplies	3391	25,536	24,291	1,244
Other miscellaneous manufacturing	3399	3,436	3,317	118
Nonmanufacturing industries	21–23, 42–81	340,433	333,339	7,094
Mining, quarrying, oil and gas extraction, and support activities	21	1,117	952	164
Utilities	22	D	D	641
Wholesale trade	42	1,968	1,820	148

TABLE 5

Worldwide R&D paid for by the company and performed by the company and others, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Performed by the company	Performed by others
Electronic shopping and electronic auctions	454111-12	D	D	60
Transportation and warehousing	48-49	D	D	41 i
Information	51	221,843	218,176	3,666
Publishing	511	63,474	61,855	1,618
Newspaper, periodical, book, and directory publishers	5111	95	72	23
Software publishers	5112	63,379	61,783	1,595
Telecommunications	517	4,335	3,812	523
Data processing, hosting, and related services	518	62,583	61,500	1,083
Other information	other 51	91,452	91,010	442
Finance and insurance	52	20,197	19,735	462 i
Real estate and rental and leasing	53	2,501	2,500 i	2 i
Lessors of nonfinancial intangible assets (except copyrighted works)	533	6 i	5 i	1 i
Other real estate and rental and leasing	other 53	2,495	2,494 i	1 r
Professional, scientific, and technical services	54	46,586	45,005	1,581
Architectural, engineering, and related services	5413	3,178	2,942	236 i
Computer systems design and related services	5415	23,951	23,412	538
Scientific research and development services	5417	10,946	10,258	687
Research and development in nanotechnology	541713	225	202	23
Research and development in biotechnology (except nanobiotechnology)	541714	3,321	2,992	329
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	7,372	7,037	334
Research and development in the social sciences and humanities	541720	28	27	1 i
Other professional, scientific, and technical services	other 54	8,512	8,393	120
Health care services	621-23	3,123	2,877	246
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,529	3,446	83
All companies (number of domestic employees)	-	799,154	743,067	56,087
Small companies				
10-19 ^a	-	5,086	4,252	834
20-49	-	15,852	13,702	2,150
Medium companies				
50-99	-	16,506	14,201	2,305
100-249	-	30,581	26,777	3,803
Large companies				
250-499	-	34,377	30,553	3,825
500-999	-	35,421	33,265	2,156
1,000-4,999	-	125,023	118,460	6,563
5,000-9,999	-	70,979	67,222	3,758
10,000-24,999	-	134,411	120,150	14,261
25,000 or more	-	330,918	314,486	16,432

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 6

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Amount
All business activities	21100-81000	799,154
Oil and gas extraction	21100	524
Mining	21200	158
Support activities for mining, including oil and gas	21300	882
Utilities	22100	D
Construction	23000	752
Food manufacturing	31100	7,646
Beverage manufacturing	31210	894
Tobacco manufacturing	31220	990
Textile, apparel, and leather products manufacturing	31990	688
Wood products manufacturing	32100	340
Paper manufacturing	32200	1,637
Printing and related support activities	32300	398
Petroleum refineries	32401	558
Asphalt paving, roofing, and saturated materials manufacturing	32402	D
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	319
Basic chemicals manufacturing	32510	4,019
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	1,833
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	1,874
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing	32541	88,109
In vitro diagnostic substances manufacturing	32542	2,198
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	69,445
Soap, cleaning compound, and toilet preparations manufacturing	32591	3,461
Paint, adhesive, and other chemical manufacturing	32592	1,780
Plastics and rubber products manufacturing	32600	4,108
Clay and glass products manufacturing	32710	1,582
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	455
Primary metal manufacturing	33100	1,270
Fabricated metal products manufacturing	33200	3,916
Agricultural machinery and equipment manufacturing	33311	2,848
Construction machinery manufacturing	33312	1,910
Mining, oil, and gas field machinery and equipment manufacturing	33319	1,552
Semiconductor machinery manufacturing	33321	7,051
Industrial machinery manufacturing (except semiconductor machinery)	33322	1,516
Photographic and photocopying equipment manufacturing	33331	D
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	2,980
Digital cameras manufacturing	33333	238
Engine, turbine, and power transmission equipment manufacturing	33360	3,143
Metalworking and other general purpose machinery manufacturing	33390	3,393
Computers and peripheral equipment manufacturing and magnetic and optical media	33412	37,324
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	10,509
Radio, television, and wireless communication equipment manufacturing	33422	4,422
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	811
Audio and video equipment manufacturing	33430	2,118
Semiconductor and other electronic components manufacturing	33440	72,075
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	5,440
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	3,235
Measuring and control instruments manufacturing (not listed elsewhere)	33459	6,357
Electrical equipment, appliances, and components manufacturing	33500	7,834
Motor vehicles manufacturing	33610	31,676

TABLE 6

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Amount	
Motor vehicle body and trailer manufacturing	33620	218	
Motor vehicle parts manufacturing	33630	9,299	
Aircraft manufacturing	33641	5,475	
Aircraft engine and engine parts manufacturing	33642	2,751	
Other aircraft parts and auxiliary equipment manufacturing	33643	2,082	
Guided missiles, space vehicles, and related parts manufacturing	33644	2,755	
Railroad rolling stock manufacturing	33651	330	
Ship and boat building	33660	281	
Motorcycle, bicycle, and parts manufacturing	33691	506	
Military armored vehicle, tank, and tank components manufacturing	33692	429	i
All other transportation equipment manufacturing	33699	432	
Furniture and related products manufacturing	33700	475	
Medical equipment and supplies manufacturing	33910	24,067	
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	3,786	
Merchant wholesalers, durable goods	42300	1,226	
Merchant wholesalers, nondurable goods	42400	781	
Wholesale electronic markets and agents and brokers (business to business)	42500	170	r
Retail trade (except electronic shopping and electronic auctions)	44000	432	
Electronic shopping and electronic auctions	45411	15,976	i
Transportation	48000	6,883	
Couriers, messengers, and express delivery services	49200	D	
Warehousing and storage	49300	D	
Newspaper, periodical, book, and directory publishers (except Internet)	51110	D	
Software publishers (except Internet)	51120	43,881	
Motion picture and sound recording (except Internet)	51200	102	r
Broadcasting (except Internet)	51500	452	
Wired telecommunications carriers	51710	622	
Wireless telecommunications carriers (except satellite)	51720	3,065	
Satellite telecommunications	51740	640	
Other telecommunications (not listed elsewhere)	51790	340	
Data processing, hosting, and related services	51800	13,572	
Cloud computing applications and Internet-based software services	51801	64,350	
Other information services, including Internet publishing, broadcasting, and Web search portals	51910	96,932	
Finance: banking and credit intermediation	52200	12,137	
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	5,262	
Insurance carriers and related activities	52400	2,529	
Real estate	53100	793	
Rental and leasing services	53200	1,739	
Lessors of nonfinancial intangible assets, including patent licensing	53300	D	
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	3,819	
Architectural, engineering, and related services	54130	3,864	
Specialized design services	54140	D	
Computer systems design and related services	54150	21,956	
Management, scientific, and technical consulting services	54160	3,521	
Research and development services in the social sciences and humanities	54172	28	
Research and development services in biotechnology	54173	3,392	
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	5,828	
Research and development services in nanotechnology	54175	224	
Advertising and related services	54180	2,395	i
Professional, scientific, and technical services (not listed elsewhere)	54190	2,055	
Management of companies and enterprises	55100	D	

TABLE 6

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Amount
Administrative and support services	56100	4,404
Waste management and remediation services	56200	5
Offices of physicians	62110	D
Medical and diagnostic laboratories	62150	3,554
Other ambulatory health care services (ambulance, dental, home health care)	62199	331
Hospitals and nursing care facilities	62200	9
Social assistance services	62400	7
Arts, entertainment, and recreation	71000	D
Accommodation and food services	72000	D
Other services (not listed elsewhere)	81000	8,738 i
Undistributed	-	0

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System industry definitions.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 7

Worldwide R&D paid for by others and performed by the company and others, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Performed by the company	Performed by others
All industries	21–23, 31–33, 42–81	107,490	98,064	9,425
Manufacturing industries	31–33	53,428	47,151	6,277
Food	311	360	358	2
Beverage and tobacco products	312	110	107	3
Textile, apparel, and leather products	313–16	15	15	*
Wood products	321	5	5	0
Paper	322	1	*	* i
Printing and related support activities	323	1	1	*
Petroleum and coal products	324	10	9	1
Chemicals	325	16,527	12,514	4,013
Basic chemicals	3251	215	212	3
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	117	D	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D
Pharmaceuticals and medicines	3254	15,584	11,617	3,967
Soap, cleaning compound, and toilet preparations	3256	240	238	1
Paint, coating, adhesive, and other chemicals	3255, 3259	D	D	D
Plastics and rubber products	326	257	248	8
Nonmetallic mineral products	327	37	29	8 r
Primary metals	331	32	22	10
Fabricated metal products	332	257	256 i	2
Machinery	333	1,410	1,354	56
Agricultural implement	33311	163	145	18
Semiconductor machinery	333242	68	66	2
Engine, turbine, and power transmission equipment	3336	351	337	14
Other machinery	other 333	828	806	22 r
Computer and electronic products	334	5,778	5,627	151
Communications equipment	3342	821	807 i	14
Semiconductor and other electronic components	3344	2,040	2,035	4
Navigational, measuring, electromedical, and control instruments	3345	2,840	2,709	131
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	653 i	626 i	27 i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,093	1,998	95
Other measuring and controlling devices	other 3345	94	85	9
Other computer and electronic products	other 334	78	76	2
Electrical equipment, appliances, and components	335	450	435 i	15 i
Transportation equipment	336	27,753	25,761	1,992
Motor vehicles, bodies, trailers, and parts	3361–63	2,869	2,647	222
Aerospace products and parts	3364	23,793	22,024	1,770
Aircraft, aircraft engine, and aircraft parts	336411–13	17,180 i	15,423 i	1,757
Guided missile, space vehicle, and related parts	336414–15, 336419	6,614	6,601	13
Military armored vehicle, tank, and tank components	336992	4	4	0
Other transportation	other 336	1,087	1,087	* r
Furniture and related products	337	6	5	1 r
Miscellaneous	339	419	405	14
Medical equipment and supplies	3391	345	337	9
Other miscellaneous manufacturing	3399	73	68	5
Nonmanufacturing industries	21–23, 42–81	54,062	50,914 i	3,148 i
Mining, quarrying, oil and gas extraction, and support activities	21	68	55 i	13 r
Utilities	22	D	D	18
Wholesale trade	42	45	41	4 r

TABLE 7

Worldwide R&D paid for by others and performed by the company and others, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Performed by the company	Performed by others
Electronic shopping and electronic auctions	454111-12	0	0	0
Transportation and warehousing	48-49	D	D	1
Information	51	1,173	1,112	61
Publishing	511	897	842	55
Newspaper, periodical, book, and directory publishers	5111	1	1	0
Software publishers	5112	896	841	55
Telecommunications	517	81	79	2
Data processing, hosting, and related services	518	153	149	3
Other information	other 51	42	42	* i
Finance and insurance	52	99	99	0
Real estate and rental and leasing	53	0	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	0
Other real estate and rental and leasing	other 53	0	0	0
Professional, scientific, and technical services	54	51,824	48,795	3,029
Architectural, engineering, and related services	5413	1,116	977	138
Computer systems design and related services	5415	3,799	3,696	104
Scientific research and development services	5417	45,612	42,938	2,675
Research and development in nanotechnology	541713	116	109	7
Research and development in biotechnology (except nanobiotechnology)	541714	11,411	11,307	104
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	33,412	30,849	2,563
Research and development in the social sciences and humanities	541720	673	673	0
Other professional, scientific, and technical services	other 54	1,296	1,185	112
Health care services	621-23	73	70	3
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	113	94	19
All companies (number of domestic employees)	-	107,490	98,064	9,425
Small companies				
10-19 ^a	-	1,437	1,285	151
20-49	-	2,142	1,934	207
Medium companies				
50-99	-	2,357	2,026	331
100-249	-	3,764	3,087	677
Large companies				
250-499	-	3,845	3,236	608
500-999	-	3,576	3,194	382
1,000-4,999	-	11,998	10,452	1,545
5,000-9,999	-	5,294	5,103	191
10,000-24,999	-	35,528	33,028	2,499
25,000 or more	-	37,549	34,717	2,832

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 8

Worldwide, domestic, and foreign sales for companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Sales					
		R&D performers or funders ^a			Domestic R&D performers ^b		
		Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign
All industries	21–23, 31–33, 42–81	18,865,332	14,184,308	4,681,024	18,740,400	14,073,306	4,667,094
Manufacturing industries	31–33	10,483,814	7,322,263	3,161,550	10,441,004	7,291,169	3,149,835
Food	311	1,328,082	965,560	362,522	D	961,540	D
Beverage and tobacco products	312	222,516	133,830	88,686	222,199	133,513	88,686
Textile, apparel, and leather products	313–16	96,905	71,745	25,160	96,905	71,745	25,160
Wood products	321	63,162	61,018	2,145	62,972	60,828	2,145
Paper	322	121,409	98,823	22,585	121,409	98,823	22,585
Printing and related support activities	323	33,661	29,296	4,366	33,630	29,265	4,366
Petroleum and coal products	324	725,574	399,161	326,413	725,574	399,161	326,413
Chemicals	325	2,073,781	1,493,442	580,339	2,065,785	1,487,865	577,920
Basic chemicals	3251	507,554	413,607	93,947	507,554	413,607	93,947
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	148,327	91,925	56,402	148,327	91,925	56,402
Pesticide, fertilizer, and other agricultural chemicals	3253	111,016	103,364	7,652	109,827	102,213	7,613
Pharmaceuticals and medicines	3254	965,978	685,744	280,234	961,728	681,493	280,234
Soap, cleaning compound, and toilet preparations	3256	228,765	131,795	96,970	228,765	131,795	96,970
Paint, coating, adhesive, and other chemicals	3255, 3259	112,141	67,008	45,133	109,585	66,832	42,752
Plastics and rubber products	326	316,751	253,088	63,662	314,991	251,372	63,619
Nonmetallic mineral products	327	87,137	66,532	20,606	72,185	55,456	16,729
Primary metals	331	187,842	160,761	27,081	186,668	159,588	27,080
Fabricated metal products	332	223,165	188,388	34,777	222,798	188,021	34,777
Machinery	333	810,458	520,724	289,734	809,236	519,502	289,734
Agricultural implement	33311	139,933	103,071	36,862	139,933	103,071	36,862
Semiconductor machinery	333242	78,349	32,885	45,464	78,349	32,885	45,464
Engine, turbine, and power transmission equipment	3336	139,276	71,407	67,870	139,276	71,407	67,870
Other machinery	other 333	452,899	313,360	139,539	451,678	312,139	139,539
Computer and electronic products	334	1,414,098	734,451	679,647	1,413,517	734,040	679,477
Communications equipment	3342	137,293	94,162	43,131	137,293	94,162	43,131
Semiconductor and other electronic components	3344	438,645	209,620	229,024	438,319	209,459	228,861
Navigational, measuring, electromedical, and control instruments	3345	171,254	121,464	49,790	171,080	121,296	49,784
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	41,740	34,617	7,123	41,740	34,617	7,123
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	28,709	25,280	3,429	28,659	25,230	3,429
Other measuring and controlling devices	other 3345	100,805	61,566	39,239	100,681	61,449	39,232
Other computer and electronic products	other 334	666,906	309,204	357,702	666,825	309,123	357,702
Electrical equipment, appliances, and components	335	246,813	190,989	55,824	246,492	190,668	55,824

TABLE 8

Worldwide, domestic, and foreign sales for companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Sales					
		R&D performers or funders ^a			Domestic R&D performers ^b		
		Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign
Transportation equipment	336	1,754,108	1,377,381	376,727	1,751,188	1,376,763	374,425
Motor vehicles, bodies, trailers, and parts	3361-63	1,219,631	934,230	285,401	1,216,710	933,611	283,098
Aerospace products and parts	3364	428,659	356,684	71,975	428,659	356,684	71,975
Aircraft, aircraft engine, and aircraft parts	336411-13	293,542	254,318	39,223	293,542	254,318	39,223
Guided missile, space vehicle, and related parts	336414-15, 336419	135,117	102,365	32,752	135,117	102,365	32,752
Military armored vehicle, tank, and tank components	336992	1,288	1,288	0	1,288	1,288	0
Other transportation	other 336	104,531	85,180	19,351	104,531	85,180	19,351
Furniture and related products	337	42,898	38,358	4,540	D	34,816	D
Miscellaneous	339	735,454	538,717	196,737	734,940	538,203	196,737
Medical equipment and supplies	3391	579,196	439,882	139,315	579,082	439,767	139,315
Other miscellaneous manufacturing	3399	156,257	98,835	57,422	155,858	98,436	57,422
Nonmanufacturing industries	21-23, 42-81	8,381,519	6,862,045	1,519,474	8,299,397	6,782,138	1,517,259
Mining, quarrying, oil and gas extraction, and support activities	21	596,556	365,103	231,453	596,015	364,561	231,453
Utilities	22	401,755	397,079	4,675	342,727	338,051	4,675
Wholesale trade	42	719,002	664,357	54,645	710,893	656,327	54,566
Electronic shopping and electronic auctions	454111-12	D	462,290	D	D	459,379	D
Transportation and warehousing	48-49	394,854	299,607	95,248	394,687	299,439	95,248
Information	51	2,468,595	1,852,965	615,631	2,467,819	1,852,263	615,556
Publishing	511	587,242	370,798	216,443	D	D	D
Newspaper, periodical, book, and directory publishers	5111	2,900	2,829	71	D	D	D
Software publishers	5112	584,342	367,970	216,372	584,251	367,879	216,372
Telecommunications	517	476,722	468,426	8,296	476,722	468,426	8,296
Data processing, hosting, and related services	518	755,298	638,156	117,141	755,179	638,061	117,118
Other information	other 51	649,333	375,583	273,750	D	D	D
Finance and insurance	52	1,364,217	1,250,350	113,867	1,362,573	1,248,706	113,867
Real estate and rental and leasing	53	83,523	74,026	9,497	83,523	74,026	9,497
Lessors of nonfinancial intangible assets (except copyrighted works)	533	475	464	11	475	464	11
Other real estate and rental and leasing	other 53	83,049	73,562	9,486	83,049	73,562	9,486
Professional, scientific, and technical services	54	741,152	561,046	180,106	733,192	555,043	178,148
Architectural, engineering, and related services	5413	126,022	105,800	20,222	124,247	104,714	19,533
Computer systems design and related services	5415	290,033	186,067	103,966	284,644	181,866	102,777
Scientific research and development services	5417	169,943	136,566	33,377	169,342	136,024	33,318
Research and development in nanotechnology	541713	968	933	34	762	760	2
Research and development in biotechnology (except nanobiotechnology)	541714	33,306	27,575	5,731	33,211	27,481	5,731

TABLE 8

Worldwide, domestic, and foreign sales for companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Sales					
		R&D performers or funders ^a			Domestic R&D performers ^b		
		Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	134,109	106,503	27,606	133,943	106,364	27,579
Research and development in the social sciences and humanities	541720	1,560	1,554	6	1,426	1,420	6
Other professional, scientific, and technical services	other 54	155,154	132,613	22,540	154,959	132,438	22,520
Health care services	621-23	97,889	96,411	1,478	97,687	96,210	1,478
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	838,811	D	D	838,132	D
All companies (number of domestic employees)	-	18,865,332	14,184,308	4,681,024	18,740,400	14,073,306	4,667,094
Small companies							
10-19 ^c	-	42,142	41,616	525	39,870	39,546	323
20-49	-	122,687	113,186	9,501	120,852	111,483	9,369
Medium companies							
50-99	-	187,536	179,757	7,779	181,831	174,164	7,668
100-249	-	413,628	384,889	28,738	396,402	370,129	26,274
Large companies							
250-499	-	471,496	366,007	105,489	460,171	358,556	101,615
500-999	-	666,613	573,879	92,733	660,689	568,206	92,483
1,000-4,999	-	2,668,856	2,052,262	616,595	2,652,727	2,040,631	612,096
5,000-9,999	-	2,083,187	1,590,874	492,313	2,055,859	1,565,944	489,916
10,000-24,999	-	4,211,285	2,883,419	1,327,866	4,174,096	2,846,230	1,327,866
25,000 or more	-	7,997,902	5,998,417	1,999,485	7,997,902	5,998,417	1,999,485

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Statistics are representative of companies located in the United States that performed or funded R&D.^b Statistics are representative of companies located in the United States that performed R&D.^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Domestic sales are the amount of sales that originated from domestic operations. Foreign sales are the amount of sales that originated from foreign operations. Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 9

Worldwide, domestic, and foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Sales		
		Worldwide	Domestic	Foreign
All business activities	21100–81000	18,865,332	14,184,308	4,681,024
Oil and gas extraction	21100	275,133	163,855	111,278
Mining	21200	37,560 i	37,098 i	462
Support activities for mining, including oil and gas	21300	229,576 i	142,631 i	86,945 i
Utilities	22100	386,256	381,945	4,311
Construction	23000	95,779	91,210	4,569
Food manufacturing	31100	1,066,413	798,579	267,834
Beverage manufacturing	31210	191,226	115,934	75,293
Tobacco manufacturing	31220	79,958	45,741	34,216
Textile, apparel, and leather products manufacturing	31990	80,551	60,625	19,926
Wood products manufacturing	32100	72,546	67,441	5,105
Paper manufacturing	32200	157,882	124,483	33,400
Printing and related support activities	32300	35,490	29,142	6,348
Petroleum refineries	32401	826,911	524,316	302,595
Asphalt paving, roofing, and saturated materials manufacturing	32402	15,062	13,970	1,092
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	24,621	19,780	4,841
Basic chemicals manufacturing	32510	324,442	218,383	106,058
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	157,618	97,304	60,314
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	92,610	77,915	14,695
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing	32541	920,920	695,247	225,673
In vitro diagnostic substances manufacturing	32542	22,958	12,587	10,371 i
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	155,946	121,621	34,325
Soap, cleaning compound, and toilet preparations manufacturing	32591	205,686	114,703	90,983
Paint, adhesive, and other chemical manufacturing	32592	147,517	89,469	58,049
Plastics and rubber products manufacturing	32600	291,741	219,412	72,329
Clay and glass products manufacturing	32710	53,398	32,522	20,876
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	47,659	41,983	5,676
Primary metal manufacturing	33100	190,656	165,814	24,843
Fabricated metal products manufacturing	33200	289,113	223,838	65,275
Agricultural machinery and equipment manufacturing	33311	116,944	87,131	29,813
Construction machinery manufacturing	33312	96,367	65,182	31,186
Mining, oil, and gas field machinery and equipment manufacturing	33319	58,825	33,391	25,434
Semiconductor machinery manufacturing	33321	78,428	32,719	45,709
Industrial machinery manufacturing (except semiconductor machinery)	33322	45,172	34,475	10,697
Photographic and photocopying equipment manufacturing	33331	1,504	1,310	194
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	141,474	102,937	38,538
Digital cameras manufacturing	33333	1,862	1,751	111
Engine, turbine, and power transmission equipment manufacturing	33360	131,474	71,986	59,488
Metalworking and other general purpose machinery manufacturing	33390	112,404	76,483	35,920
Computers and peripheral equipment manufacturing and magnetic and optical media	33412	582,618	259,306	323,312
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	73,401	41,700	31,701
Radio, television, and wireless communication equipment manufacturing	33422	52,154	43,975	8,179

TABLE 9

Worldwide, domestic, and foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Sales		
		Worldwide	Domestic	Foreign
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	12,125	9,153	2,971
Audio and video equipment manufacturing	33430	10,567	7,750	2,817
Semiconductor and other electronic components manufacturing	33440	464,211	215,736	248,474
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	45,547	31,452	14,095
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	79,806	65,564	14,242
Measuring and control instruments manufacturing (not listed elsewhere)	33459	107,583	68,690	38,893
Electrical equipment, appliances, and components manufacturing	33500	212,115	155,881	56,234
Motor vehicles manufacturing	33610	802,708	646,444	156,263
Motor vehicle body and trailer manufacturing	33620	49,712	45,343	4,370
Motor vehicle parts manufacturing	33630	305,466	188,088	117,378
Aircraft manufacturing	33641	110,740	105,653	5,087
Aircraft engine and engine parts manufacturing	33642	61,021	43,526	17,494
Other aircraft parts and auxiliary equipment manufacturing	33643	60,734	50,348	10,386
Guided missiles, space vehicles, and related parts manufacturing	33644	71,703	69,381	2,322
Railroad rolling stock manufacturing	33651	18,751	14,057	4,694
Ship and boat building	33660	24,871	22,844	2,027
Motorcycle, bicycle, and parts manufacturing	33691	15,840	9,683	6,158
Military armored vehicle, tank, and tank components manufacturing	33692	9,620	8,817	804
All other transportation equipment manufacturing	33699	19,355	16,896	2,459
Furniture and related products manufacturing	33700	45,066	40,303	4,763
Medical equipment and supplies manufacturing	33910	357,531	233,231	124,300
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	118,100	86,126	31,974
Merchant wholesalers, durable goods	42300	229,972	211,711	18,261
Merchant wholesalers, nondurable goods	42400	1,334,714	1,113,372	221,342
Wholesale electronic markets and agents and brokers (business to business)	42500	19,093	18,811	282
Retail trade (except electronic shopping and electronic auctions)	44000	709,793	663,944	45,849
Electronic shopping and electronic auctions	45411	289,431	201,078	88,353
Transportation	48000	349,211	268,274	80,937
Couriers, messengers, and express delivery services	49200	136,529	89,141	47,388
Warehousing and storage	49300	9,583	7,198	2,385
Newspaper, periodical, book, and directory publishers (except Internet)	51110	6,805	5,408	1,397
Software publishers (except Internet)	51120	337,227	234,972	102,254
Motion picture and sound recording (except Internet)	51200	12,890	11,525	1,365
Broadcasting (except Internet)	51500	158,111	132,670	25,442
Wired telecommunications carriers	51710	155,830	152,529	3,301
Wireless telecommunications carriers (except satellite)	51720	285,959	280,885	5,074
Satellite telecommunications	51740	19,759	19,185	574
Other telecommunications (not listed elsewhere)	51790	13,999	13,448	551
Data processing, hosting, and related services	51800	124,648	93,420	31,228
Cloud computing applications and Internet-based software services	51801	420,679	306,220	114,459
Other information services, including Internet publishing, broadcasting, and Web search portals	51910	382,286	208,969	173,318
Finance: banking and credit intermediation	52200	619,954	545,867	74,087
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	152,571	117,734	34,837
Insurance carriers and related activities	52400	695,361	673,915	21,446
Real estate	53100	41,353	41,353	*

TABLE 9

Worldwide, domestic, and foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Sales		
		Worldwide	Domestic	Foreign
Rental and leasing services	53200	52,555	42,843	9,712
Lessors of nonfinancial intangible assets, including patent licensing	53300	2,956	1,806	1,150
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	35,086	32,895	2,190
Architectural, engineering, and related services	54130	113,539	96,845	16,694
Specialized design services	54140	D	6,853	D
Computer systems design and related services	54150	269,016	177,086	91,929
Management, scientific, and technical consulting services	54160	88,637	70,657	17,980
Research and development services in the social sciences and humanities	54172	1,431	1,425	6
Research and development services in biotechnology	54173	16,585	11,551	5,034
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	64,757	49,874	14,883
Research and development services in nanotechnology	54175	570	568	2
Advertising and related services	54180	D	145,767	D
Professional, scientific, and technical services (not listed elsewhere)	54190	41,536	37,294	4,242
Management of companies and enterprises	55100	13,644	13,623	21
Administrative and support services	56100	98,358	85,197	13,161
Waste management and remediation services	56200	1,481	1,479	3
Offices of physicians	62110	40,303	40,282	22
Medical and diagnostic laboratories	62150	64,051	56,103	7,948
Other ambulatory health care services (ambulance, dental, home health care)	62199	22,210	21,668	542
Hospitals and nursing care facilities	62200	15,163	15,163	0
Social assistance services	62400	123	123	0
Arts, entertainment, and recreation	71000	33,195	29,365	3,830
Accommodation and food services	72000	61,543	56,323	5,220
Other services (not listed elsewhere)	81000	286,430	205,741	80,689
Less: intersegment eliminations	-	228,057	142,712	85,344
Undistributed	-	0	0	0

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System industry definitions.

Note(s):

Domestic sales are the amount of sales that originated from domestic operations. Foreign sales are the amount of sales that originated from foreign operations. Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 10

Domestic R&D paid for by the company and others and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
All industries	21-23, 31-33, 42-81	691,547	369,910	71,737	30,981	10,873	45,638	10,911	22,557	3,860	23,141	101,939
Manufacturing industries	31-33	372,459	191,374	21,680	14,312	4,416	36,060	5,825	14,074	3,196	14,892	66,629
Food	311	7,143	3,469	84	289	21	1,048	114	270	7 r	230	1,611
Beverage and tobacco products	312	767	419	3	40 i	6	62	9	34	*	22	171
Textile, apparel, and leather products	313-16	635	455	10	18	4	63	7	16	1	25	38
Wood products	321	259	194	1	4 r	9 r	32	2	3	* r	4	10
Paper	322	1,005	513	2	2 i	13	378	5	7	* i	6	77
Printing and related support activities	323	165	100	1	11 i	1	15 i	5	10 i	1	12 i	9 i
Petroleum and coal products	324	860	447	2	53	2	54	2	36	* i	104	161
Chemicals	325	125,728	53,410	7,716	8,068	1,007	11,728	2,580	4,278	1,470	9,459	26,012
Basic chemicals	3251	2,860	1,694	29	74	14	272	81	174	22	131	369
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	933	1	53	4	125	16	92	23	83	163
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	647 i	3 i	94 i	12 i	163 i	53 i	74 i	D	12 i	D
Pharmaceuticals and medicines	3254	116,073	47,456	7,667	7,757	958	10,946	2,384	3,788	1,403	9,151	24,565
Soap, cleaning compound, and toilet preparations	3256	2,886	1,805	13	83	5	151	34	100	D	46	D
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	875	3	6	14	72	12	50	D	36	D
Plastics and rubber products	326	3,470	1,906	6	84	128 i	509	18	109	7	87	616
Nonmetallic mineral products	327	1,464	932	6	44	7	76	8	75	2	55	258
Primary metals	331	1,120	423	1	2	*	576	1	31	*	45	41
Fabricated metal products	332	3,526	2,275	8	67	57	643	27	98	9	55	288 i
Machinery	333	19,464	10,935	441	828	182	2,798	158	790	62	693	2,577
Agricultural implement	33311	2,287	1,261	*	124	8	278	10	89	1 i	129	386
Semiconductor machinery	333242	5,438	2,700	352	49	50	660	49	400	*	54	1,125
Engine, turbine, and power transmission equipment	3336	3,026	1,849	17	277	8	353 i	3	79	7	183	249 i
Other machinery	other 333	8,713	5,126	71	378	116	1,507	95	223	54	328	816
Computer and electronic products	334	104,718	56,023	11,634	2,065	2,040	8,798	2,094	5,692	974	1,165	14,233
Communications equipment	3342	11,665	6,888	986	362	171	294	832	387	8	194	1,543
Semiconductor and other electronic components	3344	49,330	25,578	4,699	1,088	192	4,688	432	2,753	554	208	9,137
Navigational, measuring, electromedical, and control instruments	3345	12,777	7,564	353	409	165	1,470	132	306	25 i	398	1,955
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	2,394	236	153	21	312	51	113	23 i	268	1,007
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	2,401	52	185	51	801	50	64	*	77	464
Other measuring and controlling devices	other 3345	4,053	2,768	64	71	93	357	30	129	2	54	484

TABLE 10

Domestic R&D paid for by the company and others and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
Other computer and electronic products	other 334	30,946	15,993	5,596	206	1,512	2,345	698	2,246	386	365	1,599
Electrical equipment, appliances, and components	335	7,086	4,322	293	180	75	487	129	179	47	362	1,012
Transportation equipment	336	71,259	42,202	653	1,555	512	7,143	429	1,549	433	1,580	15,203
Motor vehicles, bodies, trailers, and parts	3361-63	32,881	19,161	560	1,099	382	3,338	245	1,049	395	624	6,029
Aerospace products and parts	3364	35,356	21,094	74	398	113	3,339	145	433	22	899	8,838
Aircraft, aircraft engine, and aircraft parts	336411-13	24,571	13,817	58	234	61	2,186	42	154	3	801	7,214
Guided missile, space vehicle, and related parts	336414-15, 336419	10,785	7,276	16	164	52	1,153	103	279	19	98	1,624
Military armored vehicle, tank, and tank components	336992	30	16	0	2	0	4	0	*	0	2	5
Other transportation	other 336	2,992	1,931	19	56	17	461	39	67	16	56	331
Furniture and related products	337	410	294	*	6	4	42	3	9	1	12	40
Miscellaneous	339	23,382	13,055	821	996	348	1,609	236	889	180	976	4,272
Medical equipment and supplies	3391	20,394	11,041	738	913	309	1,455	183	798	165	888	3,904
Other miscellaneous manufacturing	3399	2,989	2,014	83	83	39	154	52	91	16	88	368
Nonmanufacturing industries	21-23, 42-81	319,088	178,536	50,056	16,670	6,457	9,578	5,086	8,482	664	8,249	35,310
Mining, quarrying, oil and gas extraction, and support activities	21	D	670	16	D	17	89	D	D	2	D	D
Utilities	22	D	D	*	44	D	62	1	D	*	47	D
Wholesale trade	42	D	1,235	3	44	74	147	D	D	2	40	D
Electronic shopping and electronic auctions	454111-12	D	9,112	D	147	D	170	262	D	*	D	D
Transportation and warehousing	48-49	9,395	4,095	1,112	189	205	1,022	275	325	68	697	1,407
Information	51	182,340	101,654	37,620	11,156	4,620	1,699	3,025	4,054	350	3,114	15,048
Publishing	511	50,367	29,611	8,311	2,547	521	1,054	529	656	90	2,041	5,007
Newspaper, periodical, book, and directory publishers	5111	72	68	0	2	*	*	0	0	0	2	*
Software publishers	5112	50,295	29,542	8,311	2,545	521	1,054	529	656	90	2,039	5,007
Telecommunications	517	3,690	2,728	30	732	12	58	25	30	3	20	52
Data processing, hosting, and related services	518	49,407	31,340	8,744	1,615	623	442	533	562	209	755	4,584
Other information	other 51	78,876	37,975	20,536	6,261	3,463	146	1,938	2,806	48	298	5,405
Finance and insurance	52	17,222	12,496	1,035	1,504	227	D	112	738	37	124	D
Real estate and rental and leasing	53	2,398	1,215	728	115	30	3	D	48	D	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	1	*	0	0	2	0	0	0	0	2
Other real estate and rental and leasing	other 53	2,393	1,214	728	115	30	1	D	48	D	D	D
Professional, scientific, and technical services	54	74,773	43,516	2,841	3,096	975	6,037	1,241	2,182	163	3,935	10,786
Architectural, engineering, and related services	5413	3,883	3,152	2	68	29	273	42	26	1	91	197
Computer systems design and related services	5415	22,534	15,032	1,751	1,068	261	458	241	618	73	493	2,539

TABLE 10

Domestic R&D paid for by the company and others and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
Scientific research and development services	5417	39,625 i	19,749 i	652	1,315 i	576	4,822 i	901 i	1,429 i	66	3,257 i	6,857 i
Research and development in nanotechnology	541713	282	153	9	16	6	24	7	9	*	3	53
Research and development in biotechnology (except nanobiotechnology)	541714	10,226	4,422	233	380	68	1,087	148	236	18	1,660 i	1,974
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420 i	14,772 i	382	885 i	501 i	3,640 i	741 i	1,184 i	48 i	1,465 i	4,803 i
Research and development in the social sciences and humanities	541720	698	402	28	35	*	72	5	*	0	129	27
Other professional, scientific, and technical services	other 54	8,730	5,583	437	645	109	483	56	109	23	94	1,193
Health care services	621-23	2,855	1,480	D	125	29	197	67	141	13	184	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,394	D	D	D	D	D	D	D	D	D	D
All companies (number of domestic employees)	-	691,547	369,910	71,737	30,981	10,873	45,638	10,911	22,557	3,860	23,141	101,939
Small companies												
10-19 ^a	-	5,277	3,528	93 i	197	51	428	91	72	34	233	550
20-49	-	14,695	9,458	303	474	140	1,381	316	279	94	730	1,520
Medium companies												
50-99	-	15,265	9,432	507	760	210	1,509	388	263	102	687	1,407
100-249	-	27,847	16,397	1,945	1,127	307	2,411	622	641	278	1,309	2,809
Large companies												
250-499	-	29,549	16,233	2,057	1,486	244	2,498	477	768	261	1,317	4,209
500-999	-	31,802	17,013	3,292	1,446	432	2,235	695	999	532	1,382	3,776
1,000-4,999	-	104,505	57,255	13,305	3,933	1,283	5,959	1,685	2,808	726	4,545	13,006
5,000-9,999	-	58,709	32,835	5,463	1,811	819	4,324	928	2,303	305	2,624	7,297
10,000-24,999	-	121,142	63,007	8,458	6,464	1,316	10,194	1,682	5,002	553	5,865	18,600
25,000 or more	-	282,756	144,750	36,313	13,282	6,071	14,700	4,028	9,423	974	4,450	48,765

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 11

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)											
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more	
All industries	21–23, 31–33, 42–81	691,547	5,277	14,695	15,265	27,847	29,549	31,802	104,505	58,709	121,142	282,756	
Manufacturing industries	31–33	372,459	1,443	6,255	8,144	15,265	18,084	16,736	55,943	37,857	76,649	136,083	
Food	311	7,143	1	84	97	512	1,181	r 354	663	551	2,086	1,613	i
Beverage and tobacco products	312	767	*	43	r 27	28	111	20	136	285	80	38	
Textile, apparel, and leather products	313–16	635	5	9	22	48	23	48	159	241	80	0	
Wood products	321	259	1	r 27	r 5	12	3	13	34	67	97	0	
Paper	322	1,005	2	4	1	37	21	21	184	129	313	292	
Printing and related support activities	323	165	*	3	9	25	32	6	6	i 12	72	i 0	
Petroleum and coal products	324	860	1	r 1	18	8	18	77	87	10	639	0	
Chemicals	325	125,728	726	3,217	4,313	7,881	9,680	7,104	20,929	8,557	36,516	26,806	
Basic chemicals	3251	2,860	*	116	50	230	312	203	1,006	482	461	0	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	9	56	24	100	84	112	215	i 0	D	D	
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	2	49	40	D	23	1	587	D	D	0	
Pharmaceuticals and medicines	3254	116,073	680	2,905	4,120	7,339	9,100	6,689	18,125	7,789	34,070	25,257	
Soap, cleaning compound, and toilet preparations	3256	2,886	D	38	36	97	62	55	590	i D	596	1,145	
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	D	52	44	D	98	44	407	0	336	D	
Plastics and rubber products	326	3,470	6	65	83	208	218	279	1,080	675	622	234	
Nonmetallic mineral products	327	1,464	8	r 18	25	39	36	123	131	69	1,014	0	
Primary metals	331	1,120	10	r 25	r 53	95	39	33	252	133	439	40	
Fabricated metal products	332	3,526	70	278	495	487	393	376	937	169	321	i 0	
Machinery	333	19,464	74	714	839	835	1,103	829	2,760	3,648	5,650	3,012	
Agricultural implement	33311	2,287	20	18	58	49	29	61	207	256	D	D	
Semiconductor machinery	333242	5,438	2	i 33	64	60	42	323	728	1,734	2,452	0	
Engine, turbine, and power transmission equipment	3336	3,026	1	62	r D	24	206	40	88	427	710	D	
Other machinery	other 333	8,713	51	601	D	703	825	405	1,737	1,231	D	D	
Computer and electronic products	334	104,718	321	868	1,129	3,100	2,686	3,251	15,205	14,972	13,486	49,700	
Communications equipment	3342	11,665	38	D	116	D	D	D	2,578	2,416	0	D	
Semiconductor and other electronic components	3344	49,330	D	271	D	1,815	r 1,657	1,460	6,289	i 6,308	i 12,042	D	
Navigational, measuring, electromedical, and control instruments	3345	12,777	D	388	446	739	585	810	2,409	4,049	D	2,906	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	36	160	171	387	224	485	350	1,772	0	995	i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	12	49	67	151	109	197	621	1,030	0	1,911	
Other measuring and controlling devices	other 3345	4,053	D	179	209	202	252	128	1,439	1,248	D	0	
Other computer and electronic products	other 334	30,946	D	D	D	D	D	D	3,929	2,198	i D	D	
Electrical equipment, appliances, and components	335	7,086	12	r 402	r 267	354	470	990	2,811	805	528	i 447	

TABLE 11

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)										
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more
Transportation equipment	336	71,259	85 r	97	260	758	1,132	1,886	5,347	3,827	10,282	47,585
Motor vehicles, bodies, trailers, and parts	3361–63	32,881	D	D	94	520	522	795	3,698	2,078	6,570	D
Aerospace products and parts	3364	35,356	74 r	30	111	172	411	975	1,303	1,402	3,526	27,353 i
Aircraft, aircraft engine, and aircraft parts	336411–13	24,571 i	65 r	D	110	D	D	338 i	997	D	D	18,526 i
Guided missile, space vehicle, and related parts	336414–15, 336419	10,785	9 r	D	1	D	D	638	306	D	D	8,827
Military armored vehicle, tank, and tank components	336992	30	0	D	7	D	0	D	D	0	0	0
Other transportation	other 336	2,992	D	D	48	D	199	D	D	348	186	D
Furniture and related products	337	410	0	12	21	41	13	28	64	231	0	0
Miscellaneous	339	23,382	120	390	481	796	926	1,296	5,157	3,478	4,424	6,315
Medical equipment and supplies	3391	20,394	100	302	343	554	680	1,018	3,488	3,422	4,292	6,195
Other miscellaneous manufacturing	3399	2,989	19 r	87	138	242	246	279	1,669	56	132	120
Nonmanufacturing industries	21–23, 42–81	319,088	3,834	8,440	7,120	12,581	11,465	15,066	48,562	20,852	44,493	146,673
Mining, quarrying, oil and gas extraction, and support activities	21	D	* r	45 i	106 i	62 i	1 r	74 i	212 i	186 i	D	0
Utilities	22	D	55	D	0	D	D	108 i	D	D	D	D
Wholesale trade	42	D	175	269	353	498	114 i	201 i	129 i	D	D	D
Electronic shopping and electronic auctions	454111–12	D	4	13 r	36 r	D	76	114	372	D	D	D
Transportation and warehousing	48–49	9,395	2 r	0	29	33	42	35	D	2,552	4,362 i	D
Information	51	182,340	572	1,824	2,317	4,588	5,654	7,873	32,998	8,520	15,165	102,829
Publishing	511	50,367	309	774	1,102	1,747	1,332	1,761	10,556	3,765	6,025	22,995
Newspaper, periodical, book, and directory publishers	5111	72	1 r	3	10	2	58	*	0	0	0	0
Software publishers	5112	50,295	309	772	1,092	1,745	1,274	1,761	10,556	3,765	6,025	22,995
Telecommunications	517	3,690	D	D	46	D	D	D	D	36	D	D
Data processing, hosting, and related services	518	49,407	D	870	D	2,314	3,904	4,633	16,628	1,518 i	D	11,262
Other information	other 51	78,876	12 r	D	D	D	D	D	D	3,201	D	D
Finance and insurance	52	17,222	D	1,439 r	D	D	516	599	2,625	3,836 i	3,020	D
Real estate and rental and leasing	53	2,398 i	0	16	10	2	49 i	98	D	D	0	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5 i	0	4 i	1 i	* i	0	0	0	0	0	0
Other real estate and rental and leasing	other 53	2,393 i	0	12	9	1	49 i	98	D	D	0	D
Professional, scientific, and technical services	54	74,773	2,872	4,675	4,093	6,482	4,345	4,881	7,089	3,299	21,077 i	15,960
Architectural, engineering, and related services	5413	3,883	252	550	606	822	429	278	619	169	159	0
Computer systems design and related services	5415	22,534	989	1,489	1,032	1,840	1,238	2,279	2,008	1,551	4,554	5,554
Scientific research and development services	5417	39,625 i	1,110	2,298	1,887	3,249	1,959	1,742	3,666	1,186	14,275 i	8,254 i
Research and development in nanotechnology	541713	282	93	92	95	*	0	1	0	0	0	0
Research and development in biotechnology (except nanobiotechnology)	541714	10,226	442	626	603	569	552	638	438 i	586	2,319 i	3,453

TABLE 11

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)													
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more			
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420	i	569	1,579	1,184	2,598	1,407	1,103	3,223	0	11,957	i	4,801	i
Research and development in the social sciences and humanities	541720	698		4	*	6	82	*	0	5	601	0		0	
Other professional, scientific, and technical services	other 54	8,730		521	r	339	567	572	719	582	796	393	2,089	2,153	
Health care services	621–23	2,855		D		D	D	D	400	713	i	1,215	D	D	D
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,394		D		D	D	454	r	D		370	D	D	D

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 12

Domestic R&D paid for by the company and others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
All industries	21–23, 31–33, 42–81	691,547	42,957	100,654	547,935
Manufacturing industries	31–33	372,459	30,875	60,512	281,072
Food	311	7,143	568	1,144	5,430
Beverage and tobacco products	312	767	99	201	466
Textile, apparel, and leather products	313–16	635	65	86	484
Wood products	321	259	17	20	221
Paper	322	1,005	131	225	649
Printing and related support activities	323	165	8	38	118
Petroleum and coal products	324	860	166	361	334
Chemicals	325	125,728	18,722	24,783	82,224
Basic chemicals	3251	2,860	412	757	1,692
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	D	D	826
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	D	D	498
Pharmaceuticals and medicines	3254	116,073	17,725	22,365	75,983
Soap, cleaning compound, and toilet preparations	3256	2,886	D	D	2,363
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	79	282	862
Plastics and rubber products	326	3,470	229	659	2,582
Nonmetallic mineral products	327	1,464	162	328	974
Primary metals	331	1,120	64	160	896
Fabricated metal products	332	3,526	259	575	2,692
Machinery	333	19,464	1,478	2,766	15,219
Agricultural implement	33311	2,287	152	224	1,910
Semiconductor machinery	333242	5,438	671	899	3,868
Engine, turbine, and power transmission equipment	3336	3,026	24	612	2,390
Other machinery	other 333	8,713	631	1,031	7,050
Computer and electronic products	334	104,718	3,797	13,089	87,832
Communications equipment	3342	11,665	433	1,184	10,048
Semiconductor and other electronic components	3344	49,330	2,070	4,642	42,617
Navigational, measuring, electromedical, and control instruments	3345	12,777	455	2,209	10,112
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	153	948	3,477
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	112	598	3,436
Other measuring and controlling devices	other 3345	4,053	190	663	3,200
Other computer and electronic products	other 334	30,946	838	5,053	25,055
Electrical equipment, appliances, and components	335	7,086	281	837	5,968
Transportation equipment	336	71,259	3,984	12,258	55,017
Motor vehicles, bodies, trailers, and parts	3361–63	32,881	D	D	25,686

TABLE 12

Domestic R&D paid for by the company and others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
Aerospace products and parts	3364	35,356	2,050	i 6,564	26,742
Aircraft, aircraft engine, and aircraft parts	336411-13	24,571	i 1,663	i 4,254	18,655
Guided missile, space vehicle, and related parts	336414-15, 336419	10,785	387	2,310	8,087
Military armored vehicle, tank, and tank components	336992	30	1	4	24
Other transportation	other 336	2,992	D	D	2,564
Furniture and related products	337	410	23	133	i 254
Miscellaneous	339	23,382	821	2,848	19,713
Medical equipment and supplies	3391	20,394	609	2,478	17,307
Other miscellaneous manufacturing	3399	2,989	212	370	2,406
Nonmanufacturing industries	21-23, 42-81	319,088	12,082	40,143	266,863
Mining, quarrying, oil and gas extraction, and support activities	21	D	41	241	i D
Utilities	22	D	35	54	D
Wholesale trade	42	D	160	292	D
Electronic shopping and electronic auctions	454111-12	D	27	D	D
Transportation and warehousing	48-49	9,395	D	D	8,588
Information	51	182,340	4,934	11,532	165,874
Publishing	511	50,367	1,740	3,034	45,593
Newspaper, periodical, book, and directory publishers	5111	72	3	3	66
Software publishers	5112	50,295	1,737	3,031	45,527
Telecommunications	517	3,690	249	699	2,742
Data processing, hosting, and related services	518	49,407	1,814	4,091	43,501
Other information	other 51	78,876	1,130	3,707	74,038
Finance and insurance	52	17,222	657	2,938	13,627
Real estate and rental and leasing	53	2,398	i 23	812	1,562
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i 1	i 2	i 2
Other real estate and rental and leasing	other 53	2,393	i 22	810	1,560
Professional, scientific, and technical services	54	74,773	5,500	19,573	i 49,701
Architectural, engineering, and related services	5413	3,883	290	727	2,866
Computer systems design and related services	5415	22,534	2,233	4,500	15,801
Scientific research and development services	5417	39,625	i 2,658	i 13,471	i 23,497
Research and development in nanotechnology	541713	282	24	117	141
Research and development in biotechnology (except nanobiotechnology)	541714	10,226	547	1,272	8,407
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420	i 1,458	i 12,050	i 14,912
Research and development in the social sciences and humanities	541720	698	629	i 33	37
Other professional, scientific, and technical services	other 54	8,730	319	875	7,537
Health care services	621-23	2,855	323	551	1,981

TABLE 12

Domestic R&D paid for by the company and others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,394	D	D	D
All companies (number of domestic employees)	-	691,547	42,957	100,654	547,935
Small companies					
10-19 ^a	-	5,277	468	1,310	3,498
20-49	-	14,695	1,188	3,701	9,807
Medium companies					
50-99	-	15,265	1,540	3,410	10,315
100-249	-	27,847	2,715	5,954	19,178
Large companies					
250-499	-	29,549	3,419	5,436	20,695
500-999	-	31,802	1,871	5,421	24,510
1,000-4,999	-	104,505	8,597	15,414	80,495
5,000-9,999	-	58,709	4,144	6,546	48,019
10,000-24,999	-	121,142	7,754	i 20,685	92,703
25,000 or more	-	282,756	11,260	32,779	238,717

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 13

Domestic R&D paid for by the company and others and performed by the company, by source of funds and state: 2022

(Millions of U.S. dollars)

State	Total	Paid for by the company		Paid for by others		
				Total	Federal	Nonfederal
All states	691,547		608,058	83,489	31,626	51,863
Alabama	4,907		2,259	2,649	i 2,548	i 101
Alaska	211	i	189	i 22	13	8
Arizona	10,261		8,250	2,010	1,233	778
Arkansas	604		545	59	13	46
California	235,556		220,081	15,474	7,046	8,429
Colorado	10,496		8,135	2,362	i 1,982	i 379
Connecticut	11,443		9,037	2,406	2,193	213
Delaware	4,544		2,874	1,670	5	e 1,665
District of Columbia	1,007		881	126	87	39
Florida	11,509		8,746	2,763	i 1,828	i 935
Georgia	8,666		7,684	982	i 107	875
Hawaii	491		447	44	35	9
Idaho	2,932		2,883	49	6	43
Illinois	18,061		16,785	1,276	i 142	1,134
Indiana	11,493		9,943	1,550	i 132	1,418
Iowa	3,956		3,257	698	6	e 693
Kansas	2,996		2,219	777	i 14	e 763
Kentucky	1,053		925	129	i 15	113
Louisiana	604		530	75	39	36
Maine	656		597	59	45	15
Maryland	8,591		5,843	2,748	1,938	809
Massachusetts	49,732		43,311	6,421	2,160	4,261
Michigan	25,790		23,381	2,409	150	2,258
Minnesota	8,537		8,141	396	142	254
Mississippi	532		442	91	45	46
Missouri	5,478		4,914	564	i 299	i 265
Montana	404		376	28	12	15
Nebraska	1,459		1,395	64	14	50
Nevada	1,811		1,471	340	24	316
New Hampshire	3,293		1,449	1,844	1,441	403
New Jersey	26,511		20,144	6,366	i 674	i 5,692
New Mexico	1,844		1,514	330	294	36
New York	32,196		29,915	2,282	517	1,765
North Carolina	16,541		11,503	5,038	i 172	4,866
North Dakota	472		454	18	2	e 16
Ohio	13,759		10,501	3,257	793	2,465
Oklahoma	1,893		1,820	73	38	35
Oregon	12,678		12,426	252	66	187
Pennsylvania	20,624		17,151	3,473	i 433	3,040
Rhode Island	635		594	40	19	21
South Carolina	2,616		2,319	297	117	180
South Dakota	213		201	12	2	e 10
Tennessee	3,473		2,147	1,326	i 74	1,252
Texas	31,365		26,151	5,214	i 2,499	i 2,715
Utah	4,019		3,748	271	59	212
Vermont	676		614	62	44	18
Virginia	8,766		6,451	2,315	1,668	647
Washington	57,295		55,718	1,576	353	i 1,224
West Virginia	467		444	23	14	10

TABLE 13

Domestic R&D paid for by the company and others and performed by the company, by source of funds and state: 2022

(Millions of U.S. dollars)

State	Total	Paid for by the company	Paid for by others					
			Total		Federal		Nonfederal	
Wisconsin	7,585	6,470	1,114	i	64		1,050	i
Wyoming	81	78	3	i	2	i	1	e
Undistributed ^a	765	703	62		9		53	

e = more than 50% of value is modeled—see "[Technical Notes](#)"; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

^a Includes data reported that were not allocated to a specific state by multi-establishment companies. For single-establishment companies, data reported were allocated to the state in the address used to mail the survey form.

Note(s):

Detail may not add to total because of rounding. For a given estimate in this table, if the conditions are satisfied for both the "i" and "e" flags, the e flag is assigned because the imputation rate may be found in the corresponding table of imputation rates (available from the Survey Manager upon request). Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 14

Domestic R&D paid for by the company and others and performed by the company, by source of funds and core-based statistical area: 2022

(Millions of U.S. dollars)

Core-based statistical area (CBSA)	CBSA code	Total	Paid for by the company	Paid for by others
All locations		691,547	608,058	83,489
San Jose-Sunnyvale-Santa Clara, CA	41940	105,158	101,098	4,060
San Francisco-Oakland-Fremont, CA	41860	76,826	74,443	2,383
Seattle-Tacoma-Bellevue, WA	42660	54,976	53,467	1,509
Boston-Cambridge-Newton, MA-NH	14460	46,915	40,756	6,159
New York-Newark-Jersey City, NY-NJ	35620	44,758	39,196	5,562
Los Angeles-Long Beach-Anaheim, CA	31080	23,345	17,860	5,486
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	37980	20,268	15,044	5,223 i
Detroit-Warren-Dearborn, MI	19820	19,955	18,389	1,566
San Diego-Chula Vista-Carlsbad, CA	41740	19,742	17,384	2,358 i
Chicago-Naperville-Elgin, IL-IN	16980	15,183	14,072	1,111 i
Portland-Vancouver-Hillsboro, OR-WA	38900	12,671	12,478	193
Washington-Arlington-Alexandria, DC-VA-MD-WV	47900	11,731	8,529	3,202
Dallas-Fort Worth-Arlington, TX	19100	11,147 i	8,886	2,261 i
Austin-Round Rock-San Marcos, TX	12420	10,941	9,730	1,211
Indianapolis-Carmel-Greenwood, IN	26900	8,715	7,394	1,321 i
Phoenix-Mesa-Chandler, AZ	38060	8,635	7,547	1,088
Minneapolis-St. Paul-Bloomington, MN-WI	33460	7,643	7,227	416
Atlanta-Sandy Springs-Roswell, GA	12060	7,486	6,591	894 i
Trenton-Princeton, NJ	45940	6,559	5,087	1,472 i
Durham-Chapel Hill, NC	20500	6,421	3,960	2,461 i
Denver-Aurora-Centennial, CO	19740	6,046 i	4,299	1,747 i
Houston-Pasadena-The Woodlands, TX	26420	5,742	4,469	1,273 i
Cincinnati, OH-KY-IN	17140	5,225	2,988	2,237
Norwich-New London-Willimantic, CT	35980	D	D	D
St. Louis, MO-IL	41180	4,473	3,933	540
Raleigh-Cary, NC	39580	4,154 i	2,667	1,487 i
Columbus, OH	18140	3,811	3,589	222 i
Miami-Fort Lauderdale-West Palm Beach, FL	33100	3,533	3,065	468 i
Pittsburgh, PA	38300	3,454	3,241	213 i
Baltimore-Columbia-Towson, MD	12580	3,200 i	2,120	1,079 i
Bridgeport-Stamford-Danbury, CT	14860	3,165	2,286	879 i
Madison, WI	31540	3,003	2,139	864 i
Sacramento-Roseville-Folsom, CA	40900	2,783 i	2,597 i	186 i
Oxnard-Thousand Oaks-Ventura, CA	37100	2,783	2,323	461 i
Kansas City, MO-KS	28140	2,581	1,805	776 i
Boise City, ID	14260	2,553	2,525	28 i
Tampa-St. Petersburg-Clearwater, FL	45300	2,527	1,679	848
Huntsville, AL	26620	2,473	1,127	1,346
Manchester-Nashua, NH	31700	2,382	633	1,749
Milwaukee-Waukesha, WI	33340	2,346	2,238	109
Salt Lake City-Murray, UT	41620	2,085	2,041	44
Hartford-West Hartford-East Hartford, CT	25540	2,071 i	1,469	601 i
Charlotte-Concord-Gastonia, NC-SC	16740	2,056 i	1,938 i	118 i
Boulder, CO	14500	1,943 i	1,721	221 i
Orlando-Kissimmee-Sanford, FL	36740	1,919 i	1,341	578 i
Nashville-Davidson-Murfreesboro-Franklin, TN	34980	1,860 i	855 i	1,005 i
Kalamazoo-Portage, MI	28020	1,750 i	1,708 i	42 i
Albuquerque, NM	10740	1,711	1,397	314 i

TABLE 14

Domestic R&D paid for by the company and others and performed by the company, by source of funds and core-based statistical area: 2022

(Millions of U.S. dollars)

Core-based statistical area (CBSA)	CBSA code	Total	Paid for by the company	Paid for by others
Worcester, MA	49340	1,677	1,438	238
Omaha, NE-IA	36540	1,650	1,607	42 i
Cleveland, OH	17410	1,548	1,400	148 i
Providence-Warwick, RI-MA	39300	1,486	1,437	49 i
Palm Bay-Melbourne-Titusville, FL	37340	1,455 i	855 i	600 i
Albany-Schenectady-Troy, NY	10580	1,441	963	478
Tucson, AZ	46060	1,370	459 i	911
Provo-Orem-Lehi, UT	39340	1,328	1,221	107
Charleston-North Charleston, SC	16700	1,278	1,107	171 i
Riverside-San Bernardino-Ontario, CA	40140	1,273 i	1,188 i	85 i
Greensboro-High Point, NC	24660	1,270 i	1,091 i	179
Des Moines-West Des Moines, IA	19780	1,265	1,237	28 i
Rochester, NY	40380	1,212 i	1,152 i	60 i
Fort Collins-Loveland, CO	22660	1,155 i	1,049 i	107 i
Richmond, VA	40060	1,119 i	881 i	237 i
Colorado Springs, CO	17820	1,103 i	824 i	279 i
San Antonio-New Braunfels, TX	41700	1,062 i	697 i	365 i
Allentown-Bethlehem-Easton, PA-NJ	10900	1,048	1,001	47 i
Cedar Rapids, IA	16300	1,002 i	456 i	546 i
Jacksonville, FL	27260	962 i	924 i	39
Peoria, IL	37900	955 i	928 i	27
Columbus, IN	18020	D	D	D
New Haven, CT	35300	D	D	D
Las Vegas-Henderson-North Las Vegas, NV	29820	934	895	38 i
Santa Maria-Santa Barbara, CA	42200	915	745	170 i
Corning, NY	18500	911	910	1 i
Grand Rapids-Wyoming-Kentwood, MI	24340	884	819	65
Akron, OH	10420	826	791	35
Ann Arbor, MI	11460	707	503	204
Buffalo-Cheektowaga, NY	15380	645 i	411	234 i
Wilmington, NC	48900	634 i	212	421 i
Santa Rosa-Petaluma, CA	42220	627	597	30 i
Memphis, TN-MS-AR	32820	617	469	147
Dayton-Kettering-Beavercreek, OH	19430	609	383	226
Santa Cruz-Watsonville, CA	42100	600 i	559 i	41 i
Reno, NV	39900	592	291	300
Portland-South Portland, ME	38860	581	524	56
Bloomington, IL	14010	575	568	7 i
Burlington-South Burlington, VT	15540	568	516	52
Wichita, KS	48620	516	508	8 e
Davenport-Moline-Rock Island, IA-IL	19340	510	498	13
Virginia Beach-Chesapeake-Norfolk, VA-NC	47260	507 i	377 i	129
Greenville-Anderson-Greer, SC	24860	458 i	417	41 i
Winston-Salem, NC	49180	452	399	53 i
Birmingham, AL	13820	440	390	49
Brownsville-Harlingen, TX	15180	426	425	1 i
Bakersfield-Delano, CA	12540	423	332	92 i
Corpus Christi, TX	18580	416	413	2 i
Syracuse, NY	45060	386 i	340 i	46 i

TABLE 14

Domestic R&D paid for by the company and others and performed by the company, by source of funds and core-based statistical area: 2022

(Millions of U.S. dollars)

Core-based statistical area (CBSA)	CBSA code	Total	Paid for by the company	Paid for by others
Tulsa, OK	46140	368	339	28 i
Kiryas Joel-Poughkeepsie-Newburgh, NY	28880	367 i	363 i	4 i
Daphne-Fairhope-Foley, AL	19300	D	D	D
All other CBSAs		32,893 i	28,859	4,033 i
Locations outside a CBSA		6,140	5,298	842
Undistributed ^a		765	703	62

D = data withheld to avoid disclosing operations of individual companies; e = more than 50% of value is modeled—see "Technical Notes"; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

^a Includes data reported that were not allocated to a specific location by multi-establishment companies. For single-establishment companies, data reported were allocated to the location in the address used to mail the survey form.

Note(s):

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For a given estimate in this table, if the conditions are satisfied for both the "i" and "e" flags, the e flag is assigned because the imputation rate may be found in the corresponding table of imputation rates (available from the Survey Manager upon request). A CBSA is a U.S. geographic area that consists of one or more counties (or equivalents) anchored by an urban center of at least 10,000 people plus adjacent counties that are socioeconomically tied to the urban center by commuting. CBSAs are defined by the Office of Management and Budget in the Executive Office of the President.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 15

Domestic R&D paid for by the company and others and performed by the company, by industry, company size, and domestic R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size					
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more
All industries	21–23, 31–33, 42–81	691,547	5,822	34,401	54,390	31,904	565,029
Manufacturing industries	31–33	372,459	2,919	14,204	27,767	20,371	307,199
Food	311	7,143	175	847	1,960	809	3,351
Beverage and tobacco products	312	767	39	146	79	345	157
Textile, apparel, and leather products	313–16	635	44	143	299	150	0
Wood products	321	259	16	79	164	0	0
Paper	322	1,005	13	103	178	159	552
Printing and related support activities	323	165	26	59	80	0	0
Petroleum and coal products	324	860	10	D	178	D	D
Chemicals	325	125,728	389	2,539	9,800	7,808	105,193
Basic chemicals	3251	2,860	75	321	978	532	954
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	42	220	337	0	893
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	13	62	163	0	956
Pharmaceuticals and medicines	3254	116,073	126	1,484	7,939	7,102	99,422
Soap, cleaning compound, and toilet preparations	3256	2,886	67	204	183	76	2,356
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	65	248	199	98	613
Plastics and rubber products	326	3,470	155	697	998	415	1,205
Nonmetallic mineral products	327	1,464	70	142	161	77	1,014
Primary metals	331	1,120	70	199	311	128	410
Fabricated metal products	332	3,526	451	1,397	627	523	528
Machinery	333	19,464	427	2,166	2,324	1,528	13,018
Agricultural implement	33311	2,287	D	147	166	D	1,881
Semiconductor machinery	333242	5,438	6	42	182	317	4,892
Engine, turbine, and power transmission equipment	3336	3,026	D	137	176	D	2,645
Other machinery	other 333	8,713	D	1,841	1,800	D	3,601
Computer and electronic products	334	104,718	473	1,950	4,835	3,117	94,343
Communications equipment	3342	11,665	69	289	567	757	9,984
Semiconductor and other electronic components	3344	49,330	84	469	2,345	1,180	45,252
Navigational, measuring, electromedical, and control instruments	3345	12,777	215	894	1,529	773	9,365
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	16	318	502	349	3,393
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	D	108	315	D	3,633
Other measuring and controlling devices	other 3345	4,053	D	469	712	D	2,338
Other computer and electronic products	other 334	30,946	105	297	394	407	29,743

TABLE 15

Domestic R&D paid for by the company and others and performed by the company, by industry, company size, and domestic R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size					
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more
Electrical equipment, appliances, and components	335	7,086	59	908	1,237	1,032	3,851
Transportation equipment	336	71,259	206	1,156	2,104	2,380	65,413
Motor vehicles, bodies, trailers, and parts	3361–63	32,881	107	558	1,268	1,373	29,574
Aerospace products and parts	3364	35,356	47	324	677	785	33,522
Aircraft, aircraft engine, and aircraft parts	336411–13	24,571	i 40	287	597	483	23,164
Guided missile, space vehicle, and related parts	336414–15, 336419	10,785	8	37	80	i 302	10,358
Military armored vehicle, tank, and tank components	336992	30	D	18	D	0	0
Other transportation	other 336	2,992	D	256	D	221	2,316
Furniture and related products	337	410	39	119	186	65	0
Miscellaneous	339	23,382	258	D	2,246	D	D
Medical equipment and supplies	3391	20,394	133	1,041	1,645	1,534	16,042
Other miscellaneous manufacturing	3399	2,989	125	D	602	D	D
Nonmanufacturing industries	21–23, 42–81	319,088	2,903	20,197	26,623	11,534	257,831
Mining, quarrying, oil and gas extraction, and support activities	21	D	17	327	i 341	i D	D
Utilities	22	D	3	D	D	D	231
Wholesale trade	42	D	350	1,277	D	0	0
Electronic shopping and electronic auctions	454111–12	D	D	88	D	D	D
Transportation and warehousing	48–49	9,395	7	70	393	0	8,925
Information	51	182,340	458	6,061	11,499	5,460	158,861
Publishing	511	50,367	223	2,464	3,203	1,168	43,310
Newspaper, periodical, book, and directory publishers	5111	72	10	6	55	0	0
Software publishers	5112	50,295	212	2,457	3,148	1,168	43,310
Telecommunications	517	3,690	73	i 156	572	85	2,803
Data processing, hosting, and related services	518	49,407	109	3,143	6,997	3,769	35,389
Other information	other 51	78,876	53	298	727	438	77,359
Finance and insurance	52	17,222	9	1,751	r 1,155	702	13,606
Real estate and rental and leasing	53	2,398	i D	32	D	0	2,145
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i 5	i 0	0	0	0
Other real estate and rental and leasing	other 53	2,393	i D	32	D	0	2,145
Professional, scientific, and technical services	54	74,773	1,583	9,335	11,155	3,827	48,873
Architectural, engineering, and related services	5413	3,883	307	1,722	1,654	200	0
Computer systems design and related services	5415	22,534	701	3,176	3,847	1,377	13,433
Scientific research and development services	5417	39,625	i 134	3,402	3,896	1,746	30,446

TABLE 15

Domestic R&D paid for by the company and others and performed by the company, by industry, company size, and domestic R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size						
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more	
Research and development in nanotechnology	541713	282	13	185	84	0	0	
Research and development in biotechnology (except nanobiotechnology)	541714	10,226	31	828	882	612	7,873	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420	i	90	2,365	2,858	1,134	21,972
Research and development in the social sciences and humanities	541720	698	1	24	73	0	601	
Other professional, scientific, and technical services	other 54	8,730	441	r	1,035	1,757	505	4,993
Health care services	621–23	2,855	55	313	496	691	1,299	
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,394	397	r	D	D	D	D
All companies (number of domestic employees)	–	691,547	5,822	34,401	54,390	31,904	565,029	
Small companies								
10–19 ^a	–	5,277	1,608	3,105	509	55	0	
20–49	–	14,695	1,755	9,215	D	D	0	
Medium companies								
50–99	–	15,265	1,060	6,247	6,127	1,700	131	
100–249	–	27,847	958	7,395	D	D	3,127	
Large companies								
250–499	–	29,549	236	3,413	10,116	5,088	10,695	
500–999	–	31,802	128	2,380	7,898	6,211	15,186	
1,000–4,999	–	104,505	68	2,227	10,453	8,570	83,188	
5,000–9,999	–	58,709	7	164	2,156	2,831	53,550	
10,000–24,999	–	121,142	2	171	1,365	1,929	117,675	
25,000 or more	–	282,756	2	i	84	654	539	281,476

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. R&D program size classifications are based on R&D performance.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 16

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Total	Paid for by the company	Paid for by others
All business activities	21100–81000	691,547	608,058	83,489
Oil and gas extraction	21100	D	342	D
Mining	21200	138 i	138 i	0
Support activities for mining, including oil and gas	21300	786 i	729 i	57
Utilities	22100	D	D	D
Construction	23000	790	729	61 i
Food manufacturing	31100	6,525 i	6,168 i	357
Beverage manufacturing	31210	794	749	45 i
Tobacco manufacturing	31220	213	195	18
Textile, apparel, and leather products manufacturing	31990	D	573	D
Wood products manufacturing	32100	301	297	5
Paper manufacturing	32200	1,337	1,336	* i
Printing and related support activities	32300	337	336	1
Petroleum refineries	32401	432	429	3
Asphalt paving, roofing, and saturated materials manufacturing	32402	92	92	0
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	129	128	1
Basic chemicals manufacturing	32510	3,136	2,970	166
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	1,370	1,290	80 i
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	D	1,257	D
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing	32541	61,071	54,026	7,045
In vitro diagnostic substances manufacturing	32542	1,777	1,750	28
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	51,697	47,881	3,816
Soap, cleaning compound, and toilet preparations manufacturing	32591	2,586	2,325	261
Paint, adhesive, and other chemical manufacturing	32592	1,384	1,342	42
Plastics and rubber products manufacturing	32600	3,515	3,354	161
Clay and glass products manufacturing	32710	1,382	1,373	8
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	446	374	71 i
Primary metal manufacturing	33100	1,231	1,191	40
Fabricated metal products manufacturing	33200	4,020	3,570	449
Agricultural machinery and equipment manufacturing	33311	D	2,013	D
Construction machinery manufacturing	33312	1,249	1,230	19
Mining, oil, and gas field machinery and equipment manufacturing	33319	1,262	1,127	135
Semiconductor machinery manufacturing	33321	5,466	5,418	48
Industrial machinery manufacturing (except semiconductor machinery)	33322	1,503	1,237	266
Photographic and photocopying equipment manufacturing	33331	D	D	2
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	2,300	2,251	49
Digital cameras manufacturing	33333	194	194	0
Engine, turbine, and power transmission equipment manufacturing	33360	2,568	2,227	341
Metalworking and other general purpose machinery manufacturing	33390	2,767	2,637	129
Computers and peripheral equipment manufacturing and magnetic and optical media	33412	27,905	27,878	27
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	D	7,802	D
Radio, television, and wireless communication equipment manufacturing	33422	3,453	2,560	893 i
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	595	572	23
Audio and video equipment manufacturing	33430	1,713	1,705	8
Semiconductor and other electronic components manufacturing	33440	50,441	48,501	1,940

TABLE 16

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Total	Paid for by the company	Paid for by others
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	5,106	4,714	392
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	5,584	2,854	2,730
Measuring and control instruments manufacturing (not listed elsewhere)	33459	4,182	4,102	80
Electrical equipment, appliances, and components manufacturing	33500	6,700	6,290	411 i
Motor vehicles manufacturing	33610	24,738	23,852	886
Motor vehicle body and trailer manufacturing	33620	162	162	0
Motor vehicle parts manufacturing	33630	7,687	6,565	1,122
Aircraft manufacturing	33641	17,879 i	5,389	12,490 i
Aircraft engine and engine parts manufacturing	33642	4,396	2,231	2,165
Other aircraft parts and auxiliary equipment manufacturing	33643	2,873	1,767	1,106
Guided missiles, space vehicles, and related parts manufacturing	33644	6,684	2,620	4,064
Railroad rolling stock manufacturing	33651	289	289	0
Ship and boat building	33660	960	279	681
Motorcycle, bicycle, and parts manufacturing	33691	454	431	24
Military armored vehicle, tank, and tank components manufacturing	33692	660	367 i	293
All other transportation equipment manufacturing	33699	397	385	13
Furniture and related products manufacturing	33700	432	430	2
Medical equipment and supplies manufacturing	33910	18,572	18,297	275
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	3,261	3,069	192
Merchant wholesalers, durable goods	42300	1,145 i	1,115 i	30
Merchant wholesalers, nondurable goods	42400	662	645	17
Wholesale electronic markets and agents and brokers (business to business)	42500	168 r	166 r	2 r
Retail trade (except electronic shopping and electronic auctions)	44000	354	354	1 r
Electronic shopping and electronic auctions	45411	12,205 i	12,205 i	0
Transportation	48000	6,816 i	6,815 i	2
Couriers, messengers, and express delivery services	49200	1,671	1,671	0
Warehousing and storage	49300	D	D	D
Newspaper, periodical, book, and directory publishers (except Internet)	51110	94	93	1
Software publishers (except Internet)	51120	34,695	33,582	1,113
Motion picture and sound recording (except Internet)	51200	D	D	D
Broadcasting (except Internet)	51500	D	428 i	D
Wired telecommunications carriers	51710	624	615	9
Wireless telecommunications carriers (except satellite)	51720	2,582	2,517	65
Satellite telecommunications	51740	600	589	10
Other telecommunications (not listed elsewhere)	51790	315	267	48
Data processing, hosting, and related services	51800	11,506	11,481	25
Cloud computing applications and Internet-based software services	51801	51,438	51,079	359
Other information services, including Internet publishing, broadcasting, and Web search portals	51910	D	83,375	D
Finance: banking and credit intermediation	52200	10,424	10,379	45
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	4,674	4,670	4
Insurance carriers and related activities	52400	1,948	1,948	0
Real estate	53100	785	785	0
Rental and leasing services	53200	1,644	1,644	*
Lessors of nonfinancial intangible assets, including patent licensing	53300	D	D	*
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	3,238	3,238	0
Architectural, engineering, and related services	54130	5,748	3,579	2,168

TABLE 16

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2022

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	Total	Paid for by the company	Paid for by others
Specialized design services	54140	122	D	D
Computer systems design and related services	54150	20,455	17,406	3,048
Management, scientific, and technical consulting services	54160	4,158	3,203	955
Research and development services in the social sciences and humanities	54172	699	27	673
Research and development services in biotechnology	54173	9,309	2,934	6,374
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	27,923	5,311	22,612
Research and development services in nanotechnology	54175	293	182	111
Advertising and related services	54180	2,003	2,003	1
Professional, scientific, and technical services (not listed elsewhere)	54190	2,442	1,828	614
Management of companies and enterprises	55100	D	D	0
Administrative and support services	56100	4,195	4,180	15
Waste management and remediation services	56200	D	5	D
Offices of physicians	62110	D	132	D
Medical and diagnostic laboratories	62150	3,828	2,957	871
Other ambulatory health care services (ambulance, dental, home health care)	62199	317	317	0
Hospitals and nursing care facilities	62200	9	9	*
Social assistance services	62400	7	7	0
Arts, entertainment, and recreation	71000	D	D	0
Accommodation and food services	72000	104	104	0
Other services (not listed elsewhere)	81000	6,960	6,854	105
Undistributed	-	0	0	0

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50% .

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System industry definitions.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 17

Domestic R&D paid for by the company and others and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
All industries	21-23, 31-33, 42-81	691,547	4.9	4.9
Manufacturing industries	31-33	372,459	5.1	5.1
Food	311	7,143	0.7	0.7
Beverage and tobacco products	312	767	0.6	0.6
Textile, apparel, and leather products	313-16	635	0.9	0.9
Wood products	321	259	0.4	0.4
Paper	322	1,005	1.0	1.0
Printing and related support activities	323	165	0.6	0.6
Petroleum and coal products	324	860	0.2	0.2
Chemicals	325	125,728	8.4	8.5
Basic chemicals	3251	2,860	0.7	0.7
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	1.6	1.6
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	1.2	1.2
Pharmaceuticals and medicines	3254	116,073	16.9	17.0
Soap, cleaning compound, and toilet preparations	3256	2,886	2.2	2.2
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	1.8	1.8
Plastics and rubber products	326	3,470	1.4	1.4
Nonmetallic mineral products	327	1,464	2.2	2.6
Primary metals	331	1,120	0.7	0.7
Fabricated metal products	332	3,526	1.9	1.9
Machinery	333	19,464	3.7	3.7
Agricultural implement	33311	2,287	2.2	2.2
Semiconductor machinery	333242	5,438	16.5	16.5
Engine, turbine, and power transmission equipment	3336	3,026	4.2	4.2
Other machinery	other 333	8,713	2.8	2.8
Computer and electronic products	334	104,718	14.3	14.3
Communications equipment	3342	11,665	12.4	12.4
Semiconductor and other electronic components	3344	49,330	23.5	23.6
Navigational, measuring, electromedical, and control instruments	3345	12,777	10.5	10.5
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	13.2	13.2
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	16.4	16.4
Other measuring and controlling devices	other 3345	4,053	6.6	6.6
Other computer and electronic products	other 334	30,946	10.0	10.0
Electrical equipment, appliances, and components	335	7,086	3.7	3.7
Transportation equipment	336	71,259	5.2	5.2
Motor vehicles, bodies, trailers, and parts	3361-63	32,881	3.5	3.5
Aerospace products and parts	3364	35,356	9.9	9.9
Aircraft, aircraft engine, and aircraft parts	336411-13	24,571	9.7	9.7
Guided missile, space vehicle, and related parts	336414-15, 336419	10,785	10.5	10.5
Military armored vehicle, tank, and tank components	336992	30	2.3	2.3
Other transportation	other 336	2,992	3.5	3.5
Furniture and related products	337	410	1.1	1.2
Miscellaneous	339	23,382	4.3	4.3
Medical equipment and supplies	3391	20,394	4.6	4.6

TABLE 17

Domestic R&D paid for by the company and others and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)		Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Other miscellaneous manufacturing	3399	2,989		3.0	3.0
Nonmanufacturing industries	21–23, 42–81	319,088		4.7	4.7
Mining, quarrying, oil and gas extraction, and support activities	21	D		D	D
Utilities	22	D		D	D
Wholesale trade	42	D		D	D
Electronic shopping and electronic auctions	454111–12	D		D	D
Transportation and warehousing	48–49	9,395		3.1	3.1
Information	51	182,340		9.8	9.8
Publishing	511	50,367		13.6	D
Newspaper, periodical, book, and directory publishers	5111	72		2.6	D
Software publishers	5112	50,295		13.7	13.7
Telecommunications	517	3,690		0.8	0.8
Data processing, hosting, and related services	518	49,407		7.7	7.7
Other information	other 51	78,876		21.0	D
Finance and insurance	52	17,222		1.4	1.4
Real estate and rental and leasing	53	2,398	i	3.2	3.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i	1.0	1.0
Other real estate and rental and leasing	other 53	2,393	i	3.3	3.3
Professional, scientific, and technical services	54	74,773		13.3	13.5
Architectural, engineering, and related services	5413	3,883		3.7	3.7
Computer systems design and related services	5415	22,534		12.1	12.4
Scientific research and development services	5417	39,625	i	29.0	29.1
Research and development in nanotechnology	541713	282		30.2	37.0
Research and development in biotechnology (except nanobiotechnology)	541714	10,226		37.1	37.2
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420	i	26.7	26.7
Research and development in the social sciences and humanities	541720	698		44.9	49.2
Other professional, scientific, and technical services	other 54	8,730		6.6	6.6
Health care services	621–23	2,855		3.0	3.0
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,394		0.4	0.4
All companies (number of domestic employees)	–	691,547		4.9	4.9
Small companies					
10–19 ^c	–	5,277		12.7	13.3
20–49	–	14,695		13.0	13.2
Medium companies					
50–99	–	15,265		8.5	8.8
100–249	–	27,847		7.2	7.5
Large companies					
250–499	–	29,549		8.1	8.2
500–999	–	31,802		5.5	5.6
1,000–4,999	–	104,505		5.1	5.1
5,000–9,999	–	58,709		3.7	3.7
10,000–24,999	–	121,142		4.2	4.3

TABLE 17

Domestic R&D paid for by the company and others and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
25,000 or more	-	282,756	4.7	4.7

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed or funded R&D.

^b Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed R&D. The calculation of percentages in this column excludes R&D and sales of companies that fund R&D but do not perform R&D.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 18
Domestic R&D paid for by the company and others and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers only ^b
All industries	21-23, 31-33, 42-81	745,699	5.3	5.3
Manufacturing industries	31-33	417,640	5.7	5.7
Food	311	7,367	0.8	0.8
Beverage and tobacco products	312	898	0.7	0.7
Textile, apparel, and leather products	313-16	D	D	D
Wood products	321	281	0.5	0.5
Paper	322	1,011	1.0	1.0
Printing and related support activities	323	169	0.6	0.6
Petroleum and coal products	324	1,055	0.3	0.3
Chemicals	325	158,025	10.6	10.6
Basic chemicals	3251	D	D	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	D	D	D
Pesticide, fertilizer, and other agricultural chemicals	3253	1,293	1.3	1.3
Pharmaceuticals and medicines	3254	147,804	21.6	D
Soap, cleaning compound, and toilet preparations	3256	D	D	D
Paint, coating, adhesive, and other chemicals	3255, 3259	D	D	D
Plastics and rubber products	326	3,515	1.4	1.4
Nonmetallic mineral products	327	1,491	2.2	2.7
Primary metals	331	1,147	0.7	0.7
Fabricated metal products	332	3,571	1.9	1.9
Machinery	333	19,932	3.8	3.8
Agricultural implement	33311	D	D	D
Semiconductor machinery	333242	5,452	16.6	16.6
Engine, turbine, and power transmission equipment	3336	D	D	D
Other machinery	other 333	8,869	2.8	2.8
Computer and electronic products	334	108,994	14.8	14.8
Communications equipment	3342	12,859	13.7	13.7
Semiconductor and other electronic components	3344	49,708	23.7	23.7
Navigational, measuring, electromedical, and control instruments	3345	D	D	D
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,709	13.6	13.6
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,244	16.8	16.8
Other measuring and controlling devices	other 3345	D	D	D
Other computer and electronic products	other 334	D	D	D

TABLE 18
Domestic R&D paid for by the company and others and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers only ^b
Electrical equipment, appliances, and components	335	7,178	3.8	3.8
Transportation equipment	336	77,498	5.6	5.6
Motor vehicles, bodies, trailers, and parts	3361-63	37,052	4.0	4.0
Aerospace products and parts	3364	37,361	10.5	10.5
Aircraft, aircraft engine, and aircraft parts	336411-13	26,423	10.4	10.4
Guided missile, space vehicle, and related parts	336414-15, 336419	10,938	10.7	10.7
Military armored vehicle, tank, and tank components	336992	31	2.4	2.4
Other transportation	other 336	3,054	3.6	3.6
Furniture and related products	337	417	1.1	1.2
Miscellaneous	339	D	D	D
Medical equipment and supplies	3391	21,365	4.9	4.9
Other miscellaneous manufacturing	3399	D	D	D
Nonmanufacturing industries	21-23, 42-81	328,059	4.8	4.8
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D
Utilities	22	D	D	D
Wholesale trade	42	D	D	0.3
Electronic shopping and electronic auctions	454111-12	D	D	D
Transportation and warehousing	48-49	9,435	3.1	3.2
Information	51	185,531	10.0	10.0
Publishing	511	51,678	13.9	D
Newspaper, periodical, book, and directory publishers	5111	92	3.3	D
Software publishers	5112	51,586	14.0	14.0
Telecommunications	517	4,212	0.9	0.9
Data processing, hosting, and related services	518	50,343	7.9	7.9
Other information	other 51	79,298	21.1	D
Finance and insurance	52	17,569	1.4	1.4
Real estate and rental and leasing	53	2,399	3.2	3.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	6	1.2	1.2
Other real estate and rental and leasing	other 53	2,394	3.3	3.3
Professional, scientific, and technical services	54	78,876	14.1	14.2
Architectural, engineering, and related services	5413	4,197	4.0	3.9
Computer systems design and related services	5415	23,063	12.4	12.7
Scientific research and development services	5417	42,671	31.2	31.3

TABLE 18
Domestic R&D paid for by the company and others and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers only ^b
Research and development in nanotechnology	541713	311	33.3	40.5
Research and development in biotechnology (except nanobiotechnology)	541714	10,566	38.3	38.3
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	31,095	29.2	29.2
Research and development in the social sciences and humanities	541720	699	45.0	49.2
Other professional, scientific, and technical services	other 54	8,945	6.7	6.8
Health care services	621-23	3,059	3.2	3.2
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,491	0.4	0.4
All companies (number of domestic employees)	-	745,699	5.3	5.3
Small companies				
10-19 ^c	-	6,119	14.7	15.4
20-49	-	16,418	14.5	14.7
Medium companies				
50-99	-	17,527	9.8	10.0
100-249	-	31,648	8.2	8.5
Large companies				
250-499	-	33,241	9.1	9.3
500-999	-	34,194	6.0	6.0
1,000-4,999	-	111,113	5.4	5.4
5,000-9,999	-	62,306	3.9	4.0
10,000-24,999	-	135,372	4.7	4.8
25,000 or more	-	297,762	5.0	5.0

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed or funded R&D.

^b Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed R&D. The calculation of percentages in this column excludes R&D and sales of companies that fund R&D but do not perform R&D.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 19

Companies with domestic R&D paid for by the company and others and performed by the company in the software products and embedded software technology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Software products and embedded software R&D									
				Total		Paid for by the company		Paid for by others					
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Total		Federally funded			
								Companies ^b (number)	Amount	Companies ^b (number)	Amount		
All industries	21-23, 31-33, 42-81	29,990	691,547	15,440	291,661	14,570	276,644	1,660	15,016	680	5,141		
Manufacturing industries	31-33	14,850	372,459	4,990	56,589	4,840	51,929	400	4,660	70	1,903		
Food	311	960	7,143	150	565	140	561	10	4	0	0		
Beverage and tobacco products	312	160	767	10	3	10	3	0	0	0	0		
Textile, apparel, and leather products	313-16	260	635	60	D	60	D	0	0	0	0		
Wood products	321	110	259	20	19	20	19	0	0	0	0		
Paper	322	100	1,005	20	29	20	29	0	0	0	0		
Printing and related support activities	323	140	165	110	44	110	44	0	0	0	0		
Petroleum and coal products	324	80	860	10	16	10	16	0	0	0	0		
Chemicals	325	2,320	125,728	360	1,632	350	1,571	20	61	10	29		
Basic chemicals	3251	320	2,860	50	99	50	98	10	*	0	0		
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	1,493	20	4	20	3	10	1	0	0		
Pesticide, fertilizer, and other agricultural chemicals	3253	70	1,193	20	D	20	D	10	D	0	0		
Pharmaceuticals and medicines	3254	1,130	116,073	140	1,382	140	D	10	D	10	28		
Soap, cleaning compound, and toilet preparations	3256	270	2,886	120	50	120	D	10	D	0	0		
Paint, coating, adhesive, and other chemicals	3255, 3259	350	1,223	30	D	30	D	10	1	10	1		
Plastics and rubber products	326	840	3,470	170	251	170	250	10	1	0	0		
Nonmetallic mineral products	327	260	1,464	30	33	30	32	10	1	0	0		
Primary metals	331	270	1,120	20	4	20	4	0	0	0	0		
Fabricated metal products	332	1,870	3,526	410	639	360	581	60	58	0	0		
Machinery	333	2,050	19,464	970	2,333	960	2,258	30	75	10	57		
Agricultural implement	33311	160	2,287	90	141	90	141	0	0	0	0		
Semiconductor machinery	333242	50	5,438	30	786	30	780	10	6	10	1		
Engine, turbine, and power transmission equipment	3336	110	3,026	40	187	40	137	10	50	10	50		
Other machinery	other 333	1,740	8,713	820	1,220	820	1,201	30	19	10	6		
Computer and electronic products	334	2,370	104,718	1,550	36,487	1,490	34,316	170	2,170	40	601		
Communications equipment	3342	340	11,665	300	8,251	300	8,170	10	81	10	56		
Semiconductor and other electronic components	3344	510	49,330	310	13,067	290	11,678	40	1,389	10	6		
Navigational, measuring, electromedical, and control instruments	3345	1,030	12,777	750	3,389	710	2,724	120	665	30	516		
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	190	4,578	130	693	130	610	10	83	10	3		
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	4,146	90	1,686	90	1,142	10	544	10	503		
Other measuring and controlling devices	other 3345	740	4,053	530	1,010	500	972	100	38	20	11		

TABLE 19

Companies with domestic R&D paid for by the company and others and performed by the company in the software products and embedded software technology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Software products and embedded software R&D									
				Total		Paid for by the company		Paid for by others					
								Total		Federally funded			
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount		
Other computer and electronic products	other 334	500	30,946	210	11,780	210	11,744	10	36	10	23		
Electrical equipment, appliances, and components	335	520	7,086	280	1,029	280	1,012	10	17	0	0		
Transportation equipment	336	1,100	71,259	370	8,930	360	6,705	60	2,225	20	1,204		
Motor vehicles, bodies, trailers, and parts	3361-63	600	32,881	220	3,540	210	3,209	50	331	10	3		
Aerospace products and parts	3364	270	35,356	110	5,070	100	3,178	20	1,892	10	1,199		
Aircraft, aircraft engine, and aircraft parts	336411-13	230	24,571	90	3,090	90	2,415	20	675	10	533		
Guided missile, space vehicle, and related parts	336414-15, 336419	40	10,785	20	1,980	20	763	10	1,217	10	666		
Military armored vehicle, tank, and tank components	336992	10	30	10	1	10	1	0	0	0	0		
Other transportation	other 336	230	2,992	50	319	50	317	10	2	10	2		
Furniture and related products	337	210	410	40	107	40	107	0	0	0	0		
Miscellaneous	339	1,330	23,382	510	D	490	D	60	47	10	12		
Medical equipment and supplies	3391	820	20,394	420	3,579	400	3,540	60	39	10	12		
Other miscellaneous manufacturing	3399	510	2,989	90	D	90	D	10	8	0	0		
Nonmanufacturing industries	21-23, 42-81	15,150	319,088	10,450	235,072	9,740	224,716	1,260	10,356	620	3,238		
Mining, quarrying, oil and gas extraction, and support activities	21	140	D	50	283	40	261	10	22	0	0		
Utilities	22	50	D	30	123	30	123	10	*	0	0		
Wholesale trade	42	1,600	D	530	484	520	477	10	7	0	0		
Electronic shopping and electronic auctions	454111-12	120	D	100	D	100	D	0	0	0	0		
Transportation and warehousing	48-49	70	9,395	40	3,171	40	3,171	0	0	0	0		
Information	51	3,500	182,340	3,270	157,931	3,220	157,061	170	869	80	142		
Publishing	511	1,440	50,367	1,350	34,683	1,340	33,996	110	687	60	102		
Newspaper, periodical, book, and directory publishers	5111	40	72	10	4	10	4	0	0	0	0		
Software publishers	5112	1,410	50,295	1,350	34,679	1,330	33,992	110	687	60	102		
Telecommunications	517	270	3,690	190	1,943	190	D	10	D	10	7		
Data processing, hosting, and related services	518	1,530	49,407	1,480	47,396	1,440	47,264	60	132	20	33		
Other information	other 51	280	78,876	260	73,909	260	D	10	D	0	0		
Finance and insurance	52	530	17,222	510	16,217	510	16,173	10	44	0	0		
Real estate and rental and leasing	53	70	2,398	30	2,161	30	2,161	0	0	0	0		
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	5	10	*	10	*	0	0	0	0		
Other real estate and rental and leasing	other 53	50	2,393	30	2,161	30	2,161	0	0	0	0		
Professional, scientific, and technical services	54	7,280	74,773	5,340	28,776	4,690	19,369	1,080	9,407	550	3,095		
Architectural, engineering, and related services	5413	1,430	3,883	620	734	430	394	290	340	160	225		

TABLE 19

Companies with domestic R&D paid for by the company and others and performed by the company in the software products and embedded software technology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Software products and embedded software R&D											
				Total		Paid for by the company		Paid for by others							
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Total		Federally funded					
								Companies ^b (number)	Amount	Companies ^b (number)	Amount				
Computer systems design and related services	5415	3,360	22,534	3,250	i	13,716	3,030	i	10,437	410	i	3,279	120	i	765
Scientific research and development services	5417	1,450	39,625	640	i	7,673	420	i	2,556	350	i	5,117	260	i	1,530
Research and development in nanotechnology	541713	100	282	40	i	13	20	i	4	30	i	9	30	i	8
Research and development in biotechnology (except nanobiotechnology)	541714	340	10,226	90	i	391	70	i	116	40	i	275	10	i	126
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,020	28,420	520	i	7,228	340	i	2,411	290	i	4,817	220		1,380
Research and development in the social sciences and humanities	541720	20	698	10		40	10		24	10		16	10		16
Other professional, scientific, and technical services	other 54	1,050	8,730	850	i	6,653	820	i	5,983	50	i	670	30		575
Health care services	621-23	310	2,855	160	i	710	160	i	708	10		2	10		2
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,550	3,394	450	r	D	450	r	D	10		6	0		0
All companies (number of domestic employees)	-	29,990	691,547	15,440	i	291,661	14,570	i	276,644	1,660	i	15,016	680	i	5,141
Small companies															
10-19 ^c	-	5,890	5,277	3,470	i	1,931	3,140	i	1,450	520	i	482	200	i	193
20-49	-	8,200	14,695	4,510	i	5,451	4,260	i	4,940	560	i	511	230	i	278
Medium companies															
50-99	-	5,110	15,265	2,460	i	4,956	2,350	i	4,461	210	i	496	100	i	267
100-249	-	5,190	27,847	2,370	i	10,009	2,260	i	9,146	180	i	863	100		479
Large companies															
250-499	-	2,160	29,549	940		9,849	920		9,034	60		814	20		217
500-999	-	1,410	31,802	660		13,251	640		12,300	40		951	10		204
1,000-4,999	-	1,440	104,505	710		48,864	690		47,135	50		1,729	20		479
5,000-9,999	-	270	58,709	160		22,098	160		21,777	20		321	10		180
10,000-24,999	-	220	121,142	120		31,933	120		26,683	30		5,249	20		678
25,000 or more	-	140	282,756	90		143,319	90		139,718	20		3,601	10		2,166

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology.

^b Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology. These company count estimates also reflect an imputation process implemented for survey year 2014. This change has affected the comparability of these company count estimates with estimates published for years prior to 2014.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Companies could report R&D in one, more than one, or no application area.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 20

Companies with domestic R&D paid for by the company and others and performed by the company in the biotechnology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Biotechnology R&D							
				Total		Paid for by the company		Paid for by others			
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount		
All industries	21-23, 31-33, 42-81	29,990	691,547	3,040	i 117,108	2,730	i 95,021	660	i 22,087	i	
Manufacturing industries	31-33	14,850	372,459	1,980	i 97,021	1,880	i 88,352	320	i 8,669		
Food	311	960	7,143	190	i 1,994	190	i 1,956	10		38	
Beverage and tobacco products	312	160	767	10	i 36	10	i 36	0		0	
Textile, apparel, and leather products	313-16	260	635	30	i D	30	i D	0		0	
Wood products	321	110	259	10		10		0		0	
Paper	322	100	1,005	20	i 19	20	i 19	0		0	
Printing and related support activities	323	140	165	0		0		0		0	
Petroleum and coal products	324	80	860	10		108	i 105	10	i 3	i	
Chemicals	325	2,320	125,728	1,160		88,646	1,100	80,848	240	7,797	
Basic chemicals	3251	320	2,860	70	i 466	60	i D	20	i D		
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	1,493	40	i 60	40	i 60	0		0	
Pesticide, fertilizer, and other agricultural chemicals	3253	70	1,193	40	i D	40	i D	10		D	
Pharmaceuticals and medicines	3254	1,130	116,073	910		87,320	850	79,764	230	7,556	
Soap, cleaning compound, and toilet preparations	3256	270	2,886	130	i D	130	i D	10		D	
Paint, coating, adhesive, and other chemicals	3255, 3259	350	1,223	10		D	10	D	10	D	
Plastics and rubber products	326	840	3,470	90	i 66	80	i 64	10	i 2		
Nonmetallic mineral products	327	260	1,464	10		1	10	1	10	*	
Primary metals	331	270	1,120	10		1	10	1	0	0	
Fabricated metal products	332	1,870	3,526	10		10	10	10	0	0	
Machinery	333	2,050	19,464	40		128	i 40	125	i 10	3	
Agricultural implement	33311	160	2,287	10		54	i 10	54	i 0	0	
Semiconductor machinery	333242	50	5,438	10	i 56	10	i 55	10	i 1	i	
Engine, turbine, and power transmission equipment	3336	110	3,026	10		4	10	4	0	0	
Other machinery	other 333	1,740	8,713	30		13	30	11	10	i 2	
Computer and electronic products	334	2,370	104,718	140	i 2,318	140	i 1,558	10		760	
Communications equipment	3342	340	11,665	0		0	0	0	0	0	
Semiconductor and other electronic components	3344	510	49,330	10		31	10	31	0	0	
Navigational, measuring, electromedical, and control instruments	3345	1,030	12,777	140	i 2,260	130	i 1,502	10		757	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	190	4,578	50		1,240	i 50	749	i 10	491	
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	4,146	10	i 265	0	0	10	i 265	i	
Other measuring and controlling devices	other 3345	740	4,053	90	i 755	90	i 753	10		1	

TABLE 20
Companies with domestic R&D paid for by the company and others and performed by the company in the biotechnology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Biotechnology R&D					
		Domestic R&D		Total		Paid for by the company		Paid for by others	
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount
Other computer and electronic products	other 334	500	30,946	10	27	10	24	10	3
Electrical equipment, appliances, and components	335	520	7,086	10	14	10	14	0	0
Transportation equipment	336	1,100	71,259	10	101	10	99	10	2
Motor vehicles, bodies, trailers, and parts	3361-63	600	32,881	10	2	10	2	0	0
Aerospace products and parts	3364	270	35,356	10	96	10	94	10	2
Aircraft, aircraft engine, and aircraft parts	336411-13	230	24,571	10	*	10	*	0	0
Guided missile, space vehicle, and related parts	336414-15, 336419	40	10,785	10	96	10	94	10	2
Military armored vehicle, tank, and tank components	336992	10	30	0	0	0	0	0	0
Other transportation	other 336	230	2,992	10	3	10	3	0	0
Furniture and related products	337	210	410	0	0	0	0	0	0
Miscellaneous	339	1,330	23,382	310	D	280	D	60	63
Medical equipment and supplies	3391	820	20,394	300	3,539	270	3,476	60	63
Other miscellaneous manufacturing	3399	510	2,989	10	D	10	D	0	0
Nonmanufacturing industries	21-23, 42-81	15,150	319,088	1,060	20,087	850	6,669	340	13,418
Mining, quarrying, oil and gas extraction, and support activities	21	140	D	10	30	10	28	10	2
Utilities	22	50	D	10	1	10	1	0	0
Wholesale trade	42	1,600	D	60	68	60	68	0	0
Electronic shopping and electronic auctions	454111-12	120	D	0	0	0	0	0	0
Transportation and warehousing	48-49	70	9,395	0	0	0	0	0	0
Information	51	3,500	182,340	30	340	30	340	0	0
Publishing	511	1,440	50,367	10	316	10	316	0	0
Newspaper, periodical, book, and directory publishers	5111	40	72	0	0	0	0	0	0
Software publishers	5112	1,410	50,295	10	316	10	316	0	0
Telecommunications	517	270	3,690	10	1	10	1	0	0
Data processing, hosting, and related services	518	1,530	49,407	20	21	20	21	0	0
Other information	other 51	280	78,876	10	2	10	2	0	0
Finance and insurance	52	530	17,222	10	2	10	2	0	0
Real estate and rental and leasing	53	70	2,398	10	2	10	2	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	5	10	2	10	2	0	0
Other real estate and rental and leasing	other 53	50	2,393	0	0	0	0	0	0
Professional, scientific, and technical services	54	7,280	74,773	880	18,132	670	4,737	330	13,394
Architectural, engineering, and related services	5413	1,430	3,883	60	127	50	85	20	42

TABLE 20

Companies with domestic R&D paid for by the company and others and performed by the company in the biotechnology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Biotechnology R&D									
		Domestic R&D		Total		Paid for by the company		Paid for by others			
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount		
Computer systems design and related services	5415	3,360	22,534	20	45	20	43	10	1		
Scientific research and development services	5417	1,450	39,625	670	17,494	510	4,301	280	13,193		
Research and development in nanotechnology	541713	100	282	30	61	30	55	10	6		
Research and development in biotechnology (except nanobiotechnology)	541714	340	10,226	320	6,944	270	2,547	120	4,397		
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,020	28,420	330	10,489	220	1,698	160	8,791		
Research and development in the social sciences and humanities	541720	20	698	0	0	0	0	0	0		
Other professional, scientific, and technical services	other 54	1,050	8,730	140	466	110	309	40	157		
Health care services	621-23	310	2,855	90	1,490	90	1,468	10	22		
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,550	3,394	10	24	10	24	0	0		
All companies (number of domestic employees)	-	29,990	691,547	3,040	117,108	2,730	95,021	660	22,087		
Small companies											
10-19 ^c	-	5,890	5,277	620	1,373	530	1,028	160	345		
20-49	-	8,200	14,695	900	4,392	800	3,770	210	622		
Medium companies											
50-99	-	5,110	15,265	470	4,936	430	4,470	90	466		
100-249	-	5,190	27,847	450	9,035	420	8,256	90	779		
Large companies											
250-499	-	2,160	29,549	260	10,131	230	8,978	50	1,153		
500-999	-	1,410	31,802	130	7,574	120	6,949	30	625		
1,000-4,999	-	1,440	104,505	150	16,789	140	13,486	30	3,304		
5,000-9,999	-	270	58,709	40	7,939	40	7,631	10	309		
10,000-24,999	-	220	121,142	40	29,480	40	18,872	20	10,608		
25,000 or more	-	140	282,756	30	25,458	20	21,582	10	3,876		

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology.^b Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology. These company count estimates also reflect an imputation process implemented for survey year 2014. This change has affected the comparability of these company count estimates with estimates published for years prior to 2014.^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Companies could report R&D in one, more than one, or no application area.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 21
Companies with domestic R&D paid for by the company and others and performed by the company in the nanotechnology focus area, by industry and company size: 2022
(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Nanotechnology R&D						
		Companies ^a (number)	Amount	Total		Paid for by the company		Paid for by others		
				Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	
All industries	21-23, 31-33, 42-81	29,990	691,547	1,270	i 36,665	i 1,070	i 35,691	i 270	i 974	i
Manufacturing industries	31-33	14,850	372,459	860	i 33,721	i 840	i 33,236	i 60	486	
Food	311	960	7,143	10	10	10	9	10	1	
Beverage and tobacco products	312	160	767	0	0	0	0	0	0	
Textile, apparel, and leather products	313-16	260	635	10	i D	i 10	i D	0	0	
Wood products	321	110	259	10	*	10	*	0	0	
Paper	322	100	1,005	10	i 11	i 10	i 11	0	0	
Printing and related support activities	323	140	165	0	0	0	0	0	0	
Petroleum and coal products	324	80	860	10	6	10	6	0	0	
Chemicals	325	2,320	125,728	240	i 704	i 230	i 645	20	i 58	i
Basic chemicals	3251	320	2,860	70	i 326	i 60	i 306	20	i 21	i
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	1,493	30	i 24	i 30	i 15	10	9	
Pesticide, fertilizer, and other agricultural chemicals	3253	70	1,193	20	i D	i 20	i D	0	0	
Pharmaceuticals and medicines	3254	1,130	116,073	50	264	50	D	10	i D	
Soap, cleaning compound, and toilet preparations	3256	270	2,886	50	r D	50	r D	0	0	
Paint, coating, adhesive, and other chemicals	3255, 3259	350	1,223	50	i D	i 50	i D	10	D	
Plastics and rubber products	326	840	3,470	100	i 165	i 100	i 162	10	4	
Nonmetallic mineral products	327	260	1,464	50	i 49	i 50	i 45	10	4	
Primary metals	331	270	1,120	10	i 17	i 10	i 17	0	0	
Fabricated metal products	332	1,870	3,526	10	21	10	18	10	3	
Machinery	333	2,050	19,464	70	i 2,376	i 70	i 2,342	10	34	
Agricultural implement	33311	160	2,287	0	0	0	0	0	0	
Semiconductor machinery	333242	50	5,438	20	i 2,315	i 20	i 2,285	10	29	
Engine, turbine, and power transmission equipment	3336	110	3,026	10	1	10	1	0	0	
Other machinery	other 333	1,740	8,713	60	i 60	i 60	i 56	10	i 4	
Computer and electronic products	334	2,370	104,718	320	i 29,088	i 310	i 28,957	20	i 131	i
Communications equipment	3342	340	11,665	10	18	10	18	0	0	
Semiconductor and other electronic components	3344	510	49,330	80	i 28,586	i 70	i 28,459	20	i 127	i
Navigational, measuring, electromedical, and control instruments	3345	1,030	12,777	120	i 280	i 120	i 276	10	4	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	190	4,578	10	18	10	15	10	3	
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	4,146	10	3	10	2	10	*	
Other measuring and controlling devices	other 3345	740	4,053	110	i 260	i 110	i 259	10	*	

TABLE 21
Companies with domestic R&D paid for by the company and others and performed by the company in the nanotechnology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Nanotechnology R&D					
				Total		Paid for by the company		Paid for by others	
		Companies ^a (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount
Other computer and electronic products	other 334	500	r 30,946	130	r 204	130	r 204	0	0
Electrical equipment, appliances, and components	335	520	7,086	10	15	10	15	0	0
Transportation equipment	336	1,100	71,259	20	818	20	566	10	252
Motor vehicles, bodies, trailers, and parts	3361-63	600	32,881	10	6	10	*	10	5
Aerospace products and parts	3364	270	35,356	10	809	10	562	10	246
Aircraft, aircraft engine, and aircraft parts	336411-13	230	24,571	i 10	474	10	392	10	82
Guided missile, space vehicle, and related parts	336414-15, 336419	40	10,785	10	334	10	170	10	164
Military armored vehicle, tank, and tank components	336992	10	30	0	0	0	0	0	0
Other transportation	other 336	230	2,992	10	3	10	3	0	0
Furniture and related products	337	210	410	0	0	0	0	0	0
Miscellaneous	339	1,330	23,382	40	D	40	D	10	*
Medical equipment and supplies	3391	820	20,394	30	429	i 30	429	i 10	*
Other miscellaneous manufacturing	3399	510	2,989	20	D	20	D	0	0
Nonmanufacturing industries	21-23, 42-81	15,150	319,088	410	i 2,944	i 230	i 2,456	i 220	i 488
Mining, quarrying, oil and gas extraction, and support activities	21	140	i D	10	i 1	i 0	0	10	i 1
Utilities	22	50	D	0	0	0	0	0	0
Wholesale trade	42	1,600	D	10	11	r 10	11	r 0	0
Electronic shopping and electronic auctions	454111-12	120	D	0	0	0	0	0	0
Transportation and warehousing	48-49	70	9,395	0	0	0	0	0	0
Information	51	3,500	182,340	30	i 1,694	i 30	i 1,694	i 0	0
Publishing	511	1,440	50,367	20	i 1,690	i 20	i 1,690	i 0	0
Newspaper, periodical, book, and directory publishers	5111	40	72	0	0	0	0	0	0
Software publishers	5112	1,410	50,295	20	i 1,690	i 20	i 1,690	i 0	0
Telecommunications	517	270	3,690	10	*	10	*	0	0
Data processing, hosting, and related services	518	1,530	49,407	10	2	10	2	0	0
Other information	other 51	280	78,876	10	i 2	i 10	i 2	i 0	0
Finance and insurance	52	530	r 17,222	10	3	10	2	10	1
Real estate and rental and leasing	53	70	2,398	i 0	0	0	0	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	i 5	i 0	0	0	0	0	0
Other real estate and rental and leasing	other 53	50	2,393	i 0	0	0	0	0	0
Professional, scientific, and technical services	54	7,280	74,773	350	i 1,216	i 180	i 730	i 220	i 486
Architectural, engineering, and related services	5413	1,430	3,883	100	i 30	i 10	15	90	i 15

TABLE 21
Companies with domestic R&D paid for by the company and others and performed by the company in the nanotechnology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Nanotechnology R&D												
		Companies ^a (number)	Amount	Total		Paid for by the company		Paid for by others								
				Companies ^b (number)	Amount	Companies ^b (number)	Amount	Companies ^b (number)	Amount							
Computer systems design and related services	5415	3,360	22,534	70	i	481	i	60	i	302		30	i	180	i	
Scientific research and development services	5417	1,450	39,625	i	160	i	499	i	90	i	212		110	i	287	i
Research and development in nanotechnology	541713	100	282		80	i	162		50	i	95		50	i	67	i
Research and development in biotechnology (except nanobiotechnology)	541714	340	10,226		30	i	87	i	20	i	84	i	10	i	2	i
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,020	28,420	i	60	i	250	i	30		33		50	i	218	i
Research and development in the social sciences and humanities	541720	20	698		0		0		0		0		0		0	
Other professional, scientific, and technical services	other 54	1,050	8,730		40	i	205	i	30	i	202	i	10	i	4	i
Health care services	621-23	310	2,855		10		6		10		6		10		*	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,550	3,394		20	i	14		20	i	14		0		0	
All companies (number of domestic employees)	-	29,990	691,547		1,270	i	36,665	i	1,070	i	35,691	i	270	i	974	i
Small companies																
10-19 ^c	-	5,890	5,277		390	i	219		290	i	165		120	i	54	i
20-49	-	8,200	14,695		320	i	360	i	280	i	284		60	i	76	i
Medium companies																
50-99	-	5,110	15,265		170	i	326		150	i	251		40	i	76	i
100-249	-	5,190	27,847		150	i	1,058	r	130	i	1,035	r	30	i	24	i
Large companies																
250-499	-	2,160	29,549		80	i	617	i	70		573	i	10		44	i
500-999	-	1,410	31,802		50	i	505		50	i	481		10	i	24	i
1,000-4,999	-	1,440	104,505		90		5,681	i	80		5,605	i	20		76	i
5,000-9,999	-	270	58,709		30		5,660		30		5,556		10		104	i
10,000-24,999	-	220	121,142		20	i	9,222	i	20		9,015	i	10	i	206	i
25,000 or more	-	140	282,756		20		13,017	i	20		12,727	i	10		290	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology.

^b Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology. These company count estimates also reflect an imputation process implemented for survey year 2014. This change has affected the comparability of these company count estimates with estimates published for years prior to 2014.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Companies could report R&D in one, more than one, or no application area.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 22
Companies with domestic R&D paid for by the company and others and performed by the company in the artificial intelligence technology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Artificial intelligence R&D							
				Total		Paid for by the company		Paid for by others			
		Companies ^a (number)	Amount	Companies ^a (number)	Amount	Companies ^a (number)	Amount	Companies ^a (number)	Amount		
All industries	21-23, 31-33, 42-81	29,990	691,547	3,960	i 37,014	i 3,550	i 33,416	i 620	i 3,598		
Manufacturing industries	31-33	14,850	372,459	1,180	i 12,326	i 1,140	i 11,298	i 90	i 1,027		
Food	311	960	7,143	110	i 222	i 110	i 220	i 10	i 2		
Beverage and tobacco products	312	160	767	10	i 1	i 10	i 1	i 0	i 0		
Textile, apparel, and leather products	313-16	260	635	10	D	10	D	0	0		
Wood products	321	110	259	10	i *	i 10	i *	i 0	i 0		
Paper	322	100	1,005	10	i 10	i 10	i 10	i 0	i 0		
Printing and related support activities	323	140	165	0	0	0	0	0	0		
Petroleum and coal products	324	80	860	10	*	10	*	0	0		
Chemicals	325	2,320	125,728	120	292	120	291	10	1		
Basic chemicals	3251	320	2,860	10	12	10	12	10	*		
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	1,493	20	i 15	20	i 15	0	0		
Pesticide, fertilizer, and other agricultural chemicals	3253	70	1,193	10	D	10	D	0	0		
Pharmaceuticals and medicines	3254	1,130	116,073	40	218	40	218	0	0		
Soap, cleaning compound, and toilet preparations	3256	270	2,886	40	r D	40	r D	0	0		
Paint, coating, adhesive, and other chemicals	3255, 3259	350	1,223	30	i D	30	i D	10	1		
Plastics and rubber products	326	840	3,470	20	12	20	12	10	*		
Nonmetallic mineral products	327	260	1,464	10	3	10	2	10	1		
Primary metals	331	270	1,120	10	4	10	4	10	*		
Fabricated metal products	332	1,870	3,526	80	i 33	80	i 33	0	0		
Machinery	333	2,050	19,464	180	i 853	i 180	i 842	i 10	11		
Agricultural implement	33311	160	2,287	50	i 135	i 50	i 135	i 0	0		
Semiconductor machinery	333242	50	5,438	10	504	i 10	503	i 10	i 1		
Engine, turbine, and power transmission equipment	3336	110	3,026	10	25	10	18	10	7		
Other machinery	other 333	1,740	8,713	120	i 189	120	i 186	10	3		
Computer and electronic products	334	2,370	104,718	390	i 8,135	i 380	i 7,881	i 30	i 254		
Communications equipment	3342	340	11,665	20	i 38	i 20	i 38	i 10	i *		
Semiconductor and other electronic components	3344	510	49,330	160	i 5,118	i 150	i 4,872	i 20	i 246		
Navigational, measuring, electromedical, and control instruments	3345	1,030	12,777	130	i 259	130	i 254	10	i 5		
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	190	4,578	20	28	20	25	10	i 3		
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	4,146	10	5	10	3	10	2		
Other measuring and controlling devices	other 3345	740	4,053	110	i 226	110	i 226	10	*		

TABLE 22
Companies with domestic R&D paid for by the company and others and performed by the company in the artificial intelligence technology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Artificial intelligence R&D											
		Domestic R&D			Total		Paid for by the company		Paid for by others				
		Companies ^a (number)	Amount	Companies ^a (number)	Amount	Companies ^a (number)	Amount	Companies ^a (number)	Amount				
Other computer and electronic products	other 334	500	r 30,946	100	i 2,719	100	i 2,717	10	r 2				
Electrical equipment, appliances, and components	335	520	7,086	70	i 165	60	i 136	10	i 29				
Transportation equipment	336	1,100	71,259	70	i 1,981	70	i 1,260	20	721				
Motor vehicles, bodies, trailers, and parts	3361-63	600	32,881	40	i 769	40	i 744	10	26				
Aerospace products and parts	3364	270	35,356	40	i 1,210	40	i 515	10	695				
Aircraft, aircraft engine, and aircraft parts	336411-13	230	24,571	30	i 672	30	i 388	10	284				
Guided missile, space vehicle, and related parts	336414-15, 336419	40	10,785	10	538	10	127	10	411				
Military armored vehicle, tank, and tank components	336992	10	30	0	0	0	0	0	0				
Other transportation	other 336	230	2,992	10	2	10	2	0	0				
Furniture and related products	337	210	410	0	0	0	0	0	0				
Miscellaneous	339	1,330	23,382	140	i D	130	i D	30	i 8				
Medical equipment and supplies	3391	820	20,394	130	i 572	120	i 564	30	i 8				
Other miscellaneous manufacturing	3399	510	2,989	20	D	20	D	0	0				
Nonmanufacturing industries	21-23, 42-81	15,150	319,088	2,790	i 24,688	2,410	i 22,117	540	i 2,571				
Mining, quarrying, oil and gas extraction, and support activities	21	140	i D	10	i 21	10	i 21	0	0				
Utilities	22	50	D	10	42	10	42	0	0				
Wholesale trade	42	1,600	D	30	6	30	r 6	10	i *				
Electronic shopping and electronic auctions	454111-12	120	D	10	i D	10	i D	0	0				
Transportation and warehousing	48-49	70	9,395	10	D	10	D	0	0				
Information	51	3,500	182,340	830	i 15,819	820	i 15,765	30	i 54				
Publishing	511	1,440	50,367	250	i 3,759	240	i 3,721	20	i 38				
Newspaper, periodical, book, and directory publishers	5111	40	72	0	0	0	0	0	0				
Software publishers	5112	1,410	50,295	250	i 3,759	240	i 3,721	20	i 38				
Telecommunications	517	270	3,690	120	i 244	110	i 239	10	5				
Data processing, hosting, and related services	518	1,530	49,407	410	4,130	410	i 4,119	10	11				
Other information	other 51	280	78,876	70	i 7,686	70	i 7,686	0	0				
Finance and insurance	52	530	r 17,222	90	r 894	90	r 888	10	i 7				
Real estate and rental and leasing	53	70	2,398	i 10	i 98	10	i 98	0	0				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	i 5	0	0	0	0	0	0				
Other real estate and rental and leasing	other 53	50	2,393	i 10	i 98	10	i 98	0	0				
Professional, scientific, and technical services	54	7,280	74,773	1,720	i 6,210	1,360	i 3,702	510	i 2,508				
Architectural, engineering, and related services	5413	1,430	3,883	220	i 146	140	i 62	120	i 85				

TABLE 22

Companies with domestic R&D paid for by the company and others and performed by the company in the artificial intelligence technology focus area, by industry and company size: 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Domestic R&D		Artificial intelligence R&D												
		Companies ^a (number)	Amount	Total		Paid for by the company		Paid for by others								
				Companies ^a (number)	Amount	Companies ^a (number)	Amount	Companies ^a (number)	Amount							
Computer systems design and related services	5415	3,360	22,534	950	i	1,392	i	780	i	974	i	230	i	418	i	
Scientific research and development services	5417	1,450	39,625	i	290	i	2,719	i	200	i	852	i	130	i	1,867	i
Research and development in nanotechnology	541713	100	282		10	i	3		10	i	3		0		0	
Research and development in biotechnology (except nanobiotechnology)	541714	340	10,226		50	i	489	i	50	i	381	i	10	i	107	i
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,020	28,420	i	230	i	2,189	i	150	i	466	i	130	i	1,723	i
Research and development in the social sciences and humanities	541720	20	698		10		38		10		*		10		37	
Other professional, scientific, and technical services	other 54	1,050	8,730		280	i	1,953		250	i	1,815		40	i	138	
Health care services	621-23	310	2,855		60		110		60		110		0		0	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,550	3,394		40	i	D		40	i	D		10		2	
All companies (number of domestic employees)	-	29,990	691,547		3,960	i	37,014	i	3,550	i	33,416	i	620	i	3,598	i
Small companies																
10-19 ^b	-	5,890	5,277		1,080	i	487	i	910	i	364	i	210	i	123	i
20-49	-	8,200	14,695		1,070	i	821	i	940	i	722	i	220	i	99	i
Medium companies																
50-99	-	5,110	15,265		570	i	876		530	i	740		60	i	136	
100-249	-	5,190	27,847		480	i	1,192		430	i	1,004		70	i	189	i
Large companies																
250-499	-	2,160	29,549		260		1,426		250		1,246		20		180	
500-999	-	1,410	31,802		170		1,241		160		1,036		10		206	
1,000-4,999	-	1,440	104,505		230		4,392	i	220		3,994	i	20		398	i
5,000-9,999	-	270	58,709		60		1,866	i	60		1,746	i	10		120	
10,000-24,999	-	220	121,142		50		7,091	i	40		6,030	i	20		1,062	i
25,000 or more	-	140	282,756		40		17,621	i	40		16,533	i	10		1,087	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse.^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Companies could report R&D in one, more than one, or no application area.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 23

Foreign R&D paid for by the company and others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total foreign R&D performance			Research (basic and applied)			Development		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
All industries	21-23, 31-33, 42-81	149,584	135,009	14,575 i	25,331	21,019	4,312 i	124,254	113,991	10,263 i
Manufacturing industries	31-33	84,419	82,730	1,690	15,462	15,194	268	68,957	67,536	1,421
Food	311	1,463	D	D	241	D	D	1,221	1,218	3 i
Beverage and tobacco products	312	630	630	0	185	185	0	445	445	0
Textile, apparel, and leather products	313-16	113	D	D	27	27	0	86	D	D
Wood products	321	4	4	0	3	3	0	2	2	0
Paper	322	81	81	* i	1 i	1 i	* i	81 i	81 i	* i
Printing and related support activities	323	2	2	0	* i	* i	0	2	2	0
Petroleum and coal products	324	247	242	5	77	76	*	170	166	4
Chemicals	325	25,061	24,757	304	7,484	7,408	76	17,577	17,349	228
Basic chemicals	3251	956	D	D	275	D	D	681	680	1
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	539	D	D	141	D	D	398	398	* i
Pesticide, fertilizer, and other agricultural chemicals	3253	151	D	D	43	D	D	109	109	0
Pharmaceuticals and medicines	3254	22,266	22,003	263	6,803	D	D	15,463	D	D
Soap, cleaning compound, and toilet preparations	3256	917	D	D	153	D	D	764	757	7
Paint, coating, adhesive, and other chemicals	3255, 3259	232	D	D	70	D	D	163	D	D
Plastics and rubber products	326	682	652	29	239	233	6	442	419	23
Nonmetallic mineral products	327	159	159	0	13	13	0	145	145	0
Primary metals	331	19	18	2	7	D	D	12	D	D
Fabricated metal products	332	231	197	34 i	79	72	7 i	152	125	27 i
Machinery	333	5,914	5,778	136	488	464	23	5,427	5,314	113
Agricultural implement	33311	990	D	D	17	D	D	974	969	5
Semiconductor machinery	333242	1,636	1,618	18	55 i	53 i	2	1,581 i	1,566 i	16
Engine, turbine, and power transmission equipment	3336	1,071	D	D	43	D	D	1,028	1,005	23
Other machinery	other 333	2,217	2,137	81	374	363 i	11	1,844	1,774	70
Computer and electronic products	334	35,536	35,392	144	4,680	4,658	22	30,856	30,734	122
Communications equipment	3342	3,509	3,497	12	628	626	2	2,881	2,872	10
Semiconductor and other electronic components	3344	21,784	21,698	85	2,372 i	2,368 i	4	19,411 i	19,330 i	81
Navigational, measuring, electromedical, and control instruments	3345	2,668	2,630	38	805	792	13	1,863	1,838	25
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	429	421	8 i	315	311	4	114	110	4
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	327	305	22	141	132	9	186	173	14
Other measuring and controlling devices	other 3345	1,912	1,905	8	349	349	1 i	1,563	1,556	7
Other computer and electronic products	other 334	7,575	7,567	9	875	873	2	6,700	6,694	7
Electrical equipment, appliances, and components	335	1,575	1,569	5 i	146 i	146 i	* i	1,429 i	1,424 i	5 i

TABLE 23

Foreign R&D paid for by the company and others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total foreign R&D performance			Research (basic and applied)			Development		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
Transportation equipment	336	8,035	7,064	971	1,263	1,134	129	6,773	5,931	842
Motor vehicles, bodies, trailers, and parts	3361-63	6,035	5,547	487	793	775	17	5,242	4,772	470
Aerospace products and parts	3364	1,819	1,365	454	416	329	87	1,403	1,037	367
Aircraft, aircraft engine, and aircraft parts	336411-13	653	498	155	116	105	11	537	393	143
Guided missile, space vehicle, and related parts	336414-15, 336419	1,166	867	299	299	223	76	867	644	223
Military armored vehicle, tank, and tank components	336992	1	1	0	0	0	0	1	1	0
Other transportation	other 336	181	151	30	54	30	25	126	121	5
Furniture and related products	337	36	36	0	15	15	0	21	21	0
Miscellaneous	339	4,631	4,577	55	514	511	4	4,117	4,066	51
Medical equipment and supplies	3391	4,234	4,180	55	416	412	4	3,818	3,767	51
Other miscellaneous manufacturing	3399	397	397	0	98	98	0	299	299	0
Nonmanufacturing industries	21-23, 42-81	65,165	52,279	12,886	9,868	5,825	4,044	55,297	46,455	8,842
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D	D	D	0	D	D	D
Utilities	22	D	D	D	D	D	0	D	D	D
Wholesale trade	42	D	D	0	8	8	0	D	D	0
Electronic shopping and electronic auctions	454111-12	D	D	0	D	D	0	D	D	0
Transportation and warehousing	48-49	121	121	0	4	4	0	116	116	0
Information	51	36,948	36,784	164	3,550	3,505	46	33,398	33,280	118
Publishing	511	12,330	12,182	149	1,176	1,133	42	11,155	11,048	106
Newspaper, periodical, book, and directory publishers	5111	* i	* i	0	* i	* i	0	* i	* i	0
Software publishers	5112	12,330	12,182	149	1,176	1,133	42	11,155	11,048	106
Telecommunications	517	201	198	3	82	82	*	118	116	2
Data processing, hosting, and related services	518	12,242	12,229	13	1,173	1,170	3	11,069	11,060	10
Other information	other 51	12,176	12,176	0	1,120	1,120	0	11,056	11,056	0
Finance and insurance	52	2,612	2,562	50	395	372	23	2,217	2,189	27
Real estate and rental and leasing	53	102	102	0	37	37	0	65	65	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1	1	0	0	0	0	1	1	0
Other real estate and rental and leasing	other 53	101	101	0	37	37	0	65	65	0
Professional, scientific, and technical services	54	19,028	6,372	12,656	5,240	1,264	3,975	13,788	5,108	8,681
Architectural, engineering, and related services	5413	36	30	6	13	11	2	22	19	3
Computer systems design and related services	5415	4,575	4,535	40	920	912	9	3,654	3,623	31
Scientific research and development services	5417	13,571	961	12,610	4,089	125	3,964	9,481	836	8,646
Research and development in nanotechnology	541713	30	23	6	27	21	6	3	2	1
Research and development in biotechnology (except nanobiotechnology)	541714	4,073	77	3,997	9	6	3	4,064	70	3,994

TABLE 23

Foreign R&D paid for by the company and others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total foreign R&D performance			Research (basic and applied)			Development		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	9,466	i 861	8,605	i 4,052	i 98	i 3,954	i 5,415	i 763	i 4,651
Research and development in the social sciences and humanities	541720	2	0	2	2	0	2	0	0	0
Other professional, scientific, and technical services	other 54	847	846	1	216	216	*	631	630	* i
Health care services	621-23	93	D	D	28	28	0	65	D	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	146	146	0	D	D	0	D	D	0
All companies (number of domestic employees)	-	149,584	135,009	14,575	i 25,331	21,019	i 4,312	i 124,254	113,991	10,263
Small companies										
10-19 ^a	-	260	244	17	i 56	49	i 7	204	195	10
20-49	-	941	913	28	i 184	181	i 3	757	732	25
Medium companies										
50-99	-	962	927	36	283	272	11	679	655	25
100-249	-	2,017	1,934	84	494	468	27	1,523	1,466	57
Large companies										
250-499	-	4,240	4,083	157	1,162	1,157	4	3,078	2,926	152
500-999	-	4,657	4,258	399	i 1,208	979	i 230	3,448	3,279	169
1,000-4,999	-	24,407	23,845	562	4,807	4,491	316	19,600	19,354	246
5,000-9,999	-	13,616	13,204	412	2,279	2,246	33	11,337	10,958	379
10,000-24,999	-	32,036	24,079	7,957	i 4,818	3,342	1,476	27,218	20,737	6,481
25,000 or more	-	66,448	61,523	4,925	i 10,040	i 7,834	i 2,206	56,408	53,689	2,720

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 24

Domestic and foreign R&D paid for by the company and others and performed by the company, by type of R&D and industry: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Paid for by others	Research (basic and applied)			Development					
					Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others			
Total domestic R&D performance													
All industries	21-23, 31-33, 42-81	517,413	467,517	49,896	94,743	81,502	13,240	i	422,671	386,015	36,656		
Manufacturing industries	31-33	274,871	245,087	29,784	63,201	56,472	6,729	i	211,669	188,615	23,055		
Chemicals	325	79,229	76,514	2,715	26,783	25,949	833		52,446	50,564	1,881		
Pharmaceuticals and medicines	3254	72,583	70,243	2,341	24,429	D	D		48,155	D	D		
Other chemicals	other 325	6,645	6,271	374	2,354	D	D		4,291	D	D		
Computer and electronic products	334	93,873	90,443	3,430	14,834	14,134	699		79,039	76,309	2,730		
Semiconductor and other electronic components	3344	44,683	44,210	474	6,022	5,924	99	i	38,661	38,286	375	i	
Other computer and electronic products	other 334	49,189	46,233	2,956	8,812	8,211	601		40,378	38,022	2,355		
Nonmanufacturing industries	21-23, 42-81	242,543	222,430	20,112	i 31,541	25,030	6,511	i	211,001	197,400	13,601	i	
Information	51	158,838	158,603	234	12,606	12,567	40	i	146,231	146,036	195		
Software publishers	5112	42,855	42,642	213	3,553	3,516	37	i	39,302	39,127	175		
Other information	other 51	115,982	115,961	22	i 9,053	9,051	2	i	106,929	106,910	19	i	
Professional, scientific, and technical services	54	40,165	20,356	19,810	i 11,434	4,971	6,463	i	28,731	15,384	13,347	i	
Scientific research and development services	5417	i 21,860	2,560	19,300	i 6,922	i 811	i 6,110	i	i 14,939	i 1,749	i 13,190	i	
Other professional, scientific, and technical services	other 54	18,305	17,795	510	4,512	4,160	352		13,793	13,635	157		
Total foreign R&D performance													
All industries	21-23, 31-33, 42-81	149,584	135,009	14,575	i 25,331	21,019	4,312	i	124,254	113,991	10,263	i	
Manufacturing industries	31-33	84,419	82,730	1,690	15,462	15,194	268		68,957	67,536	1,421		
Chemicals	325	25,061	24,757	304	7,484	7,408	76		17,577	17,349	228		
Pharmaceuticals and medicines	3254	22,266	22,003	263	6,803	D	D		15,463	D	D		
Other chemicals	other 325	2,795	2,755	41	681	D	D		2,114	D	D		
Computer and electronic products	334	35,536	35,392	144	4,680	4,658	22		30,856	30,734	122		
Semiconductor and other electronic components	3344	21,784	21,698	85	2,372	2,368	4	i	19,411	19,330	81	i	
Other computer and electronic products	other 334	13,753	13,694	59	2,308	2,291	17		11,445	11,403	41		
Nonmanufacturing industries	21-23, 42-81	65,165	52,279	12,886	i 9,868	i 5,825	4,044	i	55,297	46,455	8,842	i	
Information	51	36,948	36,784	164	3,550	3,505	46	i	33,398	33,280	118		
Software publishers	5112	12,330	12,182	149	1,176	1,133	42	i	11,155	11,048	106		
Other information	other 51	24,618	24,603	16	2,375	2,371	3		22,244	22,231	12		
Professional, scientific, and technical services	54	i 19,028	6,372	12,656	i 5,240	i 1,264	3,975	i	i 13,788	i 5,108	8,681	i	
Scientific research and development services	5417	i 13,571	961	12,610	i 4,089	i 125	i 3,964	i	i 9,481	i 836	i 8,646	i	
Other professional, scientific, and technical services	other 54	5,457	5,411	46	1,150	1,139	11		4,307	4,272	35		

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 25

Foreign R&D paid for by the company and others and performed by the company, by type of R&D, selected industry, and location: 2022

(Millions of U.S. dollars)

Industry and location	NAICS code	Total foreign R&D performance	Research (basic and applied)	Development
All locations				
All industries	21-23, 31-33, 42-81	149,584	25,331	124,254
Manufacturing industries	31-33	84,419	15,462	68,957
Chemicals	325	25,061	7,484	17,577
Pharmaceuticals and medicines	3254	22,266	6,803	15,463
Computer and electronic products	334	35,536	4,680	30,856
Semiconductor and other electronic components	3344	21,784	2,372	19,411
Nonmanufacturing industries	21-23, 42-81	65,165	9,868	55,297
Information	51	36,948	3,550	33,398
Software publishers	5112	12,330	1,176	11,155
Professional, scientific, and technical services	54	19,028	5,240	13,788
Scientific research and development services	5417	13,571	4,089	9,481
Africa				
All industries	21-23, 31-33, 42-81	633	130	502
Manufacturing industries	31-33	257	66	191
Chemicals	325	67	24	43
Pharmaceuticals and medicines	3254	58	23	35
Computer and electronic products	334	7	2	5
Semiconductor and other electronic components	3344	D	*	D
Nonmanufacturing industries	21-23, 42-81	375	64	311
Information	51	84	5	79
Software publishers	5112	43	3	40
Professional, scientific, and technical services	54	202	41	161
Scientific research and development services	5417	178	36	142
Asia and Pacific				
All industries	21-23, 31-33, 42-81	52,070	7,581	44,489
Manufacturing industries	31-33	30,784	4,942	25,842
Chemicals	325	5,861	1,760	4,102
Pharmaceuticals and medicines	3254	5,106	1,595	3,512
Computer and electronic products	334	17,658	2,243	15,416
Semiconductor and other electronic components	3344	12,245	1,225	11,020
Nonmanufacturing industries	21-23, 42-81	21,287	2,640	18,647
Information	51	12,046	1,042	11,005
Software publishers	5112	4,956	431	4,525
Professional, scientific, and technical services	54	5,352	1,192	4,159
Scientific research and development services	5417	3,677	814	2,863
Canada				
All industries	21-23, 31-33, 42-81	11,083	1,863	9,220
Manufacturing industries	31-33	5,054	872	4,182
Chemicals	325	1,043	276	767
Pharmaceuticals and medicines	3254	983	263	720
Computer and electronic products	334	2,209	242	1,967
Semiconductor and other electronic components	3344	1,303	96	1,207
Nonmanufacturing industries	21-23, 42-81	6,029	990	5,038
Information	51	3,735	342	3,393
Software publishers	5112	1,562	127	1,435
Professional, scientific, and technical services	54	1,427	556	871
Scientific research and development services	5417	788	453	335
Europe				

TABLE 25

Foreign R&D paid for by the company and others and performed by the company, by type of R&D, selected industry, and location: 2022

(Millions of U.S. dollars)

Industry and location	NAICS code	Total foreign R&D performance	Research (basic and applied)	Development	
All industries	21-23, 31-33, 42-81	68,744	13,280	55,464	
Manufacturing industries	31-33	37,703	8,107	29,596	
Chemicals	325	16,310	4,921	11,389	
Pharmaceuticals and medicines	3254	14,592	4,490	10,102	
Computer and electronic products	334	9,710	1,526	8,184	
Semiconductor and other electronic components	3344	4,174	602	3,572	i
Nonmanufacturing industries	21-23, 42-81	31,041	5,172	25,869	i
Information	51	17,195	1,735	15,460	
Software publishers	5112	4,393	419	3,973	
Professional, scientific, and technical services	54	10,218	2,951	7,267	i
Scientific research and development services	5417	8,089	2,592	5,497	i
Latin America and other Western Hemisphere ^a					
All industries	21-23, 31-33, 42-81	5,945	940	5,005	i
Manufacturing industries	31-33	4,103	677	3,425	i
Chemicals	325	1,156	308	848	
Pharmaceuticals and medicines	3254	991	279	712	
Computer and electronic products	334	1,364	169	1,195	i
Semiconductor and other electronic components	3344	739	85	653	i
Nonmanufacturing industries	21-23, 42-81	1,842	262	1,580	i
Information	51	699	44	656	
Software publishers	5112	D	D	115	
Professional, scientific, and technical services	54	853	185	667	i
Scientific research and development services	5417	650	163	487	i
Middle East					
All industries	21-23, 31-33, 42-81	10,429	1,370	9,059	i
Manufacturing industries	31-33	6,001	663	5,338	i
Chemicals	325	460	129	331	
Pharmaceuticals and medicines	3254	428	122	306	
Computer and electronic products	334	4,538	477	4,061	i
Semiconductor and other electronic components	3344	3,319	364	2,955	i
Nonmanufacturing industries	21-23, 42-81	4,428	707	3,721	
Information	51	3,143	381	2,762	
Software publishers	5112	1,244	186	1,057	
Professional, scientific, and technical services	54	893	293	601	
Scientific research and development services	5417	177	26	151	i
Puerto Rico ^b					
All industries	21-23, 31-33, 42-81	271	83	188	
Manufacturing industries	31-33	257	76	180	
Chemicals	325	114	54	60	
Pharmaceuticals and medicines	3254	D	D	D	
Computer and electronic products	334	D	D	D	
Semiconductor and other electronic components	3344	D	0	D	
Nonmanufacturing industries	21-23, 42-81	14	6	8	i
Information	51	1	*	1	
Software publishers	5112	*	*	*	
Professional, scientific, and technical services	54	12	6	6	i
Scientific research and development services	5417	4	3	*	i

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Other Western Hemisphere is defined as Argentina, Brazil, Chile, Mexico, and other Latin America.

^b Puerto Rico is not included in the U.S. total due to its classification as a U.S. territory.

Note(s):

Detail within a select location may not add to total because of rounding. Sum of locations does not equal all locations due to the undistributed portion not being published. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Beginning in survey year 2018, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and also performed foreign R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 26

Domestic R&D paid for and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
All industries	21-23, 31-33, 42-81	608,058	323,313	70,482	28,058	10,260	36,945	9,732	20,232	3,580	18,775	86,682
Manufacturing industries	31-33	326,998	164,537	20,954	12,816	4,181	31,464	5,476	12,995	2,975	13,230	58,369
Food	311	D	3,256	82	276	20	1,009	95	D	7 r	230	1,561 r
Beverage and tobacco products	312	660	351	3	34 i	1	53	5	27	*	22	162
Textile, apparel, and leather products	313-16	D	446	10	18	4	62	7	D	1	25	35
Wood products	321	254	191	1	4 r	9 r	32	2	3	* r	3	9
Paper	322	1,004	513	2	2 i	13	378	5	7	0	6	77
Printing and related support activities	323	164	99	*	11 i	1	15 i	5	10 i	1	12 i	9 i
Petroleum and coal products	324	856	444	1	53	2	54	2	36	0	103	161
Chemicals	325	113,518	46,687	7,217	7,068	949	11,003	2,439	3,765	1,415	8,480	24,494
Basic chemicals	3251	D	1,561	29	D	11	252	78	D	22	130	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,413	873	1	53	4	D	16	D	23	83	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	3	D i	12 i	D	D	D	D	12 i	D
Pharmaceuticals and medicines	3254	104,720	41,226	7,169	6,804	907	10,324	2,286	3,332	1,351	8,186	23,135
Soap, cleaning compound, and toilet preparations	3256	D	1,680	13	78	2	145	D	D	D	36	D
Paint, coating, adhesive, and other chemicals	3255, 3259	1,195	D	3	6	12	D	12	49	D	34	D
Plastics and rubber products	326	3,251	1,791	6	83	127 i	455	18	102	7	83	578
Nonmetallic mineral products	327	1,435	912	6	44	7	73	8	74	2	54	254
Primary metals	331	1,099	410	1	2	*	574	1	31	*	39	41
Fabricated metal products	332	3,304	2,145	7	55	45	622	25	88	9	55	253 i
Machinery	333	18,246	10,298	439	721	175	2,567	150	720	62	654	2,461
Agricultural implement	33311	D	1,173	*	122	8	267	9	D	1 i	107	382
Semiconductor machinery	333242	5,390	2,672	352	48	50	652	47	397	*	51	1,120
Engine, turbine, and power transmission equipment	3336	D	1,648	16	273	3	272 i	3	D	7	180	246 i
Other machinery	other 333	7,987	4,804	70	279	114	1,375	91	172	54	317	711
Computer and electronic products	334	99,234	52,827	11,429	1,913	1,977	8,054	2,027	5,530	950	1,009	13,518
Communications equipment	3342	10,870	6,328	986	360	161	260	824	376	8	175	1,392
Semiconductor and other electronic components	3344	47,380	24,362	4,495	1,025	187	4,664	401	2,668	531	176	8,871
Navigational, measuring, electromedical, and control instruments	3345	10,105	6,190	352	323	118	792	104	244	25 i	294	1,662
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	3,959	2,031	236	92	21	273	43	105	23 i	197	937
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,170	1,444	51	169	4	169	32	11	0	44 i	245
Other measuring and controlling devices	other 3345	3,976	2,715	64	62	92	350	29	128	2	53	480

TABLE 26

Domestic R&D paid for and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
Other computer and electronic products	other 334	30,879	15,947	5,596	205	1,511	2,338	698	2,241	386	364	1,592
Electrical equipment, appliances, and components	335	6,657	4,026	293	179	73	436	127	166	42	340	975
Transportation equipment	336	46,468	27,015	634	1,359	439	4,465	326	1,273	296	1,154	9,506
Motor vehicles, bodies, trailers, and parts	3361-63	30,722	18,096	D	1,029	365	3,133	192	990	278	526	D
Aerospace products and parts	3364	13,786	7,636	D	287	63	987	104	241	12	610	D
Aircraft, aircraft engine, and aircraft parts	336411-13	9,303	4,534	58	i 199	35	618	39	107	3	555	3,155
Guided missile, space vehicle, and related parts	336414-15, 336419	4,483	3,102	D	88	28	369	65	134	10	55	D
Military armored vehicle, tank, and tank components	336992	26	13	0	2	0	4	0	*	0	2	5
Other transportation	other 336	1,935	1,269	D	41	11	342	30	43	6	17	D
Furniture and related products	337	405	290	*	6	4	41	3	9	1	12	39
Miscellaneous	339	23,032	12,835	821	987	335	1,570	232	886	180	948	4,238
Medical equipment and supplies	3391	20,112	10,861	738	904	297	1,429	180	796	165	866	3,876
Other miscellaneous manufacturing	3399	2,921	1,974	83	83	38	141	52	90	16	82	361
Nonmanufacturing industries	21-23, 42-81	281,060	158,776	49,528	15,242	6,079	5,481	4,256	7,237	604	5,544	28,312
Mining, quarrying, oil and gas extraction, and support activities	21	D	641	i 16	i D	14	i 89	i D	D	1	i D	D
Utilities	22	D	D	*	42	D	43	*	D	*	47	D
Wholesale trade	42	D	1,202	2	D	74	i 146	i D	D	2	40	D
Electronic shopping and electronic auctions	454111-12	D	9,112	i D	147	i D	170	i 262	i D	* i	D	D
Transportation and warehousing	48-49	D	4,057	1,112	i 189	199	i 983	i 275	i 325	68	D	D
Information	51	181,392	100,974	37,611	11,125	4,611	1,638	3,005	4,011	D	3,100	D
Publishing	511	49,674	29,098	8,311	2,526	515	997	517	620	D	2,034	D
Newspaper, periodical, book, and directory publishers	5111	72	68	0	2	*	* i	0	0	0	2	* i
Software publishers	5112	49,602	29,030	8,311	2,524	515	997	517	620	D	2,032	D
Telecommunications	517	3,614	D	30	724	10	57	19	30	i D	19	D
Data processing, hosting, and related services	518	49,270	31,240	8,735	1,614	623	438	532	557	209	749	4,573
Other information	other 51	78,834	D	20,535	6,260	3,463	145	1,938	2,805	D	298	D
Finance and insurance	52	17,173	12,447	1,035	1,504	227	D	112	738	37	124	D
Real estate and rental and leasing	53	2,398	i 1,215	i 728	i 115	i 30	i 3	i D	48	D	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i 1	i *	i 0	0	2	i 0	0	0	0	2
Other real estate and rental and leasing	other 53	2,393	i 1,214	i 728	i 115	i 30	i 1	D	48	D	D	D
Professional, scientific, and technical services	54	38,633	24,714	2,323	1,708	616	2,073	439	985	127	1,286	4,363
Architectural, engineering, and related services	5413	2,912	2,444	2	29	19	205	28	19	1	55	109
Computer systems design and related services	5415	18,878	12,529	1,445	915	258	415	133	566	72	389	2,156

TABLE 26

Domestic R&D paid for and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
Scientific research and development services	5417	9,297	4,919	449	287	238	1,043	250	295	31	762	1,023
Research and development in nanotechnology	541713	179	96	9	5	6	17	6	8	*	2	30
Research and development in biotechnology (except nanobiotechnology)	541714	2,916	1,235	211	107	65	424	83	101	16	219	455
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,176	3,572	228	172	167	601	160	185	15	539	536
Research and development in the social sciences and humanities	541720	27	17	* i	3	* i	1	1	*	0	1	2
Other professional, scientific, and technical services	other 54	7,547	4,822	428	478	100	410	28	104	22	81	1,075
Health care services	621-23	D	1,440	D	125	29	189	D	D	13	180	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,300	D	D	D	D	D	D	D	D	D	D
All companies (number of domestic employees)	-	608,058	323,313	70,482	28,058	10,260	36,945	9,732	20,232	3,580	18,775	86,682
Small companies												
10-19 ^a	-	4,009	2,694	67 i	138	33	327	67	59	32	204	388
20-49	-	12,788	8,360	293	374	115	1,154	255	240	91	650	1,256
Medium companies												
50-99	-	13,274	8,292	459	693	191	1,243	332	227	79	607	1,152
100-249	-	24,844	14,628	1,908	1,001	290	2,127	559	544	271	1,225	2,291
Large companies												
250-499	-	26,469	14,396	2,008	1,296	204	2,252	402	693	238	1,219	3,760
500-999	-	29,007	15,335	3,273	1,310	392	1,997	623	928	531	1,258	3,359
1,000-4,999	-	94,615	52,500	12,873	3,213	1,212	5,217	1,533	2,347	663	3,635	11,423
5,000-9,999	-	54,018	30,385	5,402	1,493	796	3,738	917	2,265	299	2,425	6,298
10,000-24,999	-	96,071	48,984	7,928	5,707	1,086	7,878	1,230	4,017	434	3,605	15,202
25,000 or more	-	252,964	127,738	36,271	12,832	5,941	11,013	3,815	8,912	942	3,949	41,551

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 27

Domestic R&D paid for and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)										
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more
All industries	21–23, 31–33, 42–81	608,058	4,009	12,788	13,274	24,844	26,469	29,007	94,615	54,018	96,071	252,964
Manufacturing industries	31–33	326,998	1,145	5,756	7,457	14,232	16,390	15,488	48,864	34,979	68,670	114,017
Food	311	D	1	D	91	D	1,174	r 348	D	D	D	1,612
Beverage and tobacco products	312	660	*	43	r 27	28	23	20	117	285	80	38
Textile, apparel, and leather products	313–16	D	D	9	D	45	22	48	155	241	80	0
Wood products	321	254	1	r 27	r 5	12	3	8	34	67	97	0
Paper	322	1,004	2	4	1	37	21	21	183	129	313	292
Printing and related support activities	323	164	*	3	8	25	32	6	6	i 12	72	i 0
Petroleum and coal products	324	856	1	r 1	18	8	18	77	87	9	636	0
Chemicals	325	113,518	D	3,050	4,063	7,565	8,981	6,712	16,025	D	31,838	26,464
Basic chemicals	3251	D	*	D	D	211	302	195	D	482	422	0
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,413	6	D	D	100	D	111	D	0	D	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	2	D	40	D	23	1	D	D	D	0
Pharmaceuticals and medicines	3254	104,720	D	2,752	3,881	7,061	8,437	6,311	13,698	D	29,653	D
Soap, cleaning compound, and toilet preparations	3256	D	D	38	36	D	61	50	590	i D	386	1,145
Paint, coating, adhesive, and other chemicals	3255, 3259	1,195	D	D	D	D	D	44	D	0	323	D
Plastics and rubber products	326	3,251	D	62	75	191	212	278	1,007	675	D	234
Nonmetallic mineral products	327	1,435	8	r 17	i 25	35	34	119	115	69	1,014	0
Primary metals	331	1,099	*	r 22	r 51	94	36	33	252	132	439	40
Fabricated metal products	332	3,304	63	r 243	426	481	387	371	842	169	321	i 0
Machinery	333	18,246	69	580	747	748	1,083	789	2,693	3,130	5,414	2,994
Agricultural implement	33311	D	20	14	58	44	29	61	207	256	D	D
Semiconductor machinery	333242	5,390	*	11	39	60	42	323	728	1,734	2,452	0
Engine, turbine, and power transmission equipment	3336	D	1	55	r 12	24	204	40	88	246	D	D
Other machinery	other 333	7,987	48	500	638	621	807	365	1,670	894	D	D
Computer and electronic products	334	99,234	295	770	961	2,845	1,994	2,774	14,327	14,273	13,445	47,549
Communications equipment	3342	10,870	36	D	D	D	D	D	2,560	D	0	D
Semiconductor and other electronic components	3344	47,380	D	247	D	1,779	r 1,126	1,097	5,459	D	D	D
Navigational, measuring, electromedical, and control instruments	3345	10,105	D	D	391	536	D	D	2,401	D	D	755
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	3,959	33	134	168	295	223	388	i 350	1,764	0	605
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,170	D	D	49	45	58	197	621	D	0	150
Other measuring and controlling devices	other 3345	3,976	D	D	175	196	D	D	1,430	1,248	D	0
Other computer and electronic products	other 334	30,879	D	D	D	D	D	D	3,907	2,198	i D	D
Electrical equipment, appliances, and components	335	6,657	12	r 393	r 259	339	436	972	2,686	805	307	447

TABLE 27

Domestic R&D paid for and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)										
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more
Transportation equipment	336	46,468	31	86	218	559	1,062	1,619	4,571	2,588	7,682	28,052
Motor vehicles, bodies, trailers, and parts	3361–63	30,722	D	14	72	345	491	548	3,143	1,844	5,786	D
Aerospace products and parts	3364	13,786	25	25	98	148	373	957	1,090	403	1,710	8,956
Aircraft, aircraft engine, and aircraft parts	336411–13	9,303	16 i	D	98	138	D	D	D	D	D	5,549
Guided missile, space vehicle, and related parts	336414–15, 336419	4,483	8 r	D	0	11	D	D	D	D	D	3,407
Military armored vehicle, tank, and tank components	336992	26	0	D	7	D	0	D	D	0	0	0
Other transportation	other 336	1,935	D	D	40	D	199	D	D	341	186	D
Furniture and related products	337	405	0	8	20	41	13	28	64	231	0	0
Miscellaneous	339	23,032	D	D	D	D	859	1,265	D	3,390	4,409	6,295
Medical equipment and supplies	3391	20,112	79	282	329	540	624	1,014	3,457	3,335	4,276	6,176
Other miscellaneous manufacturing	3399	2,921	D	D	D	D	235	250	D	56	132	120
Nonmanufacturing industries	21–23, 42–81	281,060	2,864	7,032	5,818	10,612	10,080	13,519	45,750	19,038	27,401	138,946
Mining, quarrying, oil and gas extraction, and support activities	21	D	* r	45 i	D	62 i	1 r	74 i	212 i	181 i	D	0
Utilities	22	D	55	D	0	D	D	108 i	D	D	D	D
Wholesale trade	42	D	D	262	350	478	114 i	201 i	129 i	D	D	D
Electronic shopping and electronic auctions	454111–12	D	4	13 r	36 r	D	76	114	372	D	D	D
Transportation and warehousing	48–49	D	2 r	0	29	33	42	33	D	D	4,362 i	D
Information	51	181,392	D	1,663	2,279	4,475	5,537	7,758	32,998	D	14,878	102,794
Publishing	511	49,674	D	680	1,095	1,667	1,239	D	10,556	3,765	5,738	22,960
Newspaper, periodical, book, and directory publishers	5111	72	1 r	3	10	1	58	*	0	0	0	0
Software publishers	5112	49,602	D	677	1,085	1,666	1,181	D	10,556	3,765	5,738	22,960
Telecommunications	517	3,614	D	D	46	D	D	D	D	36	D	D
Data processing, hosting, and related services	518	49,270	D	837	D	2,292	3,883	4,598	16,628	1,518 i	D	11,262
Other information	other 51	78,834	12 r	D	D	D	D	D	D	D	D	D
Finance and insurance	52	17,173	D	1,439 r	D	D	516	599	2,625	3,836 i	3,020	D
Real estate and rental and leasing	53	2,398 i	0	16	10	2	49 i	98	D	D	0	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5 i	0	4 i	1 i	* i	0	0	0	0	0	0
Other real estate and rental and leasing	other 53	2,393 i	0	12	9	1	49 i	98	D	D	0	D
Professional, scientific, and technical services	54	38,633	1,979	3,450	2,856	4,663	3,109	3,468	4,342	2,117	4,296	8,353
Architectural, engineering, and related services	5413	2,912	133	386	370	669	336	171	548	169	128	0
Computer systems design and related services	5415	18,878	718	1,378	921	1,689	1,199	2,179	1,897	1,551	2,075 i	5,271
Scientific research and development services	5417	9,297	691	1,495	1,137	1,840	1,004	665	1,100	4	4 i	1,356
Research and development in nanotechnology	541713	179	62	71	45	*	0	1	0	0	0	0
Research and development in biotechnology (except nanobiotechnology)	541714	2,916	343	489	419	538	422	638	1	4	0	62

TABLE 27

Domestic R&D paid for and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)											
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,176	284	935	673	1,281	582	26	1,095	0	4	i	1,294
Research and development in the social sciences and humanities	541720	27	2	*	0	20	*	0	5	0	0		0
Other professional, scientific, and technical services	other 54	7,547	437	r	191	428	466	569	452	796	393	2,089	1,725
Health care services	621–23	D	D	D	D	272	367	707	i	1,197	D	D	D
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,300	D	D	D	D	D	360	D	D	D	D	D

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 28

Domestic R&D paid for and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
All industries	21-23, 31-33, 42-81	608,058	35,918	80,834	491,307
Manufacturing industries	31-33	326,998	26,083	53,647	247,268
Food	311	D	D	1,075	5,222
Beverage and tobacco products	312	660	77	175	408
Textile, apparel, and leather products	313-16	D	D	82	476
Wood products	321	254	17	19	217
Paper	322	1,004	131	224	649
Printing and related support activities	323	164	8	38	118
Petroleum and coal products	324	856	165	359	333
Chemicals	325	113,518	15,913	22,975	74,630
Basic chemicals	3251	D	389	707	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,413	214	420	778
Pesticide, fertilizer, and other agricultural chemicals	3253	D	124	264	D
Pharmaceuticals and medicines	3254	104,720	15,035	20,938	68,747
Soap, cleaning compound, and toilet preparations	3256	D	75	380	D
Paint, coating, adhesive, and other chemicals	3255, 3259	1,195	76	266	852
Plastics and rubber products	326	3,251	216	611	2,423
Nonmetallic mineral products	327	1,435	160	323	952
Primary metals	331	1,099	61	146	893
Fabricated metal products	332	3,304	241	485	2,578
Machinery	333	18,246	1,451	2,637	14,158
Agricultural implement	33311	D	D	222	D
Semiconductor machinery	333242	5,390	670	899	3,821
Engine, turbine, and power transmission equipment	3336	D	D	509	2,194
Other machinery	other 333	7,987	D	1,007	D
Computer and electronic products	334	99,234	3,524	12,481	83,229
Communications equipment	3342	10,870	222	1,100	9,547
Semiconductor and other electronic components	3344	47,380	2,040	4,518	40,822
Navigational, measuring, electromedical, and control instruments	3345	10,105	446	1,835	7,824
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	3,959	151	901	2,907
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,170	106	277	1,788
Other measuring and controlling devices	other 3345	3,976	189	657	3,130
Other computer and electronic products	other 334	30,879	816	5,027	25,036
Electrical equipment, appliances, and components	335	6,657	280	629	5,747
Transportation equipment	336	46,468	2,450	8,446	35,572
Motor vehicles, bodies, trailers, and parts	3361-63	30,722	1,769	4,917	24,035
Aerospace products and parts	3364	13,786	614	3,268	9,904
Aircraft, aircraft engine, and aircraft parts	336411-13	9,303	414	2,150	6,738
Guided missile, space vehicle, and related parts	336414-15, 336419	4,483	200	1,118	3,166
Military armored vehicle, tank, and tank components	336992	26	1	4	20
Other transportation	other 336	1,935	66	257	1,612
Furniture and related products	337	405	23	133	249
Miscellaneous	339	23,032	809	2,808	19,415
Medical equipment and supplies	3391	20,112	597	2,440	17,075
Other miscellaneous manufacturing	3399	2,921	212	368	2,341
Nonmanufacturing industries	21-23, 42-81	281,060	9,835	27,186	244,039
Mining, quarrying, oil and gas extraction, and support activities	21	D	41	236	D
Utilities	22	D	34	48	D
Wholesale trade	42	D	159	279	D

TABLE 28

Domestic R&D paid for and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
Electronic shopping and electronic auctions	454111-12	D	27	D	D
Transportation and warehousing	48-49	D	D	703	D
Information	51	181,392	4,891	11,400	165,101
Publishing	511	49,674	1,727	2,948	44,999
Newspaper, periodical, book, and directory publishers	5111	72	3	3	66
Software publishers	5112	49,602	1,724	2,944	44,934
Telecommunications	517	3,614	234	674	2,707
Data processing, hosting, and related services	518	49,270	1,801	4,072	43,397
Other information	other 51	78,834	1,130	3,706	73,998
Finance and insurance	52	17,173	655	2,936	13,582
Real estate and rental and leasing	53	2,398	i 23	812	1,562
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i 1	i 2	i 2
Other real estate and rental and leasing	other 53	2,393	i 22	810	1,560
Professional, scientific, and technical services	54	38,633	3,316	6,806	28,512
Architectural, engineering, and related services	5413	2,912	211	507	2,194
Computer systems design and related services	5415	18,878	1,842	3,270	13,766
Scientific research and development services	5417	9,297	1,016	2,208	6,073
Research and development in nanotechnology	541713	179	13	62	104
Research and development in biotechnology (except nanobiotechnology)	541714	2,916	408	816	1,691
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,176	595	1,307	4,274
Research and development in the social sciences and humanities	541720	27	*	22	4
Other professional, scientific, and technical services	other 54	7,547	247	822	6,478
Health care services	621-23	D	307	523	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,300	D	D	D
All companies (number of domestic employees)	-	608,058	35,918	80,834	491,307
Small companies					
10-19 ^a	-	4,009	379	986	2,644
20-49	-	12,788	1,028	3,397	8,364
Medium companies					
50-99	-	13,274	1,317	2,878	9,079
100-249	-	24,844	2,464	5,339	17,041
Large companies					
250-499	-	26,469	3,195	4,739	18,535
500-999	-	29,007	1,734	4,819	22,453
1,000-4,999	-	94,615	6,310	14,073	74,231
5,000-9,999	-	54,018	3,265	6,149	44,604
10,000-24,999	-	96,071	6,639	11,716	77,715
25,000 or more	-	252,964	9,587	26,738	216,639

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 29-A

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (A–M): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	
All industries	21–23, 31–33, 42–81	28,450	608,058	2,259	189	i 8,250	545	220,081	8,135	9,037	2,874	881	8,746	7,684	447	2,883	16,785	9,943	3,257	2,219	925	530	597	5,843	43,311	23,381	8,141	442	4,914	376	
Manufacturing industries	31–33	14,310	326,998	1,088	145	i 6,463	351	102,627	3,774	8,048	2,449	166	i 3,650	2,444	275	i 2,419	11,838	9,284	2,161	1,611	663	343	425	3,925	32,673	21,502	6,183	354	3,844	185	i
Food	311	950	D	20	e 17	e 18	e 78	509	78	27	271	i *	e 69	e 66	e 173	i 71	978	i 283	i 572	i 187	28	21	e 4	e 46	62	e 148	479	54	165	4	e
Beverage and tobacco products	312	160	660	21	i D	* e	* e	60	7	1	e *	e 2	i 6	158	* e	* e	1	e 1	e *	e *	e 6	* e	3	i 1	e 30	i 2	e 6	* e	4	* e	
Textile, apparel, and leather products	313–16	260	D	3	D	1	2	94	23	4	* e	* e	25	85	* e	* e	3	* e	* e	2	1	i *	e *	e *	13	15	8	* e	2	i *	
Wood products	321	100	254	5	D	2	1	29	5	*	*	0	6	14	* e	6	1	4	i 11	1	1	e 1	e *	e 1	2	4	52	6	1	e *	e
Paper	322	100	1,004	26	0	1	16	20	* e	1	* e	0	29	85	0	*	23	5	2	8	29	4	14	2	4	10	8	*	1	0	
Printing and related support activities	323	140	164	* e	* e	* i	1	i 9	14	* e	* e	* e	*	2	* e	1	4	i *	1	i 3	5	* e	* e	* e	1	i 3	i 41	i *	e 12	* e	
Petroleum and coal products	324	80	856	* e	D	* e	* e	28	12	* e	* e	0	5	* e	0	* e	20	10	1	7	4	9	* e	* e	* e	* e	* e	6	4	44	
Chemicals	325	2,240	113,518	244	i D	74	i 56	i 25,825	243	6,080	1,993	123	i 508	335	59	101	i 4,975	6,056	182	172	i 194	87	17	2,335	i 23,452	787	274	29	2,716	11	i
Basic chemicals	3251	310	D	8	0	2	8	272	9	58	192	0	3	i 79	* e	1	e 93	16	49	47	11	51	* e	72	66	22	4	5	29	* e	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	1,413	2	e 0	* e	0	65	*	1	i D	0	3	37	0	* e	81	i 8	3	* e	14	32	3	1	i 7	261	10	* e	1	*	
Pesticide, fertilizer, and other agricultural chemicals	3253	70	D	*	* e	2	1	67	D	8	D	0	9	4	* e	4	8	1	13	2	*	*	* e	* e	4	30	D	2	15	1	
Pharmaceuticals and medicines	3254	1,080	104,720	227	i D	69	i 47	i 25,159	219	5,826	1,639	123	i 477	189	58	89	i 4,622	6,008	105	51	20	i 3	14	2,258	i 23,287	428	i 71	21	2,618	9	i
Soap, cleaning compound, and toilet preparations	3256	270	D	1	e 0	1	e *	e 202	1	e 102	* e	0	13	14	* e	7	111	4	7	i 69	i *	e *	e 2	67	9	112	* e	10	* r		
Paint, coating, adhesive, and other chemicals	3255, 3259	340	1,195	7	* e	*	* e	58	D	84	*	*	3	13	0	*	60	19	5	3	i 149	*	*	2	i 21	38	D	* e	44	1	i
Plastics and rubber products	326	790	3,251	17	* e	482	6	202	53	35	7	0	119	58	* e	9	110	96	12	6	44	i 54	1	e 125	280	186	76	6	15	2	r
Nonmetallic mineral products	327	250	1,435	1	e *	e 4	* e	83	36	2	i *	e *	e 5	e 4	i 1	* e	40	1	e 1	e *	e 1	e *	e 4	8	34	14	18	25	5	* e	
Primary metals	331	230	1,099	5	*	17	1	e 16	8	1	i 0	0	8	30	0	1	r 24	47	7	1	e 15	r 1	e 1	i 2	59	33	34	26	4	* e	
Fabricated metal products	332	1,780	3,304	19	e D	45	i 11	323	39	89	i 2	e *	e 70	51	* e	7	133	134	21	67	13	e 13	e 2	e 46	85	141	104	26	79	3	e
Machinery	333	1,990	18,246	63	* e	137	92	4,484	65	169	2	e 1	268	272	2	51	i 1,742	408	799	183	108	61	9	246	726	i 563	598	22	i 160	81	i

TABLE 29-A

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (A–M): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana
Agricultural implement	33311	160	D	3	0	1	1	144	1 e	1 i	0	*	1	35	0	2	438	7	740	98	1	14	1	1 i	4	26	124	* e	1 e	*
Semiconductor machinery	333242	50	5,390	0	0	82 i	0	3,497 i	0	*	0	0	12	0	0	31 i	0	* e	0	0	0	0	0	0	414 i	0	14 i	0	0	79 i
Engine, turbine, and power transmission equipment	3336	110	D	1	0	21	1	249	8	11	0	0	47	36	0	*	983	142	3	5	2	20	*	9	13	15	26	4	20	*
Other machinery	other 333	1,680	7,987	59	* e	33	90	594	56	156	2 e	1	209	202	2	18	320	260	57	80	105	27	8	236	295	523	434	17 i	138	2 e
Computer and electronic products	334	2,300	99,234	152 i	D	4,414	35	53,114	2,326	276	154 i	33	1,280	549	36	2,117	1,113	106	122 i	690	36	20	64	339	3,994	391	903	14	86	18
Communications equipment	3342	330	10,870	99 i	D	103	8	5,056	236	36	*	D	319	252	17	13	574	33	14	20	10	8	1 i	224	363	104	110	6	38	1 e
Semiconductor and other electronic components	3344	490	47,380	37	0	4,169	16	22,183	556	108	7	3	172	30	3	1,944	207	27 e	66 i	13 e	19	2 e	38	33 e	1,577	162	167	4	15	7
Navigational, measuring, electromedical, and control instruments	3345	990	10,105	7	* e	62	5	3,290	954	120 i	143 i	1	448 i	106	9	4	86	34	32	593	4 i	6	20	47	856	88	260	1 e	24	6
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	170	3,959	* e	0	7	*	1,995	113	39	74 i	*	369 i	23	*	1	26	4	0	*	1	*	2	*	467	5	45	*	* e	*
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	2,170	1	0	6	*	140	580	1 i	0	1	35	22	* e	*	1	2	11	569	* e	* e	18	6	35	1 i	41	* e	8	*
Other measuring and controlling devices	other 3345	730	3,976	5	* e	49 i	5	1,155	261	80 i	69	0	44	61	8	3	59	28	21 i	24	4 i	5	1 e	41	354	82	173	1 e	16 i	6
Other computer and electronic products	other 334	500	30,879	10	0	80	5	22,585	580	13	3	D	342	162	7	157 i	247	12	9	64	4	5	5	34	1,198	37	366	2 e	9	4
Electrical equipment, appliances, and components	335	510	6,657	20	D	66	5 e	1,788	19	105	3 e	1	41	94	*	20	387	45	38	18 e	30	9 e	1	21	694	489	84	7	78	9 r
Transportation equipment	336	1,040	46,468	396	D	1,039	41	8,933	555	1,132	6	7	880	365 i	2	10 i	947	1,612	363	254	135	58	32	555	830	17,174	656	122	401	4
Motor vehicles, bodies, trailers, and parts	3361–63	550	30,722	68	* e	329	7	6,038	43	10	* e	0	135	71	0	7 i	460	1,438	16	4	127	* e	1	D	176	16,934	164	32 i	17	1

TABLE 29-A

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (A-M): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana
Aerospace products and parts	3364	250	13,786	255	1	696	29	2,767	482	1,107	6	7	652	100	2	3 e	445	160	342	246	5	50	25	486	643	144	155	88	378	3
Aircraft, aircraft engine, and aircraft parts	336411-13	220	9,303	174	1	D	25	2,004	307	343	5	D	464	84	1	3 e	123	150	4	229	2	50	2	435	211	108	73	41	D	3
Guided missile, space vehicle, and related parts	336414-15, 336419	40	4,483	82	0	D	4	763	175	763	*	D	187	17	*	*	321	10	338	17	3	0	24	52	431	35	82	46	D	0
Military armored vehicle, tank, and tank components	336992	10	26	0	0	1 i	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D	1 i	0	D	0	0	0	0
Other transportation	other 336	230	1,935	73	D	13	4	121	29	15 i	* e	0	94	194 i	1 e	1 e	43	13	5	3	2 e	8 e	D	D	12	D	337	2 e	6	* e
Furniture and related products	337	210	405	3	* e	2	* e	56	27	* e	* e	0	* e	21	* e	* e	6	23	1 i	* e	3	* e	* i	* e	6 i	131	19	1 i	* e	* e
Miscellaneous	339	1,280	23,032	93	D	162	5 e	7,055	264	127	12	1 i	331	255	1	25	1,333 i	453	28	13	9 e	4 e	270	198	2,401	1,409 i	2,824	10	110	7
Medical equipment and supplies	3391	790	20,112	86	D	122	2 e	6,794	236	107	11	1 i	295	193	1	2 e	1,236 i	444	7	4 e	4 e	2 e	268	195	2,268	1,305 i	2,787	6	103 i	4
Other miscellaneous manufacturing	3399	500	2,921	7	D	40	3	261	28	21	* e	0	36	61	* e	23	97	8	21	9	5	2 e	2	3 e	132	104	37	4	7	3
Nonmanufacturing industries	21-23, 42-81	14,150	281,060	1,170	44 e	1,788	194	117,455	4,361	988	425	715	5,096	5,240	172	464	4,947	659	1,096	607	261	187	172	1,918	10,639	1,880	1,958	88	1,070	191
Mining, quarrying, oil and gas extraction, and support activities	21	140 i	D	* e	2	42 i	D	D	8 i	* e	* e	0	* e	21 i	* e	D	2	17 i	* e	6 i	* e	1	* e	* e	*	* e	1 r	*	* e	5
Utilities	22	50	D	D	0	0	D	D	D	0	*	D	D	D	*	0	D	*	2	1	*	D	4 i	1	0	D	D	D	*	0
Wholesale trade	42	1,560	D	D	1 e	42 i	D	235	21	41 i	2 e	D	55 e	78 i	2 e	7 i	156 i	26	43 i	16	10 e	19 i	2 e	12 e	54 i	78 i	48 i	4 e	20 e	D
Electronic shopping and electronic auctions	454111-12	120	D	1 i	D	D	D	7,239 i	77 i	6 i	1 i	D	28 i	29 i	1	2 i	39	11 i	1	1	D	1	2	3 i	D	D	35 i	* e	4	D
Transportation and warehousing	48-49	60	D	1	D	9	11	4,619 i	36	7	1	D	231	11	29	D	108	2	3	4	1	1	*	310	14	D	4	15	11	D
Information	51	3,450	181,392	925	24 e	883	99	83,117	3,106	589	56	575	2,906	3,271	94	345	2,245	384	876	374	139	66	97	828	6,588	1,044	924	32	303	88
Publishing	511	1,430	49,674	91	7	218	42	13,337	1,165 i	130	25 e	61	837	971	25	269 i	716	123	D	70	29	27	34	268	3,103	591	404	D	98	30
Newspaper, periodical, book, and directory publishers	5111	40	72	*	* e	*	* e	14	1	1	* e	* i	3	1	*	1	2 i	1 i	* e	1	* e	*	*	1	12	1	1	* e	* e	1
Software publishers	5112	1,400	49,602	91	7	217	42	13,323	1,164 i	128	25 e	60	834	970	25	268 i	714	122	D	69	29	27	34	266	3,091	590	403	D	98	29
Telecommunications	517	260	3,614	2	1 e	43	1 e	196	160	D	* e	D	657	54	D	2	44	4	2	103	2	5	D	12	46	5	7	1 e	35	D

TABLE 29-A

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (A–M): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana	
Data processing, hosting, and related services	518	1,490	49,270	D	D	334	45	25,850	974	116	25	190	980	1,286	26	45	812	180	131	D	90	27	47	387	2,122	295	417	24	111	44	
Other information	other 51	280	78,834	D	D	288	11	43,734	807	D	6	D	432	960	D	29	673	76	D	D	19	7	D	161	1,317	152	96	D	59	D	
Finance and insurance	52	530	17,173	D	D	101	D	5,527	143	119	319	D	713	340	D	D	1,152	35	39	37	D	D	35	114	233	103	236	D	61	D	
Real estate and rental and leasing	53	70	2,398	D	* e	D	*	1,506	D	* e	* e	* i	D	D	* i	1 i	D	* e	9	* i	D	D	* e	5 i	D	D	D	D	D	* e	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	5	0	0	0	0	* i	D	0	0	0	0	0	0	0	0	0	D	0	D	0	0	2 i	0	0	0	0	0	0	
Other real estate and rental and leasing	other 53	50	2,393	D	* e	D	*	1,506	D	* e	* e	* i	D	D	* i	1 i	D	* e	D	* i	D	D	* e	4 i	D	D	D	D	D	* e	
Professional, scientific, and technical services	54	6,420	38,633	174	14 e	500	46	12,846	865	210	41	106	785	1,394	34	85 i	1,019	145	77	132	47	63	25	599	2,954	428	627	12 e	568	90	
Architectural, engineering, and related services	5413	1,240	2,912	20	2 e	54	16	503	114	70	4	15	112	63	13	26	89	41	18	25	7 i	21	9	70	90	92	49	3	95	14	
Computer systems design and related services	5415	3,150	18,878	106	8 e	231	26	5,951	439 i	57	31	33 e	338	461	13	46 i	376	69	33	95	32	22 e	10	272 e	1,179	207	477	6 e	440	11	
Scientific research and development services	5417	1,070	9,297	43	3 e	191	2	3,749	128	42	3 i	4	186	31	4	2	95	14	8	8	2	11	2	169	1,349	86	45	1	18	63	
Research and development in nanotechnology	541713	60	179	1	* e	* e	* e	31	*	*	* e	* e	*	*	* e	* e	2	* e	* e	* e	* e	* e	* e	* e	*	31	5	5	* e	* e	* e
Research and development in biotechnology (except nanobiotechnology)	541714	280	2,916	* e	* e	137 i	* e	883	2 i	7	*	2	29	17	* e	* e	30	4	7	1	*	7	1	98	471	5	18 i	* e	3	*	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	730	6,176	42	3 e	54	2	2,835	126	35	3 i	2	157	14	4	2	63	10	1	7	2	4	1 e	71 r	846	76	21	1	15	63	

TABLE 29-A

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (A-M): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Alabama	Alaska	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	District of Columbia	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri	Montana
Research and development in the social sciences and humanities	541720	10	27	0	0	0	0	1 i	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0
Other professional, scientific, and technical services	other 54	980	7,547	5 e	1 e	25	3 e	2,643	183	42	3 e	54	150	840	3	11	458	21	18	4 e	6 e	8 e	4	87	337	42	56	2 e	14 e	2
Health care services	621-23	270	D	5 e	* e	127 i	7	1,705	36	8	1 e	D	53 i	17	1	2	17	5 e	1 e	6	9 i	3 e	3 i	8	164	14	7	D	4 e	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,540	3300	D	D	D	D	D	D	8	4	D	D	D	D	D	D	35	45	30	D	D	4	38	D	D	D	D	D	D
All companies (number of domestic employees)	-	28,450	608,058	2,259	189 i	8,250	545	220,081	8,135	9,037	2,874	881	8,746	7,684	447	2,883	16,785	9,943	3,257	2,219	925	530	597	5,843	43,311	23,381	8,141	442	4,914	376
Small companies																														
10-19 ^b	-	5,390	4,009	28 e	D	38 e	9 e	1,038	88	65 i	10 e	29 e	112 e	92 e	4 e	8 e	143 e	44 e	12 e	13 e	11 e	17 e	5 e	111 e	379	90 e	90	6 e	34 e	7
20-49	-	7,760	12,788	81 e	8 e	142 e	24 e	3,243	239	164 e	27 e	30 e	324 e	218 e	21	37	390 e	153 e	102	69 e	56 e	57 e	15 e	451	1,525	289 e	211	43	106 e	32
Medium companies																														
50-99	-	4,880	13,274	51 e	6 e	146	32	3,698	183	76 e	21 e	31 e	247	172 e	9	29	394	123 e	62 e	60 e	51 e	42 e	23	317	2,388	380	207	13 e	97 e	12
100-249	-	5,010	24,844	120	8 e	177	61	8,850	405	238	123	67	443	383	18	99	748	241	77	120	83	59	23	353	3,755	630	351	33	144	17
Large companies																														
250-499	-	2,090	26,469	246	18 e	375	34	8,620	476	474 i	15	67	638	461	13	40	602	158	118	167	50	44 e	21	338	4,254	581	307	29 e	235	47
500-999	-	1,370	29,007	49	6 e	577	29	10,421	439	116	16	20	669	432	20	243 i	795	229	137	57	45	31	9	404	3,630	502	505	72	108	16
1,000-4,999	-	1,400	94,615	426	6	971	168	33,726	2,242	966	1,549	167	1,289	1,199	24	197	2,207	821	362	290	367	138	88	1,890 i	11,019	2,048	1,579	91	531	130
5,000-9,999	-	270	54,018	68	D	801	27	20,693	851	810	73	30	530	766	42	1,823	1,232	687	59	839	41	35	264	245	2,577	1,424	764	9	304	7
10,000-24,999	-	210	96,071	245 i	D	349	31 i	37,373	1,362 i	838	520 i	103 i	1,656	1,377	227 i	298 i	1,385	6,234	598 i	274	139	41	25	419	6,223 i	5,497 i	1,146	67	1,573	84 i
25,000 or more	-	140	252,964	945	6	4,675	130	92,419	1,850	5,292	520	337	2,837	2,584	69	110	8,889	1,253	1,731	329	82	66	123	1,315	7,562	11,939	2,981	78	1,782	25

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; e = more than 50% of value is modeled—see "Technical Notes"; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For a given estimate in this table, if the conditions are satisfied for the "i," "r," and "e" flags, the e flag is assigned because the imputation rate and relative standard error may be found in the corresponding tables of imputation rates and relative standard errors (available from the Survey Manager upon request).

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 29-B

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (N-Z): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Undistributed ^b	
All industries	21-23, 31-33, 42-81	28,450	608,058	1,395	1,471	1,449	20,144	1,514	29,915	11,503	454	10,501	1,820	12,426	17,151	594	2,319	201	2,147	26,151	3,748	614	6,451	55,718	444	6,470	78	703	
Manufacturing industries	31-33	14,310	326,998	359	833	839	14,062	1,254	10,564	6,789	305	8,339	608	10,085	12,445	482	1,162	129	1,097	13,505	1,486	487	1,878	6,322	377	4,321	31	349	
Food	311	950	D	74	8 e	17	266	4 e	360	195	9 e	190	75	54	125	71 i	32	7 e	69	402	27	7 e	64	76 e	1 e	172	1 e	D	
Beverage and tobacco products	312	160	660	* e	* e	* e	1 e	* e	20	78	* e	2	1	2 e	4	* e	* e	* e	1 e	63	5 r	1 e	109	50	* e	6	* e	D	
Textile, apparel, and leather products	313-16	260	D	* e	* e	7	18	* e	25	60	* e	94	2	15	2 i	4	66	* e	1	5	2	4	1 e	16	* e	10	*	D	
Wood products	321	100	254	* e	* e	* e	1	*	3	12	8	4	*	8	5	*	5	* e	5	18	1	* e	3	12	1	10	* e	D	
Paper	322	100	1,004	1	*	* e	22	* e	18	33	*	23	2	* e	39	3	85	* e	9	26	* e	* e	112	24	* e	316	0	2	
Printing and related support activities	323	140	164	* e	* e	* e	2	* e	6	14 i	* e	* i	* e	* i	7	* e	1 i	* e	9	5	1 i	* e	* e	*	4	8 i	* e	8	
Petroleum and coal products	324	80	856	* e	* e	* e	270	* e	* e	5	0	6	44	5	7	* e	* e	* e	* e	356	D	0	1	*	* e	2	0	D	
Chemicals	325	2,240	113,518	99 i	27 i	74	11,301	8 e	5,458	2,360	19	2,499	15	98	8,912	45	248 i	24	322	1,076	359	47	407 i	2,064	263 i	695	9 e	D	
Basic chemicals	3251	310	D	32	3	2	237 i	1 e	90	43	1 e	230	9	5	195	* e	13	22	260	191	4	0	109	26	3	66	7 e	D	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	1,413	* e	1	3 r	4	0	40 i	28	0	283	*	7	121	2	13	0	15	305	* e	* e	2	1	32	10	0	D	
Pesticide, fertilizer, and other agricultural chemicals	3253	70	D	D	* e	* e	D	* e	*	293	*	D	*	2	9	0	*	1	1 i	33	*	* e	*	3	* e	D	0	D	
Pharmaceuticals and medicines	3254	1,080	104,720	61 i	18 i	61	10,503	6 e	5,074	1,933	18	597	4	71	8,402	41	202 i	D	39	498	348	43	290 i	2,030	227 i	484	1	D	
Soap, cleaning compound, and toilet preparations	3256	270	D	2	1 r	* e	350 i	* e	243	33	* e	1,117	* e	1 e	13	1 i	2 i	* e	5	35	2 e	4	* e	3 i	* e	105	1 i	D	
Paint, coating, adhesive, and other chemicals	3255, 3259	340	1,195	D	3	8	D	* e	10	28	* e	D	2	11	172	* e	18	D	2	14	5	* e	5	2 i	* e	D	* e	D	
Plastics and rubber products	326	790	3,251	11	1 e	12	18	2	160 i	124	* e	364	52	2 e	131	7	58	3	28	128	4	* e	19	7	3	83	4	30	
Nonmetallic mineral products	327	250	1,435	2 i	9	1 i	10	* e	931	64	* e	57	1 e	4	20	* e	4	* e	4	11	1 i	* e	1 e	4	* e	11	* e	11	
Primary metals	331	230	1,099	9	* e	6	2	* e	12	10	* e	72	2	39	136	1	4	2	3 i	388	5	1 i	2	1 e	2	48	* e	12	
Fabricated metal products	332	1,780	3,304	22	11	65	327	26	75	56	2 e	243	35	23	110	26 i	55	4 e	29	314 i	23	1 e	26 i	34	7 i	224	1 i	D	
Machinery	333	1,990	18,246	93	51	65	114	8	540	670	224	474	243	737	298	36	171	35	99 i	1,730	57	12	144	136	4 e	931	9	50	
Agricultural implement	33311	160	D	71	* e	*	7	* e	22	26	115	14	39	2 e	44	0	5	14	6	11	5	0	*	9	0	111	* e	D	
Semiconductor machinery	333242	50	5,390	0	6 i	1	33 i	0	103 i	0	0	0	0	588	13 i	0	0	0	0	516 i	0	* i	0	0	0	0	0	0	0
Engine, turbine, and power transmission equipment	3336	110	D	*	4	2	1	0	276	102	1	18	11	2 e	15	1	107	4	6 r	125	4	0	100	9	* e	315	*	D	
Other machinery	other 333	1,680	7,987	22	41	62	73	8	139	542	108	443	193	146	226	35	60 i	17 i	87 i	1,078	47	12	44	118	4 e	505	9	46	
Computer and electronic products	334	2,300	99,234	31	90	438	807	1,098	1,567	2,222	2	596	45	8,406	1,046	93	122	43	170	6,981	343	192	302	1,930	4 e	303	6	D	
Communications equipment	3342	330	10,870	7	23	82	354	9	250	856	* e	91	17	56	176	2	25	2	53	697	67	1	169	237	*	30	D	D	
Semiconductor and other electronic components	3344	490	47,380	14	18	111	170	1,082	414	945 i	1	159 i	5	7,848	459	43	47	39	58 e	3,601	100	160	37	431	2 e	63 e	2	4	

TABLE 29-B

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (N-Z): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Undistributed ^b	
Navigational, measuring, electromedical, and control instruments	3345	990	10,105	8	17	189	229	2	402	116	1 e	291	13	208	299	5	38	*	44	367	129	26	58	264	* e	185	1	7	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	170	3,959	4	9	43	25	*	251 i	7	*	54	2	4	134	4	5	*	31	31	91	* e	16 i	64	*	10	1	0	
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	110	2,170	*	1	127	76	* e	24	26	0	37	2	109	28	* e	0	* e	3	34	8	6 i	17	60	0	133	0	1	
Other measuring and controlling devices	other 3345	730	3,976	4	7	19	128	2	127	83	1 e	199 i	10	95	137	1 e	33	*	11	302	30	20	25	139	* e	42	1	6	
Other computer and electronic products	other 334	500 r	30,879	2 i	31	55 i	54	5	501	305	1 e	56	10 i	294	111	43	12	1 i	15	2,317	46	6	38	998	1	26	D	*	
Electrical equipment, appliances, and components	335	510	6,657	2 e	3 e	35	271	1 e	220	203	* e	176	16	108	342	25	84	1 e	54	189	4 e	4 e	32	167	1 e	643	* e	D	
Transportation equipment	336	1,040	46,468	12	145	19	144	103	370	354 i	21	3,205	69	342	662	3	210	8	89	1,443	182	209	609 i	1,361	87	285	* e	D	
Motor vehicles, bodies, trailers, and parts	3361-63	550	30,722	5	130	2	8	1	115	229 i	3	2,605	7	289	221	* e	81	3	61	498	37	* e	18	142	1 e	103	* e	D	
Aerospace products and parts	3364	250	13,786	6	15	16	119	102	245	111	17	588	62	52	233	D	110	2	15	864	136	209	264	1,208	86	40	* e	D	
Aircraft, aircraft engine, and aircraft parts	336411-13	220	9,303	6	15	16	90	5	203	42	*	525	49	52	218	*	101	2	14	722	134	184	229	1,175	83	37	* e	D	
Guided missile, space vehicle, and related parts	336414-15, 336419	40	4,483	*	*	1	30	97	42	69	17	63	13	*	15	D	8	0	1	142	2	24	35	33	3	4	0	D	
Military armored vehicle, tank, and tank components	336992	10	26	0	0	0	0	0	0	2	0	* i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	D
Other transportation	other 336	230	1,935	1 i	* e	* e	17	0	11	12	1	12	1 e	2 e	208	D	19	3	13	80	9	0	327 i	11 e	* e	141	0	D	
Furniture and related products	337	210	405	* e	* e	* e	2	* e	4	13	* e	10	* r	5	2	3	* e	* e	12	2 i	25	6	1 i	1	* e	9	* e	12	
Miscellaneous	339	1,280	23,032	4	488	100	487	2 e	797 i	317	18	326	6	235	597	165	16	3	193	367	D	4	46 i	440	1 e	565	* e	D	
Medical equipment and supplies	3391	790	20,112	1 e	2 e	86	435	1 e	299 i	294	17	301	5	46	560	12	14	1 e	180	295	272	* e	39 i	237	1	527	* e	D	
Other miscellaneous manufacturing	3399	500	2,921	3	486	14	52	1 e	498 i	23	* e	25	2 e	190	37	153	2 e	2 r	13	72	D	4	6	203	* e	38	* e	10	
Nonmanufacturing industries	21-23, 42-81	14,150	281,060	1,036	638	610	6,083	260	19,351	4,714	149	2,162	1,212	2,341	4,705	112	1,157	72	1,050	12,646	2,262	127	4,573	49,396	67	2,149	48	353	
Mining, quarrying, oil and gas extraction, and support activities	21	140 i	D	1 i	15 i	D	* e	8 i	* e	* e	7 i	* e	105 i	* e	37 i	D	* e	1 i	* e	511	5	D	* e	D	2 i	39 i	D	3	
Utilities	22	50	D	D	0	D	3	0	D	D	D	D	0	*	3	0	0	2	0	D	* i	0	D	D	4	D	4	*	
Wholesale trade	42	1,560	D	7 e	6 e	D	106 i	2 e	67 e	48 i	10 i	77 i	13	17	46 e	D	18	6	36 i	107 e	76 i	D	18 e	D	2 e	24 e	D	D	
Electronic shopping and electronic auctions	454111-12	120	D	6	D	D	172 i	1 i	469 i	14 i	D	53 i	1 i	D	48 i	D	10 i	1 i	5 i	D	52	D	D	D	D	40 i	D	2	
Transportation and warehousing	48-49	60	D	4	5	D	33	*	370 i	19	D	34	1	17	385 i	D	1	*	116	574	5	D	8	1,686	D	10	1	D	

TABLE 29-B

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (N-Z): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Undistributed ^b	
Information	51	3,450	181,392	794	391	386	3,157	146	12,396	2,684	88	994	1,007	1,810	2,205	46	985	21	658	6,238	1,612	64	2,344	31,671	18	1,580	24	95	
Publishing	511	1,430	49,674	40	88	154	531	19	1,215	800	79	299	D	729	745	16	D	D	132	1,984	327	28	583	18,887	D	141	8	D	
Newspaper, periodical, book, and directory publishers	5111	40	72	* e	*	1	3	*	4	2	* e	2	*	2	3	1	* e	* e	1 i	4 i	1	*	*	1	* e	3	* e	1	
Software publishers	5112	1,400	49,602	40	87	154	528	18	1,211	799	79	298	D	727	741	15	D	D	132	1,981	327	28	583	18,886	D	137	8	D	
Telecommunications	517	260	3,614	D	3	19	1,397	2	57	95	1 e	8	D	5	10	*	2	D	D	128	5	D	78	388	*	17	1 e	D	
Data processing, hosting, and related services	518	1,490	49,270	514	73	171	603	16	2,564	1,124	D	406	156	460	569	18	271	12	107	1,974	883	23	693	2,403	10	1,352	D	D	
Other information	other 51	280	78,834	D	227	42	627	109	8,559	665	D	281	D	616	881	12	D	D	D	2,152	396	D	990	9,994	D	70	D	D	
Finance and insurance	52	530	17,173	38	49	D	1,046	D	2,907	725	D	437	32	30	272	D	42	D	30 e	1,258	69	D	149 i	D	D	83	D	D	
Real estate and rental and leasing	53	70	2,398	i D	D	D	* e	1 i	213	D	* e	D	* e	D	4 i	* e	* e	* e	1 i	D	3 r	* e	D	D	* e	D	* e	D	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	20	5	i 0	0	0	0	0	0	0	0	0	0	0	* i	0	0	0	0	0	0	0	0	0	0	0	0	0	* i
Other real estate and rental and leasing	other 53	50	2,393	i D	D	D	* e	1 i	213	D	* e	D	* e	D	3 i	* e	* e	* e	1 i	D	3 r	* e	D	D	* e	D	* e	D	
Professional, scientific, and technical services	54	6,420	38,633	126	45	177	1,473	i 90	2,825	1,097	36	462	37 e	225	1,649	29	84	26	140	2,706	389	50	1,341	1,293	33	305	15	91	
Architectural, engineering, and related services	5413	1,240	2,912	9	13	20	44	8	81	90	5	49	7	74	112	5	15	10	38	247	27	5	175	108	19	73	2	41	
Computer systems design and related services	5415	3,150	18,878	18 e	23	56 i	396	19	2,272	765	23	196	19 e	90	244	17	46	10	52	1,897	150	43	723 e	667	11	136 i	4	31	
Scientific research and development services	5417	1,070	9,297	83	2	96	232	60	150	156	7	157	5	41	1,044	4	6	5	16	180	96	1 i	266	364	1 e	56	* i	8	
Research and development in nanotechnology	541713	60	179	* e	* e	*	* e	9	13	1	* e	16	* e	2	6 i	* e	* e	0	* e	33	3	*	3	15	* e	* e	0	*	
Research and development in biotechnology (except nanobiotechnology)	541714	280	2,916	82	* e	90	25	8	52	47	*	9	1	1	642	1	3	5	1	18	2 i	* e	26	155	* e	26	0	1	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	730	6,176	1 e	2	6	183	43	85	109	7	132	3	38	397	2	2	1 i	15	129	91	1 i	236	194	1 e	30	* i	6	
Research and development in the social sciences and humanities	541720	10	27	0	0	0	24	0	0	0	0	0	0	0	0	* i	0	0	0	0	0	0	1 i	0	0	0	0	0	
Other professional, scientific, and technical services	other 54	980	7,547	17	6 e	5	801 i	2 e	322	86	1 e	59	5 e	20	250	3	18	1	34	381	117	2	177	155	2 e	40	8	11	
Health care services	621-23	270	D	12	D	2	35	3	42	13	* e	14	2 e	14	25	10	3 e	* e	17	291	23	D	31	D	1 e	4 e	1	D	

TABLE 29-B

Companies with domestic R&D paid for and performed by the company, by industry, company size, and state (N-Z): 2022

(Millions of U.S. dollars and number of companies)

Industry and company size	NAICS code	Companies, U.S. total ^a (number)	United States	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	West Virginia	Wisconsin	Wyoming	Undistributed ^b
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	1,540	3,300	D	D	D	57	D	D	D	D	D	15	D	31	D	14	D	46	D	31	D	D	D	D	D	D	D
All companies (number of domestic employees)	-	28,450	608,058	1,395	1,471	1,449	20,144	1,514	29,915	11,503	454	10,501	1,820	12,426	17,151	594	2,319	201	2,147	26,151	3,748	614	6,451	55,718	444	6,470	78	703
Small companies																												
10-19 ^c	-	5,390	4,009	8 e	22	23	137 e	16	182 e	96 i	4 e	83 e	12 e	39 i	180	18	30 e	9	32 e	258 e	34 e	2 e	139 e	134	3 e	43 e	2 e	D
20-49	-	7,760	12,788	32 e	41 e	52	432	39	736 e	251	22	336 e	52 e	150	436	33	64 e	15 e	97 e	672 e	154	11 e	362 e	478	10 e	189 e	13 e	53
Medium companies																												
50-99	-	4,880	13,274	25 e	31	49	279	26	453	359	11	363	38 e	127	545	19	71 i	17	73 e	673	134	17	298 e	478	11 e	205	4 e	96
100-249	-	5,010	24,844	116	60	175	612	27	774	467	17	408	45	250	842	41 i	66	20 e	119 e	1,024	321	19	286 e	964	15	405	10	133
Large companies																												
250-499	-	2,090	26,469	150	69	62	381	64	992	561	18	374	39 e	263	968	31	98	18	161	1,243	384	210	461	1,067	23	286	5	117
500-999	-	1,370	29,007	72	75	196	1,274	119	1,451	600	14	414	56	263	918	27	104	20	129	1,458	604	6	398	598	11	488	4	135
1,000-4,999	-	1,400	94,615	295	721	443	2,385	23 i	5,468	2,684	155	1,630	152	763	3,043	258	401	73	250	4,025	925	152	919	4,212	107	954	21	65
5,000-9,999	-	270	54,018	133	17	89	1,296	8	4,792	1,444	14	616	344	948	1,005	6	284	5	202	2,745	191	95	403	3,346	2	1,008	10	D
10,000-24,999	-	210	96,071	43	61	109	5,488	4	4,264	1,307	51	1,062	147	799	2,715 i	39	274 i	10	298	6,037	342	12	393 i	1,870	174 i	2,304	1	D
25,000 or more	-	140	252,964	520	374	252	7,860 i	1,189	10,803	3,734	147	5,215	934	8,823	6,500	122 i	926	12	787	8,016	658	89	2,792	42,572	89	588	8	27

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; e = more than 50% of value is modeled—see "Technical Notes"; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2019, these company count estimates reflect a change in rounding methodology.

^b Includes data reported that were not allocated to a specific state by multi-establishment companies. For single-establishment companies, data reported were allocated to the state in the address used to mail the survey form.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For a given estimate in this table, if the conditions are satisfied for the "i," "r," and "e" flags, the e flag is assigned because the imputation rate and relative standard error may be found in the corresponding tables of imputation rates and relative standard errors (available from the Survey Manager upon request).

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 30

Domestic R&D paid for and performed by the company, by industry, company size, and domestic R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size						
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more	
All industries	21–23, 31–33, 42–81	608,058	5,382	30,478	49,030	29,517	493,651	
Manufacturing industries	31–33	326,998	2,764	13,182	25,506	19,039	266,507	
Food	311	D	D	835	1,886	r D	3,186	
Beverage and tobacco products	312	660	39	146	79	239	157	
Textile, apparel, and leather products	313–16	D	D	133	299	150	0	
Wood products	321	254	16	74	164	0	0	
Paper	322	1,004	12	103	178	159	552	
Printing and related support activities	323	164	25	59	80	i 0	0	
Petroleum and coal products	324	856	10	D	176	D	D	
Chemicals	325	113,518	373	2,348	8,882	7,407	94,508	
Basic chemicals	3251	D	D	292	877	D	D	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,413	D	197	284	0	D	
Pesticide, fertilizer, and other agricultural chemicals	3253	D	13	D	163	0	D	
Pharmaceuticals and medicines	3254	104,720	D	1,355	7,202	D	89,275	
Soap, cleaning compound, and toilet preparations	3256	D	66	204	D	76	i 2,146	
Paint, coating, adhesive, and other chemicals	3255, 3259	1,195	D	D	D	98	D	
Plastics and rubber products	326	3,251	150	662	930	415	1,094	
Nonmetallic mineral products	327	1,435	69	115	161	77	1,014	
Primary metals	331	1,099	57	193	311	128	410	
Fabricated metal products	332	3,304	D	1,306	612	D	528	i
Machinery	333	18,246	387	1,992	2,107	1,474	12,286	
Agricultural implement	33311	D	D	141	166	D	D	
Semiconductor machinery	333242	5,390	6	31	145	317	4,892	
Engine, turbine, and power transmission equipment	3336	D	D	123	138	D	2,396	
Other machinery	other 333	7,987	D	1,697	1,658	D	D	
Computer and electronic products	334	99,234	457	1,800	4,309	2,930	89,738	
Communications equipment	3342	10,870	D	D	D	D	D	
Semiconductor and other electronic components	3344	47,380	D	D	2,142	r D	43,576	
Navigational, measuring, electromedical, and control instruments	3345	10,105	D	833	1,273	D	7,095	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	3,959	14	291	394	349	2,911	
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,170	D	D	214	1	1,847	
Other measuring and controlling devices	other 3345	3,976	D	D	665	D	2,337	
Other computer and electronic products	other 334	30,879	D	D	D	407	D	

TABLE 30

Domestic R&D paid for and performed by the company, by industry, company size, and domestic R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size					
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more
Electrical equipment, appliances, and components	335	6,657	58	880	1,082	1,032	3,605
Transportation equipment	336	46,468	193	1,002	1,866	2,009	41,400
Motor vehicles, bodies, trailers, and parts	3361–63	30,722	101	499	1,081	1,106	27,936
Aerospace products and parts	3364	13,786	D	247	626	681	D
Aircraft, aircraft engine, and aircraft parts	336411–13	9,303	D	217	549	D	8,033
Guided missile, space vehicle, and related parts	336414–15, 336419	4,483	D	29	78	D	D
Military armored vehicle, tank, and tank components	336992	26	D	14	D	0	0
Other transportation	other 336	1,935	D	242	D	221	D
Furniture and related products	337	405	38	115	186	65	0
Miscellaneous	339	23,032	237	D	2,200	D	D
Medical equipment and supplies	3391	20,112	114	948	1,628	1,514	15,908
Other miscellaneous manufacturing	3399	2,921	123	D	573	D	D
Nonmanufacturing industries	21–23, 42–81	281,060	2,618	17,295	23,524	10,478	227,144
Mining, quarrying, oil and gas extraction, and support activities	21	D	17	306	336	D	D
Utilities	22	D	3	D	D	D	231
Wholesale trade	42	D	344	1,243	D	0	0
Electronic shopping and electronic auctions	454111–12	D	D	88	D	D	D
Transportation and warehousing	48–49	D	D	70	393	0	D
Information	51	181,392	424	5,848	11,208	5,382	158,530
Publishing	511	49,674	D	2,332	3,041	1,093	D
Newspaper, periodical, book, and directory publishers	5111	72	10	6	55	0	0
Software publishers	5112	49,602	D	2,325	2,985	1,093	D
Telecommunications	517	3,614	D	139	D	85	2,803
Data processing, hosting, and related services	518	49,270	106	3,079	6,930	3,767	35,389
Other information	other 51	78,834	53	298	D	438	D
Finance and insurance	52	17,173	9	D	1,155	702	D
Real estate and rental and leasing	53	2,398	D	32	D	0	2,145
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	D	0	0	0	0
Other real estate and rental and leasing	other 53	2,393	D	32	D	0	2,145
Professional, scientific, and technical services	54	38,633	1,352	6,782	8,429	2,908	19,161
Architectural, engineering, and related services	5413	2,912	187	1,340	1,185	200	0
Computer systems design and related services	5415	18,878	647	2,763	3,529	1,266	10,672
Scientific research and development services	5417	9,297	85	1,897	2,248	1,023	4,045

TABLE 30

Domestic R&D paid for and performed by the company, by industry, company size, and domestic R&D program size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D program size					
		All companies	Less than \$1 million	\$1 million–\$9.999 million	\$10 million–\$49.999 million	\$50 million–\$99.999 million	\$100 million or more
Research and development in nanotechnology	541713	179	7	130	42	0	0
Research and development in biotechnology (except nanobiotechnology)	541714	2,916	23	639	682	530	1,042
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,176	55	1,121	1,504	493	3,003
Research and development in the social sciences and humanities	541720	27	1	6	20	0	0
Other professional, scientific, and technical services	other 54	7,547	433	r 783	1,467	419	4,444
Health care services	621–23	D	D	D	481	691	1,299
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,300	D	D	D	D	D
All companies (number of domestic employees)	–	608,058	5,382	30,478	49,030	29,517	493,651
Small companies							
10–19 ^a	–	4,009	1,409	2,168	377	55	0
20–49	–	12,788	D	7,973	3,127	D	0
Medium companies							
50–99	–	13,274	D	5,594	5,042	D	127
100–249	–	24,844	926	6,717	9,844	4,369	2,988
Large companies							
250–499	–	26,469	227	3,235	9,401	4,257	9,349
500–999	–	29,007	121	2,282	7,324	6,149	13,130
1,000–4,999	–	94,615	66	2,100	9,916	7,956	74,578
5,000–9,999	–	54,018	7	160	2,054	2,797	49,000
10,000–24,999	–	96,071	2	165	1,291	1,857	92,756
25,000 or more	–	252,964	2	i 84	654	499	251,724

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. R&D program size classifications are based on R&D performance.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 31

Domestic R&D paid for and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
All industries	21-23, 31-33, 42-81	608,058	4.3	4.3
Manufacturing industries	31-33	326,998	4.5	4.5
Food	311	D	D	D
Beverage and tobacco products	312	660	0.5	0.5
Textile, apparel, and leather products	313-16	D	D	D
Wood products	321	254	0.4	0.4
Paper	322	1,004	1.0	1.0
Printing and related support activities	323	164	0.6	0.6
Petroleum and coal products	324	856	0.2	0.2
Chemicals	325	113,518	7.6	7.6
Basic chemicals	3251	D	D	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,413	1.5	1.5
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D
Pharmaceuticals and medicines	3254	104,720	15.3	15.4
Soap, cleaning compound, and toilet preparations	3256	D	D	D
Paint, coating, adhesive, and other chemicals	3255, 3259	1,195	1.8	1.8
Plastics and rubber products	326	3,251	1.3	1.3
Nonmetallic mineral products	327	1,435	2.2	2.6
Primary metals	331	1,099	0.7	0.7
Fabricated metal products	332	3,304	1.8	1.8
Machinery	333	18,246	3.5	3.5
Agricultural implement	33311	D	D	D
Semiconductor machinery	333242	5,390	16.4	16.4
Engine, turbine, and power transmission equipment	3336	D	D	D
Other machinery	other 333	7,987	2.5	2.6
Computer and electronic products	334	99,234	13.5	13.5
Communications equipment	3342	10,870	11.5	11.5
Semiconductor and other electronic components	3344	47,380	22.6	22.6
Navigational, measuring, electromedical, and control instruments	3345	10,105	8.3	8.3
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	3,959	11.4	11.4
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,170	8.6	8.6
Other measuring and controlling devices	other 3345	3,976	6.5	6.5
Other computer and electronic products	other 334	30,879	10.0	10.0

TABLE 31

Domestic R&D paid for and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Electrical equipment, appliances, and components	335	6,657	3.5	3.5
Transportation equipment	336	46,468	3.4	3.4
Motor vehicles, bodies, trailers, and parts	3361-63	30,722	3.3	3.3
Aerospace products and parts	3364	13,786	3.9	3.9
Aircraft, aircraft engine, and aircraft parts	336411-13	9,303	3.7	3.7
Guided missile, space vehicle, and related parts	336414-15, 336419	4,483	4.4	4.4
Military armored vehicle, tank, and tank components	336992	26	2.0	2.0
Other transportation	other 336	1,935	2.3	2.3
Furniture and related products	337	405	1.1	1.2
Miscellaneous	339	23,032	4.3	4.3
Medical equipment and supplies	3391	20,112	4.6	4.6
Other miscellaneous manufacturing	3399	2,921	3.0	3.0
Nonmanufacturing industries	21-23, 42-81	281,060	4.1	4.1
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D
Utilities	22	D	D	D
Wholesale trade	42	D	D	D
Electronic shopping and electronic auctions	454111-12	D	D	D
Transportation and warehousing	48-49	D	D	D
Information	51	181,392	9.8	9.8
Publishing	511	49,674	13.4	D
Newspaper, periodical, book, and directory publishers	5111	72	2.5	D
Software publishers	5112	49,602	13.5	13.5
Telecommunications	517	3,614	0.8	0.8
Data processing, hosting, and related services	518	49,270	7.7	7.7
Other information	other 51	78,834	21.0	D
Finance and insurance	52	17,173	1.4	1.4
Real estate and rental and leasing	53	2,398	3.2	3.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	1.0	1.0
Other real estate and rental and leasing	other 53	2,393	3.3	3.3
Professional, scientific, and technical services	54	38,633	6.9	7.0
Architectural, engineering, and related services	5413	2,912	2.8	2.8
Computer systems design and related services	5415	18,878	10.1	10.4
Scientific research and development services	5417	9,297	6.8	6.8

TABLE 31

Domestic R&D paid for and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Research and development in nanotechnology	541713	179	19.2	23.6
Research and development in biotechnology (except nanobiotechnology)	541714	2,916	10.6	10.6
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,176	5.8	5.8
Research and development in the social sciences and humanities	541720	27	1.7	1.9
Other professional, scientific, and technical services	other 54	7,547	5.7	5.7
Health care services	621-23	D	D	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,300	0.4	0.4
All companies (number of domestic employees)	-	608,058	4.3	4.3
Small companies				
10-19 ^c	-	4,009	9.6	10.1
20-49	-	12,788	11.3	11.5
Medium companies				
50-99	-	13,274	7.4	7.6
100-249	-	24,844	6.5	6.7
Large companies				
250-499	-	26,469	7.2	7.4
500-999	-	29,007	5.1	5.1
1,000-4,999	-	94,615	4.6	4.6
5,000-9,999	-	54,018	3.4	3.4
10,000-24,999	-	96,071	3.3	3.4
25,000 or more	-	252,964	4.2	4.2

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed or funded R&D.^b Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed R&D. The calculation of percentages in this column excludes R&D and sales of companies that fund R&D but do not perform R&D.^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Unless indicated otherwise, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 32

Domestic R&D paid for by the company and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
All industries	21-23, 31-33, 42-81	653,547	4.6	4.6
Manufacturing industries	31-33	366,498	5.0	5.0
Food	311	7,012	0.7	0.7
Beverage and tobacco products	312	788	0.6	0.6
Textile, apparel, and leather products	313-16	629	0.9	0.9
Wood products	321	276	0.5	0.5
Paper	322	1,010	1.0	1.0
Printing and related support activities	323	167	0.6	0.6
Petroleum and coal products	324	1,050	0.3	0.3
Chemicals	325	142,366	9.5	9.6
Basic chemicals	3251	2,714	0.7	0.7
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,428	1.6	1.6
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D
Pharmaceuticals and medicines	3254	133,039	19.4	D
Soap, cleaning compound, and toilet preparations	3256	2,978	2.3	2.3
Paint, coating, adhesive, and other chemicals	3255, 3259	D	D	D
Plastics and rubber products	326	3,288	1.3	1.3
Nonmetallic mineral products	327	1,454	2.2	2.6
Primary metals	331	1,117	0.7	0.7
Fabricated metal products	332	3,347	1.8	1.8
Machinery	333	18,658	3.6	3.6
Agricultural implement	33311	2,390	2.3	2.3
Semiconductor machinery	333242	5,402	16.4	16.4
Engine, turbine, and power transmission equipment	3336	2,745	3.8	3.8
Other machinery	other 333	8,122	2.6	2.6
Computer and electronic products	334	103,366	14.1	14.1
Communications equipment	3342	12,051	12.8	12.8
Semiconductor and other electronic components	3344	47,754	22.8	22.8
Navigational, measuring, electromedical, and control instruments	3345	D	D	D
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,063	11.7	11.7
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,173	8.6	8.6
Other measuring and controlling devices	other 3345	D	D	D
Other computer and electronic products	other 334	D	D	D
Electrical equipment, appliances, and components	335	6,733	3.5	3.5
Transportation equipment	336	50,738	3.7	3.7
Motor vehicles, bodies, trailers, and parts	3361-63	34,689	3.7	3.7
Aerospace products and parts	3364	14,026	3.9	3.9
Aircraft, aircraft engine, and aircraft parts	336411-13	9,400	3.7	3.7
Guided missile, space vehicle, and related parts	336414-15, 336419	4,625	4.5	4.5
Military armored vehicle, tank, and tank components	336992	27	2.1	2.1
Other transportation	other 336	1,997	2.3	2.3
Furniture and related products	337	411	1.1	1.2
Miscellaneous	339	24,087	4.5	4.5
Medical equipment and supplies	3391	21,075	4.8	4.8

TABLE 32

Domestic R&D paid for by the company and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Other miscellaneous manufacturing	3399	3,012	3.0	3.1
Nonmanufacturing industries	21–23, 42–81	287,049	4.2	4.2
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D
Utilities	22	D	D	D
Wholesale trade	42	D	D	0.3
Electronic shopping and electronic auctions	454111–12	D	D	D
Transportation and warehousing	48–49	D	D	D
Information	51	184,538	10.0	10.0
Publishing	511	50,945	13.7	D
Newspaper, periodical, book, and directory publishers	5111	91	3.2	D
Software publishers	5112	50,854	13.8	13.8
Telecommunications	517	4,134	0.9	0.9
Data processing, hosting, and related services	518	50,203	7.9	7.9
Other information	other 51	79,256	21.1	D
Finance and insurance	52	17,520	1.4	1.4
Real estate and rental and leasing	53	2,399	3.2	3.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	6	1.2	1.2
Other real estate and rental and leasing	other 53	2,394	3.3	3.3
Professional, scientific, and technical services	54	39,859	7.1	7.2
Architectural, engineering, and related services	5413	3,100	2.9	2.9
Computer systems design and related services	5415	19,304	10.4	10.6
Scientific research and development services	5417	9,804	7.2	7.2
Research and development in nanotechnology	541713	201	21.5	26.1
Research and development in biotechnology (except nanobiotechnology)	541714	3,157	11.4	11.4
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,418	6.0	6.0
Research and development in the social sciences and humanities	541720	28	1.8	1.9
Other professional, scientific, and technical services	other 54	7,650	5.8	5.8
Health care services	621–23	D	D	D
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,378	0.4	0.4
All companies (number of domestic employees)	–	653,547	4.6	4.6
Small companies				
10–19 ^c	–	D	D	11.9
20–49	–	14,310	12.6	12.8
Medium companies				
50–99	–	D	D	8.7
100–249	–	27,984	7.3	7.5
Large companies				
250–499	–	29,591	8.1	8.2
500–999	–	31,026	5.4	5.5
1,000–4,999	–	100,094	4.9	4.9
5,000–9,999	–	57,432	3.6	3.7
10,000–24,999	–	107,863	3.7	3.8

TABLE 32

Domestic R&D paid for by the company and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
25,000 or more	-	265,281	4.4	4.4

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed or funded R&D.

^b Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed R&D. The calculation of percentages in this column excludes R&D and sales of companies that fund R&D but do not perform R&D.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Unless indicated otherwise, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 33

Domestic R&D paid for by others and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
All industries	21-23, 31-33, 42-81	83,489	46,597	1,255	2,923	613	8,694	1,179	2,325	280	4,366	15,257
Manufacturing industries	31-33	45,461	26,837	726	1,496	236	4,596	350	1,079	220	1,662	8,260
Food	311	D	212	2	13	1	40	19	D	0	*	50
Beverage and tobacco products	312	107	68	0	6	5	9	4	7	0	0	9
Textile, apparel, and leather products	313-16	D	9	0	0	0	1	0	D	0	0	3
Wood products	321	5	3	*	*	*	*	*	*	*	1	1
Paper	322	*	*	*	*	*	*	*	0	*	*	*
Printing and related support activities	323	1	1	*	*	*	*	*	*	*	*	*
Petroleum and coal products	324	4	3	*	*	*	*	*	0	*	*	*
Chemicals	325	12,210	6,723	498	1,000	59	725	141	513	55	979	1,518
Basic chemicals	3251	D	132	0	D	3	20	2	D	0	1	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	80	60	0	*	*	D	1	D	0	*	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	*	D	*	D	D	D	*	*	*
Pharmaceuticals and medicines	3254	11,353	6,230	498	953	50	622	98	456	51	965	1,430
Soap, cleaning compound, and toilet preparations	3256	D	126	0	5	3	6	D	D	4	11	D
Paint, coating, adhesive, and other chemicals	3255, 3259	29	D	0	*	2	D	0	*	0	2	D
Plastics and rubber products	326	219	116	0	1	1	54	*	6	0	4	38
Nonmetallic mineral products	327	29	20	0	*	1	3	*	1	0	1	3
Primary metals	331	20	13	0	0	0	2	*	*	0	6	0
Fabricated metal products	332	222	129	*	12	11	21	2	10	*	1	35
Machinery	333	1,218	638	1	106	7	231	8	70	*	39	116
Agricultural implement	33311	D	88	0	2	*	11	1	D	0	22	4
Semiconductor machinery	333242	48	27	0	1	*	8	2	2	0	2	5
Engine, turbine, and power transmission equipment	3336	D	200	1	4	5	81	1	D	0	3	3
Other machinery	other 333	725	322	1	99	2	132	4	51	*	11	104
Computer and electronic products	334	5,483	3,196	205	152	63	743	67	162	24	156	715
Communications equipment	3342	795	560	0	2	10	34	8	11	*	19	151
Semiconductor and other electronic components	3344	1,950	1,216	204	63	5	24	31	84	23	31	266
Navigational, measuring, electromedical, and control instruments	3345	2,671	1,373	1	86	47	678	28	62	*	104	293
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	619	363	0	61	*	38	8	8	*	71	70
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,976	957	1	16	47	632	18	53	*	32	219
Other measuring and controlling devices	other 3345	77	53	0	9	*	8	2	1	*	*	4

TABLE 33

Domestic R&D paid for by others and performed by the company, by type of cost, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Salaries, wages, and fringe benefits	Stock-based compensation	Temporary staffing	Expensed equipment	Materials and supplies	Lease and rental payments	Depreciation	Royalties and licensing fees	Other purchased services (except R&D)	Other
Scientific research and development services	5417	30,328 i	14,829 i	203 i	1,028 i	337 i	3,780 i	651 i	1,135 i	35 i	2,495 i	5,834 i
Research and development in nanotechnology	541713	102	57	0	11	*	7	1	1	*	1	23
Research and development in biotechnology (except nanobiotechnology)	541714	7,310	3,187 i	22 i	273	3 i	663	66	134	2	1,441 i	1,518
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	22,244 i	11,200 i	153 i	713 i	334 i	3,038 i	580 i	999 i	33 i	926 i	4,267 i
Research and development in the social sciences and humanities	541720	672	385	28	31	*	71	4	*	0	128	25
Other professional, scientific, and technical services	other 54	1,184	761	9	168	9	73	28	5	1	14	118
Health care services	621-23	D	40	*	*	*	8	D	D	*	4	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	94	D	0	D	*	5	D	D	D	D	3 i
All companies (number of domestic employees)	-	83,489	46,597	1,255	2,923	613 i	8,694	1,179	2,325	280	4,366 i	15,257
Small companies												
10-19 ^a	-	1,269	834	25 i	59 i	18	100	24	14	2 i	30	162
20-49	-	1,907	1,098	10	100	25	227	61	39	2	80	264
Medium companies												
50-99	-	1,990	1,140	48	67	19	265	56	36	23	80	255
100-249	-	3,003	1,770	37	126	17	284	63	97	7	84	518
Large companies												
250-499	-	3,080	1,837	49	190	40	246	74	75	23	98	448
500-999	-	2,795	1,679	19 i	136	39	238	72	70	2 i	124	417
1,000-4,999	-	9,890	4,754	433	720	71	742	152	461	63 i	910 i	1,583
5,000-9,999	-	4,692	2,450	61	318	23	587	11 i	38	6	199	999
10,000-24,999	-	25,072 i	14,024 i	530	757 i	231 i	2,316 i	452 i	985 i	119 i	2,260 i	3,398 i
25,000 or more	-	29,792	17,012 i	42 i	450	130	3,687	213 i	511	32 i	501	7,214

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies.; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 34

Domestic R&D paid for by others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)											
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more	
All industries	21–23, 31–33, 42–81	83,489	1,269	1,907	1,990	3,003	3,080	2,795	9,890	4,692	25,072	29,792	
Manufacturing industries	31–33	45,461	299	499	687	1,033	1,694	1,248	7,079	2,877	7,979	22,065	
Food	311	D	0	D	6	D	7	r 7	D	D	D	2	
Beverage and tobacco products	312	107	0	0	0	0	88	0	19	0	0	0	
Textile, apparel, and leather products	313–16	D	D	0	D	4	1	0	4	0	0	0	
Wood products	321	5	0	0	0	0	0	5	0	*	0	0	
Paper	322	*	0	0	0	*	0	0	*	0	0	0	
Printing and related support activities	323	1	0	* r	*	0	*	0	0	0	0	0	
Petroleum and coal products	324	4	0	0	0	*	0	*	0	1	3	0	
Chemicals	325	12,210	D	167	251	317	698	392	4,904	D	4,678	342	
Basic chemicals	3251	D	*	D	D	19	10	9	D	0	39	0	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	80	i 3	D	D	*	D	1	D	0	0	D	
Pesticide, fertilizer, and other agricultural chemicals	3253	D	0	D	0	D	0	0	D	0	0	0	
Pharmaceuticals and medicines	3254	11,353	D	154	239	278	663	378	4,427	D	4,416	D	
Soap, cleaning compound, and toilet preparations	3256	D	0	*	0	D	2	4	0	0	210	0	
Paint, coating, adhesive, and other chemicals	3255, 3259	29	D	D	D	D	D	0	D	0	12	0	
Plastics and rubber products	326	219	D	3 r	7	17	6	1	73	0	D	0	
Nonmetallic mineral products	327	29	0	1	1	4	2	4	17	0	0	0	
Primary metals	331	20	r 10 r	3 r	2 r	2	3	0	0	*	0	0	
Fabricated metal products	332	222	i 7	34	69 r	6	6	5	95	i 0	0	0	
Machinery	333	1,218	4	134	92	88 r	20	40	67	517	237	18	
Agricultural implement	33311	D	0	4 r	0	5	0	0	0	0	D	0	
Semiconductor machinery	333242	48	1	i 22	24	0	0	0	0	0	0	0	
Engine, turbine, and power transmission equipment	3336	D	*	7	D	*	2	*	0	180	D	18	
Other machinery	other 333	725	3	101 r	D	82 r	18	40	67	337	D	0	
Computer and electronic products	334	5,483	25	98	168	254	692	477	878	698	i 41	2,151	
Communications equipment	3342	795	i 2	D	D	D	D	D	18	D	0	0	
Semiconductor and other electronic components	3344	1,950	D	24	D	36	531	363	829	D	D	0	
Navigational, measuring, electromedical, and control instruments	3345	2,671	D	D	55	203	D	D	9	D	0	2,151	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	619	i 3	26	3	91	*	i 97	0	8	0	390	i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,976	D	D	18	106	51	0	0	D	0	1,761	
Other measuring and controlling devices	other 3345	77	1	D	34	6	D	D	9	0	0	0	
Other computer and electronic products	other 334	67	0	D	4 r	D	D	0	22	0	D	0	
Electrical equipment, appliances, and components	335	429	i 0	9	8	15	34	17	125	0	220	i 0	

TABLE 34

Domestic R&D paid for by others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)											
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more	
Transportation equipment	336	24,790	54 r	11	42	199	69	268	776 i	1,239	2,599	19,533 i	
Motor vehicles, bodies, trailers, and parts	3361–63	2,159	5	D	22	175	31	247	555 i	234	784	D	
Aerospace products and parts	3364	21,570	49 r	4	12	23	38	19 i	213	999	1,816	18,397 i	
Aircraft, aircraft engine, and aircraft parts	336411–13	15,268	i 48 r	D	11	D	D	D	D	D	1,816	12,977 i	
Guided missile, space vehicle, and related parts	336414–15, 336419	6,302	1	D	1	D	D	D	D	D	0	5,420	
Military armored vehicle, tank, and tank components	336992	4	0	0	0	0	0	0	4	0	0	0	
Other transportation	other 336	1,057	0	D	8 r	1	0	2	4	7	0	D	
Furniture and related products	337	5	0	4	*	1	0	0	0	0	0	0	
Miscellaneous	339	350	D	D	D	D	67	32	D	88	16	19	
Medical equipment and supplies	3391	282	21	20	14	13	56	3	31	88	16	19	
Other miscellaneous manufacturing	3399	68	D	D	D	D	11	28	D	0	0	0	
Nonmanufacturing industries	21–23, 42–81	38,028	i 970	1,408	1,303	1,970	1,385	1,547	2,811	1,814	17,092 i	7,727	
Mining, quarrying, oil and gas extraction, and support activities	21	D	0	0	D	0	0	0	0	5 i	D	0	
Utilities	22	D	0	D	0	0	0	0	D	D	*	D	
Wholesale trade	42	41	D	7	3	20 i	0	0	0	0	D	0	
Electronic shopping and electronic auctions	454111–12	0	0	0	0	0	0	0	0	0	0	0	
Transportation and warehousing	48–49	D	0	0	0	0	0	2	0	D	0	0	
Information	51	947	D	161	38	113	117	115	0	D	287	35	
Publishing	511	693	D	94 r	7	80	93	D	0	0	287	35	
Newspaper, periodical, book, and directory publishers	5111	1	0	0	0	1	0	0	0	0	0	0	
Software publishers	5112	693	D	94 r	7	80	93	D	0	0	287	35	
Telecommunications	517	76	30 r	33	0	11	2	0	0	0	0	0	
Data processing, hosting, and related services	518	137	D	33	D	22	21	35	0	0	0	0	
Other information	other 51	42	0	*	D	0	0	D	0	D	0	0	
Finance and insurance	52	49	0	0	0	D	0	0	0	0	0	D	
Real estate and rental and leasing	53	0	0	0	0	0	0	0	0	0	0	0	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	0	0	0	0	0	0	0	0	0	
Other real estate and rental and leasing	other 53	0	0	0	0	0	0	0	0	0	0	0	
Professional, scientific, and technical services	54	36,139	i 892	1,225	1,237	1,819	1,235	1,414	2,747	1,183	16,780 i	7,607 i	
Architectural, engineering, and related services	5413	971	119	163	236	153	92	106	71	0	31	0	
Computer systems design and related services	5415	3,656	271	111	112	151	39	100	110	0	2,478	283	
Scientific research and development services	5417	30,328	i 419	802	750	1,409	954	1,077	2,565	1,183	14,271 i	6,897 i	
Research and development in nanotechnology	541713	102	32	21	49	0	0	0	0	0	0	0	
Research and development in biotechnology (except nanobiotechnology)	541714	7,310	99	137	183	31	130	0	438 i	582	2,319 i	3,391	

TABLE 34

Domestic R&D paid for by others and performed by the company, by industry and company size: 2022

(Millions of U.S. dollars)

Industry	NAICS code	Company size (domestic employees)													
		All companies	10–19 ^a	20–49	50–99	100–249	250–499	500–999	1,000–4,999	5,000–9,999	10,000–24,999	25,000 or more			
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	22,244	i	285	644	511	1,316	824	1,077	2,128	0	11,952	i	3,506	i
Research and development in the social sciences and humanities	541720	672		3	0	6	62	0	0	0	601	0		0	
Other professional, scientific, and technical services	other 54	1,184		84	148	139	105	149	130	0	0	0		427	
Health care services	621–23	D		D	D	D	D	33	6	18	0	0		D	
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	94		0	D	D	D	0	10	D	D	0		0	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 35

Domestic R&D paid for by others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development			
All industries	21–23, 31–33, 42–81	83,489	7,040	19,821	56,629			
Manufacturing industries	31–33	45,461	4,792	6,865	33,804			
Food	311	D	D	69	208			
Beverage and tobacco products	312	107	22	26	59			
Textile, apparel, and leather products	313–16	D	D	4	9			
Wood products	321	5	0	1	4			
Paper	322	*	*	*	0			
Printing and related support activities	323	1	*	*	*			
Petroleum and coal products	324	4	1	2	1			
Chemicals	325	12,210	2,808	1,808	7,594			
Basic chemicals	3251	D	22	49	D			
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	80	i	D	47			
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D	D			
Pharmaceuticals and medicines	3254	11,353	2,691	1,427	7,236			
Soap, cleaning compound, and toilet preparations	3256	D	D	D	D			
Paint, coating, adhesive, and other chemicals	3255, 3259	29	3	16	9			
Plastics and rubber products	326	219	13	48	159			
Nonmetallic mineral products	327	29	2	5	22			
Primary metals	331	20	r	3	r	3		
Fabricated metal products	332	222	i	18	i	90		
Machinery	333	1,218	27	129	1,062			
Agricultural implement	33311	D	D	2	D			
Semiconductor machinery	333242	48	1	*	47			
Engine, turbine, and power transmission equipment	3336	D	D	103	196			
Other machinery	other 333	725	D	24	D			
Computer and electronic products	334	5,483	272	i	608	4,603		
Communications equipment	3342	795	i	211	i	84	501	
Semiconductor and other electronic components	3344	1,950	30	124	1,795			
Navigational, measuring, electromedical, and control instruments	3345	2,671	9	374	2,288			
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	619	i	2	r	47	i	570
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,976	6	321	1,648			
Other measuring and controlling devices	other 3345	77	1	5	70			
Other computer and electronic products	other 334	67	22	26	19			
Electrical equipment, appliances, and components	335	429	i	1	207	i	221	
Transportation equipment	336	24,790	1,534	i	3,812	19,445		
Motor vehicles, bodies, trailers, and parts	3361–63	2,159	D	D	1,651			
Aerospace products and parts	3364	21,570	1,436	i	3,296	16,838		
Aircraft, aircraft engine, and aircraft parts	336411–13	15,268	i	1,249	i	2,103	i	11,916
Guided missile, space vehicle, and related parts	336414–15, 336419	6,302	188	1,193	4,922			
Military armored vehicle, tank, and tank components	336992	4	0	0	4			
Other transportation	other 336	1,057	D	D	952			
Furniture and related products	337	5	*	*	5			
Miscellaneous	339	350	12	41	297			
Medical equipment and supplies	3391	282	12	38	232			
Other miscellaneous manufacturing	3399	68	*	2	65			
Nonmanufacturing industries	21–23, 42–81	38,028	i	2,247	i	12,956	i	22,825
Mining, quarrying, oil and gas extraction, and support activities	21	D	0	5	i	D		
Utilities	22	D	1	6	D			
Wholesale trade	42	41	*	13	28			

TABLE 35

Domestic R&D paid for by others and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
Electronic shopping and electronic auctions	454111-12	0	0	0	0
Transportation and warehousing	48-49	D	0	D	D
Information	51	947	43	132	773
Publishing	511	693	13	87	593
Newspaper, periodical, book, and directory publishers	5111	1	0	0	1
Software publishers	5112	693	13	87	593
Telecommunications	517	76	16	25	35
Data processing, hosting, and related services	518	137	13	19	104
Other information	other 51	42	1	1	40
Finance and insurance	52	49	2	2	45
Real estate and rental and leasing	53	0	0	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	0	0
Other real estate and rental and leasing	other 53	0	0	0	0
Professional, scientific, and technical services	54	36,139	i 2,184	i 12,767	i 21,189
Architectural, engineering, and related services	5413	971	79	220	672
Computer systems design and related services	5415	3,656	391	1,230	2,035
Scientific research and development services	5417	30,328	i 1,642	i 11,263	i 17,423
Research and development in nanotechnology	541713	102	11	54	37
Research and development in biotechnology (except nanobiotechnology)	541714	7,310	139	455	6,716
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	22,244	i 863	i 10,743	i 10,638
Research and development in the social sciences and humanities	541720	672	628	10	33
Other professional, scientific, and technical services	other 54	1,184	73	53	1,058
Health care services	621-23	D	16	28	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	94	2	D	D
All companies (number of domestic employees)	-	83,489	7,040	19,821	i 56,629
Small companies					
10-19 ^a	-	1,269	89	325	854
20-49	-	1,907	160	304	1,443
Medium companies					
50-99	-	1,990	224	532	1,235
100-249	-	3,003	251	615	2,137
Large companies					
250-499	-	3,080	224	697	2,159
500-999	-	2,795	137	601	2,057
1,000-4,999	-	9,890	2,287	1,340	6,263
5,000-9,999	-	4,692	879	i 397	3,415
10,000-24,999	-	25,072	i 1,115	i 8,969	i 14,988
25,000 or more	-	29,792	1,674	i 6,041	i 22,077

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 36

Domestic R&D paid for by others and performed by the company, by source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Companies in the United States	Companies outside the United States		U.S. federal government agencies	U.S. state government agencies	Foreign government agencies	U.S. universities, colleges, and academic researchers	Foreign universities, colleges, and academic researchers	All other					
				Company's parent	Unaffiliated companies						In the United States	Outside the United States				
All industries	21-23, 31-33, 42-81	83,489	27,125	i	21,005	2,599		31,626	208	104	38	10	720	52		
Manufacturing industries	31-33	45,461	6,623		12,732	1,628		24,082	57	95	22	2	r	215	6	
Food	311	D	D		269	D		0	0	0	0	0		D	0	
Beverage and tobacco products	312	107	*	i	106	i	*	i	0	0	0	0		*	i	
Textile, apparel, and leather products	313-16	D	D		3	D		5	0	0	*	0		D	0	
Wood products	321	5	0		5	0		*	0	0	0	0		0	0	
Paper	322	*	*		*	0		0	0	0	0	0		0	0	
Printing and related support activities	323	1	0		0	0		0	0	0	0	0		1	0	
Petroleum and coal products	324	4	4		0	*		*	0	0	0	0		0	0	
Chemicals	325	12,210	2,426		8,176	770		766	9	0	10	*	i	49	4	
Basic chemicals	3251	D	29		124	11		D	*	0	*	*		0	0	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	80	i	5	62	i	8	D	0	0	*	0		D	*	
Pesticide, fertilizer, and other agricultural chemicals	3253	D	0		D	*		0	0	0	0	0		D	0	
Pharmaceuticals and medicines	3254	11,353	2,388		7,447	748		703	8	0	10	0		46	4	
Soap, cleaning compound, and toilet preparations	3256	D	2		229	0		0	0	0	0	0		D	0	
Paint, coating, adhesive, and other chemicals	3255, 3259	29	2		4	3		19	1	0	0	*	i	0	0	
Plastics and rubber products	326	219	80		112	*		25	0	0	*	0		2	r	
Nonmetallic mineral products	327	29	1		16	9		3	0	0	0	0		0	0	
Primary metals	331	20	r	5	r	3	0	*	2	r	0	*		10	r	
Fabricated metal products	332	222	i	133	i	61	i	1	r	16	0	0		11	r	
Machinery	333	1,218	165		203	155		673	0	*	6	1	r	15	0	
Agricultural implement	33311	D	0		D	D		D	0	0	0	0		0	0	
Semiconductor machinery	333242	48	*	i	34	*	i	14	0	0	*	i	*	i	*	
Engine, turbine, and power transmission equipment	3336	D	51		9	5		235	0	*	*	D		2	0	
Other machinery	other 333	725	113		D	D		D	0	0	6	D		13	0	
Computer and electronic products	334	5,483	537	i	1,976	287		2,560	16	r	21	3	r	*	82	1
Communications equipment	3342	795	i	D	D	D		205	1	i	2	i	0	0	0	
Semiconductor and other electronic components	3344	1,950	23		1,515	262		71	15	r	0	*		63	*	
Navigational, measuring, electromedical, and control instruments	3345	2,671	123		245	15		2,246	1		19	3	r	*	18	*
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	619	i	3	197	0		402	i	*	0	2	r	*	14	*
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,976	115		3	15		1,824	1		19	0		0	*	0

TABLE 36

Domestic R&D paid for by others and performed by the company, by source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Companies in the United States	Companies outside the United States		U.S. federal government agencies	U.S. state government agencies	Foreign government agencies	U.S. universities, colleges, and academic researchers	Foreign universities, colleges, and academic researchers	All other							
				Company's parent	Unaffiliated companies						In the United States	Outside the United States						
Other measuring and controlling devices	other 3345	77	5	46	*	20	0	0	*	r	*	r	4	0				
Other computer and electronic products	other 334	67	D	D	D	38	0	0	0		0		1	0				
Electrical equipment, appliances, and components	335	429	i	35	361	i	8	21	1	0	*		0	0				
Transportation equipment	336	24,790		3,060	1,348		328	19,934	28	73	0		0	17	i	2	r	
Motor vehicles, bodies, trailers, and parts	3361-63	2,159		528	1,322		237	D	25	*	i		0	0	D	*	i	
Aerospace products and parts	3364	21,570		2,529	12		91	18,855	i	D	73		0	0	D		1	
Aircraft, aircraft engine, and aircraft parts	336411-13	15,268	i	815	12		71	14,298	i	0	D		0	0	D		1	
Guided missile, space vehicle, and related parts	336414-15, 336419	6,302		1,714	0		20	4,557		D	D		0	0	D		0	
Military armored vehicle, tank, and tank components	336992	4		3	0		0	1		0	0		0	0	0		0	
Other transportation	other 336	1,057		*	14		0	D	D	0	0		0	0	0		1	r
Furniture and related products	337	5		5	0		0	0		0	0		0	0	*		0	
Miscellaneous	339	350		114	94		57	77		*	2		0	0	5		0	
Medical equipment and supplies	3391	282		93	83		45	58		0	2		0	0	1	r	0	
Other miscellaneous manufacturing	3399	68		21	r	11	12	19		0	*	*	i	0	5		0	
Nonmanufacturing industries	21-23, 42-81	38,028	i	20,502	i	8,273	i	972	i	7,544	152		9	17	9		506	46
Mining, quarrying, oil and gas extraction, and support activities	21	D		D	0		21	i	0	0	0		0	0	0		0	0
Utilities	22	D		*	0		0	D	*	0	0		0	0	*		0	
Wholesale trade	42	41		7	i	32		0	1	r	*		0	0	*	r	0	
Electronic shopping and electronic auctions	454111-12	0		0	0		0	0		0	0		0	0	0		0	
Transportation and warehousing	48-49	D		D	0		0	D		0	0		0	0	0		0	
Information	51	947		332	375		38	176		3	0		1	0	13		10	
Publishing	511	693		308	261		0	102	r	3	0		0	0	10		10	
Newspaper, periodical, book, and directory publishers	5111	1		0	1		0	0		0	0		0	0	0		0	
Software publishers	5112	693		308	260		0	102	r	3	0		0	0	10		10	
Telecommunications	517	76		D	D		0	41	r	*	i		0	0	0		0	
Data processing, hosting, and related services	518	137		13	49		38	33		0	0		1	0	4	i	0	
Other information	other 51	42		D	D		0	0		0	0		0	0	0		0	
Finance and insurance	52	49		49	0		0	0		0	0		0	0	0		0	
Real estate and rental and leasing	53	0		0	0		0	0		0	0		0	0	0		0	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0		0	0		0	0		0	0		0	0	0		0	
Other real estate and rental and leasing	other 53	0		0	0		0	0		0	0		0	0	0		0	
Professional, scientific, and technical services	54	36,139	i	19,452	i	7,837	i	911	i	7,273	107		9	16	9		488	36

TABLE 36

Domestic R&D paid for by others and performed by the company, by source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Companies in the United States	Companies outside the United States		U.S. federal government agencies	U.S. state government agencies	Foreign government agencies	U.S. universities, colleges, and academic researchers	Foreign universities, colleges, and academic researchers	All other	
				Company's parent	Unaffiliated companies						In the United States	Outside the United States
Architectural, engineering, and related services	5413	971	374	53	6	475	38	3 r	3	*	19	*
Computer systems design and related services	5415	3,656	408	2,277	1	897	28	*	*	0	44 r	0
Scientific research and development services	5417	30,328 i	18,562 i	5,285 i	885 i	5,084	40	6	10	8	413 i	36
Research and development in nanotechnology	541713	102	22	5	1	71	2	0	*	0	2	0
Research and development in biotechnology (except nanobiotechnology)	541714	7,310	6,222 i	204	14	701	2	0	1 i	0	145	22
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	22,244 i	12,296 i	5,077 i	870 i	3,700	28	1	9	4	245 i	14 i
Research and development in the social sciences and humanities	541720	672	22	0	0	612	8	5	0	3	21	0
Other professional, scientific, and technical services	other 54	1,184	108	222	20	818	1	*	2 i	1	12	* r
Health care services	621-23	D	46	0	*	D	0	0	*	*	3	0
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	94	22	28	2	1	40	0	0	0	0	0
All companies (number of domestic employees)	-	83,489	27,125 i	21,005	2,599	31,626	208	104	38	10	720	52
Small companies												
10-19 ^a	-	1,269	433	211	31	495	7	1	4	1	83	2
20-49	-	1,907	553	412	63	741	32	D	10	2 r	81	D
Medium companies												
50-99	-	1,990	358	745	69	746	21	3 r	13	*	34	1
100-249	-	3,003	554	832	114	1,402	13	3	3	*	80	0
Large companies												
250-499	-	3,080	607	1,250	338	687	26	0	1	4	141	26
500-999	-	2,795	980	1,015	73	679	12	*	5	0	31	0
1,000-4,999	-	9,890	2,346	5,203	575	1,672	62	* i	1 i	*	32 i	* i
5,000-9,999	-	4,692	1,299	384	329	2,573	8	12 i	*	3	83	* i
10,000-24,999	-	25,072 i	11,010 i	10,954 i	926 i	1,960	D	D	* i	* i	D	D
25,000 or more	-	29,792	8,985	0	82	20,670	D	29	0	0	D	1

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 37

Domestic R&D paid for by others and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)		Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
All industries	21-23, 31-33, 42-81	83,489		0.6	0.6
Manufacturing industries	31-33	45,461		0.6	0.6
Food	311	D		D	D
Beverage and tobacco products	312	107		0.1	0.1
Textile, apparel, and leather products	313-16	D		D	D
Wood products	321	5		*	*
Paper	322	*		*	*
Printing and related support activities	323	1		*	*
Petroleum and coal products	324	4		*	*
Chemicals	325	12,210		0.8	0.8
Basic chemicals	3251	D		D	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	80	i	0.1	0.1
Pesticide, fertilizer, and other agricultural chemicals	3253	D		D	D
Pharmaceuticals and medicines	3254	11,353		1.7	1.7
Soap, cleaning compound, and toilet preparations	3256	D		D	D
Paint, coating, adhesive, and other chemicals	3255, 3259	29		*	*
Plastics and rubber products	326	219		0.1	0.1
Nonmetallic mineral products	327	29		*	0.1
Primary metals	331	20	r	*	*
Fabricated metal products	332	222	i	0.1	0.1
Machinery	333	1,218		0.2	0.2
Agricultural implement	33311	D		D	D
Semiconductor machinery	333242	48		0.1	0.1
Engine, turbine, and power transmission equipment	3336	D		D	D
Other machinery	other 333	725		0.2	0.2
Computer and electronic products	334	5,483		0.7	0.7
Communications equipment	3342	795	i	0.8	0.8
Semiconductor and other electronic components	3344	1,950		0.9	0.9
Navigational, measuring, electromedical, and control instruments	3345	2,671		2.2	2.2
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	619	i	1.8	1.8
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,976		7.8	7.8
Other measuring and controlling devices	other 3345	77		0.1	0.1
Other computer and electronic products	other 334	67		*	*

TABLE 37

Domestic R&D paid for by others and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)		Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Electrical equipment, appliances, and components	335	429	i	0.2	0.2
Transportation equipment	336	24,790		1.8	1.8
Motor vehicles, bodies, trailers, and parts	3361-63	2,159		0.2	0.2
Aerospace products and parts	3364	21,570		6.0	6.0
Aircraft, aircraft engine, and aircraft parts	336411-13	15,268	i	6.0	6.0
Guided missile, space vehicle, and related parts	336414-15, 336419	6,302		6.2	6.2
Military armored vehicle, tank, and tank components	336992	4		0.3	0.3
Other transportation	other 336	1,057		1.2	1.2
Furniture and related products	337	5		*	*
Miscellaneous	339	350		0.1	0.1
Medical equipment and supplies	3391	282		0.1	0.1
Other miscellaneous manufacturing	3399	68		0.1	0.1
Nonmanufacturing industries	21-23, 42-81	38,028	i	0.6	0.6
Mining, quarrying, oil and gas extraction, and support activities	21	D		D	D
Utilities	22	D		D	D
Wholesale trade	42	41		*	*
Electronic shopping and electronic auctions	454111-12	0		0.0	0.0
Transportation and warehousing	48-49	D		D	D
Information	51	947		0.1	0.1
Publishing	511	693		0.2	D
Newspaper, periodical, book, and directory publishers	5111	1		*	D
Software publishers	5112	693		0.2	0.2
Telecommunications	517	76		*	*
Data processing, hosting, and related services	518	137		*	*
Other information	other 51	42		*	D
Finance and insurance	52	49		*	*
Real estate and rental and leasing	53	0		0.0	0.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0		0.0	0.0
Other real estate and rental and leasing	other 53	0		0.0	0.0
Professional, scientific, and technical services	54	36,139	i	6.4	6.5
Architectural, engineering, and related services	5413	971		0.9	0.9
Computer systems design and related services	5415	3,656		2.0	2.0
Scientific research and development services	5417	30,328	i	22.2	22.3

TABLE 37

Domestic R&D paid for by others and performed by the company as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Research and development in nanotechnology	541713	102	11.0	13.5
Research and development in biotechnology (except nanobiotechnology)	541714	7,310	26.5	26.6
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	22,244	i	20.9
Research and development in the social sciences and humanities	541720	672	43.2	47.3
Other professional, scientific, and technical services	other 54	1,184	0.9	0.9
Health care services	621-23	D	D	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	94	*	*
All companies (number of domestic employees)	-	83,489	0.6	0.6
Small companies				
10-19 ^c	-	1,269	3.0	3.2
20-49	-	1,907	1.7	1.7
Medium companies				
50-99	-	1,990	1.1	1.1
100-249	-	3,003	0.8	0.8
Large companies				
250-499	-	3,080	0.8	0.9
500-999	-	2,795	0.5	0.5
1,000-4,999	-	9,890	0.5	0.5
5,000-9,999	-	4,692	0.3	0.3
10,000-24,999	-	25,072	i	0.9
25,000 or more	-	29,792	0.5	0.5

* = amount < \$500,000 or less than 0.05%; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed or funded R&D.

^b Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed R&D. The calculation of percentages in this column excludes R&D and sales of companies that fund R&D but do not perform R&D.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Unless indicated otherwise, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 38

Domestic R&D paid for by others and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
All industries	21-23, 31-33, 42-81	92,152	0.6	0.7
Manufacturing industries	31-33	51,143	0.7	0.7
Food	311	355	*	*
Beverage and tobacco products	312	110	0.1	0.1
Textile, apparel, and leather products	313-16	D	D	D
Wood products	321	5	*	*
Paper	322	*	*	*
Printing and related support activities	323	1	*	*
Petroleum and coal products	324	5	*	*
Chemicals	325	15,660	1.0	1.1
Basic chemicals	3251	D	D	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	D	D	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D
Pharmaceuticals and medicines	3254	14,765	2.2	D
Soap, cleaning compound, and toilet preparations	3256	D	D	D
Paint, coating, adhesive, and other chemicals	3255, 3259	D	D	D
Plastics and rubber products	326	227	0.1	0.1
Nonmetallic mineral products	327	37	0.1	0.1
Primary metals	331	30	*	*
Fabricated metal products	332	224	i	0.1
Machinery	333	1,273	0.2	0.2
Agricultural implement	33311	D	D	D
Semiconductor machinery	333242	50	0.2	0.2
Engine, turbine, and power transmission equipment	3336	D	D	D
Other machinery	other 333	748	0.2	0.2
Computer and electronic products	334	5,628	0.8	0.8
Communications equipment	3342	809	i	0.9
Semiconductor and other electronic components	3344	1,954	0.9	0.9
Navigational, measuring, electromedical, and control instruments	3345	2,796	2.3	2.3
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	645	i	1.9
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,071	8.2	8.2
Other measuring and controlling devices	other 3345	80	0.1	0.1
Other computer and electronic products	other 334	69	*	*
Electrical equipment, appliances, and components	335	445	0.2	0.2
Transportation equipment	336	26,759	1.9	1.9
Motor vehicles, bodies, trailers, and parts	3361-63	2,363	0.3	0.3
Aerospace products and parts	3364	23,335	6.5	6.5
Aircraft, aircraft engine, and aircraft parts	336411-13	17,023	i	6.7
Guided missile, space vehicle, and related parts	336414-15, 336419	6,312	6.2	6.2
Military armored vehicle, tank, and tank components	336992	4	0.3	0.3
Other transportation	other 336	1,057	1.2	1.2
Furniture and related products	337	6	*	*
Miscellaneous	339	D	D	D
Medical equipment and supplies	3391	291	0.1	0.1

TABLE 38

Domestic R&D paid for by others and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)		Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
Other miscellaneous manufacturing	3399	D		D	D
Nonmanufacturing industries	21–23, 42–81	41,009	i	0.6	0.6
Mining, quarrying, oil and gas extraction, and support activities	21	D		D	D
Utilities	22	D		D	D
Wholesale trade	42	45		*	*
Electronic shopping and electronic auctions	454111–12	0		0.0	0.0
Transportation and warehousing	48–49	D		D	D
Information	51	993		0.1	0.1
Publishing	511	732		0.2	D
Newspaper, periodical, book, and directory publishers	5111	1		*	D
Software publishers	5112	732		0.2	0.2
Telecommunications	517	78		*	*
Data processing, hosting, and related services	518	140		*	*
Other information	other 51	42		*	D
Finance and insurance	52	49		*	*
Real estate and rental and leasing	53	0		0.0	0.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0		0.0	0.0
Other real estate and rental and leasing	other 53	0		0.0	0.0
Professional, scientific, and technical services	54	39,017	i	7.0	7.0
Architectural, engineering, and related services	5413	1,097		1.0	1.0
Computer systems design and related services	5415	3,759		2.0	2.1
Scientific research and development services	5417	32,867	i	24.1	24.1
Research and development in nanotechnology	541713	110		11.8	14.5
Research and development in biotechnology (except nanobiotechnology)	541714	7,409		26.9	27.0
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	24,677	i	23.2	23.2
Research and development in the social sciences and humanities	541720	672		43.2	47.3
Other professional, scientific, and technical services	other 54	1,294		1.0	1.0
Health care services	621–23	D		D	D
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	113		*	*
All companies (number of domestic employees)	–	92,152		0.6	0.7
Small companies					
10–19 ^c	–	D		D	3.5
20–49	–	2,108		1.9	1.9
Medium companies					
50–99	–	D		D	1.3
100–249	–	3,664		1.0	1.0
Large companies					
250–499	–	3,650		1.0	1.0
500–999	–	3,168		0.6	0.6
1,000–4,999	–	11,019		0.5	0.5
5,000–9,999	–	4,874		0.3	0.3
10,000–24,999	–	27,508	i	1.0	1.0

TABLE 38

Domestic R&D paid for by others and performed by the company and others as a percentage of domestic net sales, by industry and company size: 2022

(Millions of U.S. dollars and percent)

Industry and company size	NAICS code	Domestic R&D (US\$millions)	Percentage of domestic sales of R&D performers or funders ^a	Percentage of domestic sales of R&D performers ^b
25,000 or more	-	32,481	0.5	0.5

* = amount < \$500,000 or less than 0.05%; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed or funded R&D.

^b Statistics used for both the numerator and denominator in the calculation of these percentages are representative of companies located in the United States that performed R&D. The calculation of percentages in this column excludes R&D and sales of companies that fund R&D but do not perform R&D.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Unless indicated otherwise, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 39

Domestic R&D paid for by the U.S. federal government and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development
All industries	21-23, 31-33, 42-81	31,626	2,438	5,461	23,727
Manufacturing industries	31-33	24,082	1,426	3,524	19,132
Food	311	0	0	0	0
Beverage and tobacco products	312	0	0	0	0
Textile, apparel, and leather products	313-16	5	D	3	D
Wood products	321	*	0	*	*
Paper	322	0	0	0	0
Printing and related support activities	323	0	0	0	0
Petroleum and coal products	324	*	D	*	D
Chemicals	325	766	19	93	655
Basic chemicals	3251	D	D	12	20
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	D	D	D	2
Pesticide, fertilizer, and other agricultural chemicals	3253	0	0	0	0
Pharmaceuticals and medicines	3254	703	8	69	626
Soap, cleaning compound, and toilet preparations	3256	0	0	0	0
Paint, coating, adhesive, and other chemicals	3255, 3259	19	D	D	6
Plastics and rubber products	326	25	1	*	24
Nonmetallic mineral products	327	3	0	*	2
Primary metals	331	*	*	0	0
Fabricated metal products	332	16	1	*	15
Machinery	333	673	13	66	594
Agricultural implement	33311	D	D	D	*
Semiconductor machinery	333242	14	0	0	14
Engine, turbine, and power transmission equipment	3336	235	5	61	169
Other machinery	other 333	D	D	D	411
Computer and electronic products	334	2,560	46	375	2,139
Communications equipment	3342	205	D	D	145
Semiconductor and other electronic components	3344	71	4	2	65
Navigational, measuring, electromedical, and control instruments	3345	2,246	2	324	1,920
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	402	2	31	370
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,824	*	292	1,531
Other measuring and controlling devices	other 3345	20	*	1	19
Other computer and electronic products	other 334	38	D	D	9
Electrical equipment, appliances, and components	335	21	*	2	19
Transportation equipment	336	19,934	1,338	2,968	15,628
Motor vehicles, bodies, trailers, and parts	3361-63	D	1	D	D

TABLE 39

Domestic R&D paid for by the U.S. federal government and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research		Applied research		Development	
Aerospace products and parts	3364	18,855	i	1,337	i	2,847	i	14,671
Aircraft, aircraft engine, and aircraft parts	336411-13	14,298	i	D		D		11,149
Guided missile, space vehicle, and related parts	336414-15, 336419	4,557		D		D		3,522
Military armored vehicle, tank, and tank components	336992	1		0		0		1
Other transportation	other 336	D		0		D		D
Furniture and related products	337	0		0		0		0
Miscellaneous	339	77		6		16		55
Medical equipment and supplies	3391	58		6		15		37
Other miscellaneous manufacturing	3399	19		0		1		18
Nonmanufacturing industries	21-23, 42-81	7,544		1,012	i	1,936		4,596
Mining, quarrying, oil and gas extraction, and support activities	21	0		0		0		0
Utilities	22	D		0		6		D
Wholesale trade	42	1	r	0		*	r	*
Electronic shopping and electronic auctions	454111-12	0		0		0		0
Transportation and warehousing	48-49	D		0		0		D
Information	51	176		4	r	58	i	113
Publishing	511	102	r	*	r	34	r	68
Newspaper, periodical, book, and directory publishers	5111	0		0		0		0
Software publishers	5112	102	r	*	r	34	r	68
Telecommunications	517	41	r	*	i	23	r	17
Data processing, hosting, and related services	518	33		4	r	*	i	28
Other information	other 51	0		0		0		0
Finance and insurance	52	0		0		0		0
Real estate and rental and leasing	53	0		0		0		0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0		0		0		0
Other real estate and rental and leasing	other 53	0		0		0		0
Professional, scientific, and technical services	54	7,273		1,006	i	1,868		4,400
Architectural, engineering, and related services	5413	475		41		176		257
Computer systems design and related services	5415	897		46		228		622
Scientific research and development services	5417	5,084		897	i	1,443		2,743
Research and development in nanotechnology	541713	71		8		43	r	19
Research and development in biotechnology (except nanobiotechnology)	541714	701		39		206		456
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	3,700		275		1,190		2,236
Research and development in the social sciences and humanities	541720	612		575	i	4	i	33
Other professional, scientific, and technical services	other 54	818		22		20		776
Health care services	621-23	D		D		D		16

TABLE 39

Domestic R&D paid for by the U.S. federal government and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Basic research	Applied research	Development		
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	1	D	D	D		
All companies (number of domestic employees)	–	31,626	2,438	i	5,461	23,727	
Small companies							
10–19 ^a	–	495	29		117	i	349
20–49	–	741	58		142		542
Medium companies							
50–99	–	746	39		257		451
100–249	–	1,402	105		312		986
Large companies							
250–499	–	687	32		223		432
500–999	–	679	31		158		490
1,000–4,999	–	1,672	152		493		1,026
5,000–9,999	–	2,573	602	i	206		1,765
10,000–24,999	–	1,960	38		363		1,560
25,000 or more	–	20,670	1,352	i	3,189	i	16,129

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 40

Domestic R&D paid for by sources located outside the United States and performed by the company, by source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Foreign companies					Foreign government agencies	Foreign universities, colleges, and academic researchers	All other
			Subsidiaries ^a	Company's parent	Unaffiliated companies					
All industries	21-23, 31-33, 42-81	53,933	30,161	21,005	2,599	104	10	52		
Manufacturing industries	31-33	34,413	19,950	12,732	1,628	95	2	6		
Food	311	493	D	269	D	0	0	0		
Beverage and tobacco products	312	106	i 0	106	i *	i 0	0	0		
Textile, apparel, and leather products	313-16	4	D	3	D	0	0	0		
Wood products	321	28	r 23	r 5	0	0	0	0		
Paper	322	*	0	*	0	0	0	0		
Printing and related support activities	323	0	0	0	0	0	0	0		
Petroleum and coal products	324	D	D	0	*	0	0	0		
Chemicals	325	12,340	3,390	8,176	770	0	*	i 4		
Basic chemicals	3251	172	37	124	11	0	*	0		
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	70	i 0	62	i 8	0	0	*		
Pesticide, fertilizer, and other agricultural chemicals	3253	D	0	D	*	0	0	0		
Pharmaceuticals and medicines	3254	11,534	3,335	7,447	748	0	0	4		
Soap, cleaning compound, and toilet preparations	3256	243	13	229	0	0	0	0		
Paint, coating, adhesive, and other chemicals	3255, 3259	10	4	4	3	0	*	i 0		
Plastics and rubber products	326	154	42	112	*	0	0	0		
Nonmetallic mineral products	327	25	0	16	9	0	0	0		
Primary metals	331	5	2	3	0	0	*	0		
Fabricated metal products	332	63	i 1	61	i 1	r 0	0	0		
Machinery	333	639	280	203	155	*	1	r 0		
Agricultural implement	33311	D	D	D	D	0	0	0		
Semiconductor machinery	333242	61	27	34	*	i 0	*	i 0		
Engine, turbine, and power transmission equipment	3336	19	D	9	5	*	D	0		
Other machinery	other 333	D	245	D	D	0	D	0		
Computer and electronic products	334	16,831	14,546	1,976	287	21	*	1 r		
Communications equipment	3342	D	D	D	D	2	i 0	0		
Semiconductor and other electronic components	3344	D	D	1,515	262	0	0	* r		
Navigational, measuring, electromedical, and control instruments	3345	D	D	245	15	19	*	*		
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	D	D	197	0	0	*	*		
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	37	*	3	15	19	0	0		
Other measuring and controlling devices	other 3345	D	D	46	*	0	*	r 0		

TABLE 40

Domestic R&D paid for by sources located outside the United States and performed by the company, by source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Foreign companies				Foreign government agencies	Foreign universities, colleges, and academic researchers	All other
			Subsidiaries ^a	Company's parent	Unaffiliated companies				
Other computer and electronic products	other 334	D	D	D	D	0	0	0	
Electrical equipment, appliances, and components	335	469	i 100	361	i 8	0	0	0	
Transportation equipment	336	1,965	214	1,348	328	i 73	0	2 r	
Motor vehicles, bodies, trailers, and parts	3361-63	1,768	209	1,322	237	i *	i 0	* i	
Aerospace products and parts	3364	182	5	12	91	73	0	1	
Aircraft, aircraft engine, and aircraft parts	336411-13	D	5	12	71	D	0	1	
Guided missile, space vehicle, and related parts	336414-15, 336419	D	0	0	20	D	0	0	
Military armored vehicle, tank, and tank components	336992	0	0	0	0	0	0	0	
Other transportation	other 336	15	0	14	0	0	0	1 r	
Furniture and related products	337	65	65	0	0	0	0	0	
Miscellaneous	339	D	D	94	57	*	0	0	
Medical equipment and supplies	3391	993	865	83	45	0	0	0	
Other miscellaneous manufacturing	3399	D	D	11	12	*	0	0	
Nonmanufacturing industries	21-23, 42-81	19,520	i 10,211	i 8,273	i 972	i 9	9	46	
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	0	21	i 0	0	0	
Utilities	22	0	0	0	0	0	0	0	
Wholesale trade	42	35	3	32	0	0	0	0	
Electronic shopping and electronic auctions	454111-12	D	D	0	0	0	0	0	
Transportation and warehousing	48-49	0	0	0	0	0	0	0	
Information	51	9,164	i 8,742	i 375	38	0	0	10	
Publishing	511	D	D	261	0	0	0	10	
Newspaper, periodical, book, and directory publishers	5111	1	0	1	0	0	0	0	
Software publishers	5112	D	D	260	0	0	0	10	
Telecommunications	517	D	49	D	0	0	0	0	
Data processing, hosting, and related services	518	284	197	49	38	0	0	0	
Other information	other 51	D	D	D	0	0	0	0	
Finance and insurance	52	D	D	0	0	0	0	0	
Real estate and rental and leasing	53	0	0	0	0	0	0	0	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	0	0	0	0	0	
Other real estate and rental and leasing	other 53	0	0	0	0	0	0	0	
Professional, scientific, and technical services	54	8,952	i 149	7,837	i 911	i 9	9	36	
Architectural, engineering, and related services	5413	67	5	53	6	3	r *	*	

TABLE 40

Domestic R&D paid for by sources located outside the United States and performed by the company, by source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total	Foreign companies			Foreign government agencies	Foreign universities, colleges, and academic researchers	All other
			Subsidiaries ^a	Company's parent	Unaffiliated companies			
Computer systems design and related services	5415	2,357	79	2,277	1	*	0	0
Scientific research and development services	5417	6,244	i 24	5,285	i 885	i 6	8	36
Research and development in nanotechnology	541713	14	9	5	1	0	0	0
Research and development in biotechnology (except nanobiotechnology)	541714	243	3	i 204	14	0	0	22
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	5,977	i 12	5,077	i 870	i 1	4	14
Research and development in the social sciences and humanities	541720	9	0	0	0	5	3	0
Other professional, scientific, and technical services	other 54	285	41	222	20	*	1	* r
Health care services	621-23	*	0	0	*	0	*	0
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	56	25	28	2	0	0	0
All companies (number of domestic employees)	-	53,933	30,161	21,005	2,599	104	10	52
Small companies								
10-19 ^b	-	264	17	211	31	1	1	2
20-49	-	618	128	r 412	63	D	2	r D
Medium companies								
50-99	-	909	91	745	69	3	r *	1
100-249	-	1,052	102	r 832	114	3	*	0
Large companies								
250-499	-	1,874	256	1,250	338	0	4	26
500-999	-	2,145	1,057	1,015	73	*	0	0
1,000-4,999	-	9,254	3,477	5,203	575	*	i *	* i
5,000-9,999	-	1,777	1,049	384	329	12	i 3	* i
10,000-24,999	-	13,795	i 1,852	10,954	i 926	i D	*	i D
25,000 or more	-	22,245	22,133	0	82	29	0	1

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. These statistics include an adjustment to the weight to account for unit nonresponse.^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. In all other tables, R&D costs of foreign-company subsidiaries of U.S. companies are included in company-funded U.S. domestic R&D totals. Only in this table are such R&D costs classified as being part of R&D paid for by sources located outside of the United States.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 41

Domestic R&D paid for by the company's foreign subsidiaries and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total ^a	Basic research ^b	Applied research ^b	Development ^b
All industries	21-23, 31-33, 42-81	30,161	977	3,671	25,512
Manufacturing industries	31-33	19,950	933	3,549	15,467
Food	311	D	D	D	124
Beverage and tobacco products	312	0	0	0	0
Textile, apparel, and leather products	313-16	D	0	0	D
Wood products	321	23	2	2	20
Paper	322	0	0	0	0
Printing and related support activities	323	0	0	0	0
Petroleum and coal products	324	D	D	D	D
Chemicals	325	3,390	185	491	2,713
Basic chemicals	3251	37	D	8	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	0	0	0	0
Pesticide, fertilizer, and other agricultural chemicals	3253	0	0	0	0
Pharmaceuticals and medicines	3254	3,335	179	481	2,675
Soap, cleaning compound, and toilet preparations	3256	13	D	1	D
Paint, coating, adhesive, and other chemicals	3255, 3259	4	D	1	D
Plastics and rubber products	326	42	6	3	33
Nonmetallic mineral products	327	0	0	0	0
Primary metals	331	2	*	*	1
Fabricated metal products	332	1	0	*	1
Machinery	333	280	61	62	157
Agricultural implement	33311	D	D	*	3
Semiconductor machinery	333242	27	4	4	19
Engine, turbine, and power transmission equipment	3336	D	D	1	2
Other machinery	other 333	245	56	57	132
Computer and electronic products	334	14,546	593	2,653	11,301
Communications equipment	3342	D	*	4	D
Semiconductor and other electronic components	3344	D	D	D	D
Navigational, measuring, electromedical, and control instruments	3345	D	D	44	D
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	D	46	0	D
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	*	*	*	*
Other measuring and controlling devices	other 3345	D	D	44	D
Other computer and electronic products	other 334	D	D	D	D
Electrical equipment, appliances, and components	335	100	1	2	98
Transportation equipment	336	214	9	2	203
Motor vehicles, bodies, trailers, and parts	3361-63	209	8	1	199

TABLE 41

Domestic R&D paid for by the company's foreign subsidiaries and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total ^a	Basic research ^b	Applied research ^b	Development ^b
Aerospace products and parts	3364	5	1	1	3
Aircraft, aircraft engine, and aircraft parts	336411-13	5	1	1	3
Guided missile, space vehicle, and related parts	336414-15, 336419	0	0	0	0
Military armored vehicle, tank, and tank components	336992	0	0	0	0
Other transportation	other 336	0	0	0	0
Furniture and related products	337	65	0	65	i 0
Miscellaneous	339	D	D	D	D
Medical equipment and supplies	3391	865	12	136	717
Other miscellaneous manufacturing	3399	D	D	D	D
Nonmanufacturing industries	21-23, 42-81	10,211	i 44	122	i 10,045
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D	D
Utilities	22	0	0	0	0
Wholesale trade	42	3	1	*	2
Electronic shopping and electronic auctions	454111-12	D	D	D	D
Transportation and warehousing	48-49	0	0	0	0
Information	51	8,742	i 12	85	i 8,645
Publishing	511	D	1	58	i D
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0
Software publishers	5112	D	1	58	i D
Telecommunications	517	49	0	5	44
Data processing, hosting, and related services	518	197	11	i 21	165
Other information	other 51	D	0	2	D
Finance and insurance	52	D	0	0	D
Real estate and rental and leasing	53	0	0	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	0	0
Other real estate and rental and leasing	other 53	0	0	0	0
Professional, scientific, and technical services	54	149	25	12	112
Architectural, engineering, and related services	5413	5	*	*	4
Computer systems design and related services	5415	79	2	7	69
Scientific research and development services	5417	24	1	4	19
Research and development in nanotechnology	541713	9	1	4	4
Research and development in biotechnology (except nanobiotechnology)	541714	3	i 0	1	i 2
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	12	0	0	12
Research and development in the social sciences and humanities	541720	0	0	0	0
Other professional, scientific, and technical services	other 54	41	22	0	19
Health care services	621-23	0	0	0	0

TABLE 41

Domestic R&D paid for by the company's foreign subsidiaries and performed by the company, by type of R&D, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total ^a	Basic research ^b	Applied research ^b	Development ^b
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	25	*	D	D
All companies (number of domestic employees)	-	30,161	977	3,671	25,512
Small companies					
10-19 ^c	-	17	2	5	11
20-49	-	128	r 3	r 4	i 122
Medium companies					
50-99	-	91	8	18	66
100-249	-	102	r 2	3	97
Large companies					
250-499	-	256	92	20	i 144
500-999	-	1,057	4	249	804
1,000-4,999	-	3,477	401	450	2,626
5,000-9,999	-	1,049	11	196	841
10,000-24,999	-	1,852	60	143	1,649
25,000 or more	-	22,133	395	2,585	19,152

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. These statistics include an adjustment to the weight to account for unit nonresponse.

^b Respondent was not asked to report categorical breakouts of research and development paid for by foreign subsidiaries. Rather, ratios of the company's basic research, applied research, and development were calculated as proportions of the overall domestic R&D performance paid for by the company. These ratios were applied to the company's domestic R&D performance paid for by foreign subsidiaries to get estimates of a company's basic research, applied research, and development paid for by foreign subsidiaries.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 42

Domestic R&D performance, by performer, source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Performed by the company			Performed by others		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
All industries	21–23, 31–33, 42–81	691,547	608,058	83,489	54,152	45,489	8,663
Manufacturing industries	31–33	372,459	326,998	45,461	45,181	39,499	5,682
Food	311	7,143	D	D	224	D	D
Beverage and tobacco products	312	767	660	107	131	128	3
Textile, apparel, and leather products	313–16	635	D	D	D	D	*
Wood products	321	259	254	5	22	22	0
Paper	322	1,005	1,004	*	6	6	0
Printing and related support activities	323	165	164	1	4	3	*
Petroleum and coal products	324	860	856	4	195	194	1
Chemicals	325	125,728	113,518	12,210	32,297	28,847	3,450
Basic chemicals	3251	2,860	D	D	D	D	3
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	1,413	80	D	15	D
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	D	D	100	D	D
Pharmaceuticals and medicines	3254	116,073	104,720	11,353	31,731	28,319	3,411
Soap, cleaning compound, and toilet preparations	3256	2,886	D	D	D	D	1
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	1,195	29	D	D	D
Plastics and rubber products	326	3,470	3,251	219	46	37	8
Nonmetallic mineral products	327	1,464	1,435	29	27	19	8
Primary metals	331	1,120	1,099	20	27	18	10
Fabricated metal products	332	3,526	3,304	222	45	43	2
Machinery	333	19,464	18,246	1,218	468	412	56
Agricultural implement	33311	2,287	D	D	D	D	18
Semiconductor machinery	333242	5,438	5,390	48	14	12	2
Engine, turbine, and power transmission equipment	3336	3,026	D	D	D	D	13
Other machinery	other 333	8,713	7,987	725	157	134	22
Computer and electronic products	334	104,718	99,234	5,483	4,276	4,131	145
Communications equipment	3342	11,665	10,870	795	1,194	1,181	14
Semiconductor and other electronic components	3344	49,330	47,380	1,950	379	374	4
Navigational, measuring, electromedical, and control instruments	3345	12,777	10,105	2,671	D	D	125
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	3,959	619	131	104	27
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	2,170	1,976	98	3	95
Other measuring and controlling devices	other 3345	4,053	3,976	77	D	D	3
Other computer and electronic products	other 334	30,946	30,879	67	D	D	2
Electrical equipment, appliances, and components	335	7,086	6,657	429	92	76	15

TABLE 42

Domestic R&D performance, by performer, source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Performed by the company			Performed by others		
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others
Transportation equipment	336	71,259	46,468	24,790	6,239	4,270	1,969
Motor vehicles, bodies, trailers, and parts	3361-63	32,881	30,722	2,159	4,171	3,967	204
Aerospace products and parts	3364	35,356	13,786	21,570	2,005	240	1,765
Aircraft, aircraft engine, and aircraft parts	336411-13	24,571	9,303	15,268	1,852	98	1,754
Guided missile, space vehicle, and related parts	336414-15, 336419	10,785	4,483	6,302	153	142	11
Military armored vehicle, tank, and tank components	336992	30	26	4	1	1	0
Other transportation	other 336	2,992	1,935	1,057	63	63	0
Furniture and related products	337	410	405	5	7	6	1
Miscellaneous	339	23,382	23,032	350	D	1,055	D
Medical equipment and supplies	3391	20,394	20,112	282	972	963	9
Other miscellaneous manufacturing	3399	2,989	2,921	68	D	92	D
Nonmanufacturing industries	21-23, 42-81	319,088	281,060	38,028	8,971	5,989	2,981
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D	128	115	13
Utilities	22	D	D	D	658	640	18
Wholesale trade	42	D	D	41	142	137	4
Electronic shopping and electronic auctions	454111-12	D	D	0	60	60	0
Transportation and warehousing	48-49	9,395	D	D	39	38	1
Information	51	182,340	181,392	947	3,191	3,146	45
Publishing	511	50,367	49,674	693	1,311	1,272	39
Newspaper, periodical, book, and directory publishers	5111	72	72	1	20	20	0
Software publishers	5112	50,295	49,602	693	1,291	1,252	39
Telecommunications	517	3,690	3,614	76	522	520	2
Data processing, hosting, and related services	518	49,407	49,270	137	936	933	3
Other information	other 51	78,876	78,834	42	422	422	*
Finance and insurance	52	17,222	17,173	49	347	347	0
Real estate and rental and leasing	53	2,398	2,398	0	2	2	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	5	0	1	1	0
Other real estate and rental and leasing	other 53	2,393	2,393	0	1	1	0
Professional, scientific, and technical services	54	74,773	38,633	36,139	4,103	1,226	2,878
Architectural, engineering, and related services	5413	3,883	2,912	971	314	189	126
Computer systems design and related services	5415	22,534	18,878	3,656	529	427	102
Scientific research and development services	5417	39,625	9,297	30,328	3,045	507	2,539
Research and development in nanotechnology	541713	282	179	102	29	22	7
Research and development in biotechnology (except nanobiotechnology)	541714	10,226	2,916	7,310	340	241	99

TABLE 42

Domestic R&D performance, by performer, source of funds, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Performed by the company			Performed by others			
		Total	Paid for by the company	Paid for by others	Total	Paid for by the company	Paid for by others	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420	i 6,176	22,244	i 2,675	i 242	2,433	i
Research and development in the social sciences and humanities	541720	698	27	672	1	i 1	i 0	
Other professional, scientific, and technical services	other 54	8,730	7,547	1,184	214	104	110	
Health care services	621-23	2,855	D	D	204	201	3	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,394	3,300	94	97	78	19	
All companies (number of domestic employees)	-	691,547	608,058	83,489	54,152	45,489	8,663	
Small companies								
10-19 ^a	-	5,277	4,009	1,269	841	D	D	
20-49	-	14,695	12,788	1,907	1,723	1,521	201	
Medium companies								
50-99	-	15,265	13,274	1,990	2,262	D	D	
100-249	-	27,847	24,844	3,003	3,801	3,140	660	
Large companies								
250-499	-	29,549	26,469	3,080	3,692	3,121	570	
500-999	-	31,802	29,007	2,795	2,392	2,019	373	
1,000-4,999	-	104,505	94,615	9,890	6,608	5,479	1,129	
5,000-9,999	-	58,709	54,018	4,692	3,597	3,415	182	
10,000-24,999	-	121,142	96,071	25,072	i 14,229	11,792	2,437	
25,000 or more	-	282,756	252,964	29,792	15,006	12,317	2,689	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 43

Domestic R&D performance, by source of funds, performer, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Paid for by the company			Paid for by others				
		Total	R&D performed by others (purchased and collaborative R&D)	R&D performed by the company	Total	R&D performed by others (subcontracted or passed-through R&D costs)	R&D performed by the company		
							Total	Paid for by the U.S. government	Paid for by non-U.S. government sources
All industries	21–23, 31–33, 42–81	653,547	45,489	608,058	92,152	8,663	83,489	31,626	51,863
Manufacturing industries	31–33	366,498	39,499	326,998	51,143	5,682	45,461	24,082	21,379
Food	311	7,012	D	D	355	D	D	0	D
Beverage and tobacco products	312	788	128	660	110	3	107	0	107
Textile, apparel, and leather products	313–16	629	D	D	D	*	D	5	D
Wood products	321	276	22	254	5	0	5	*	5
Paper	322	1,010	6	1,004	*	0	*	0	*
Printing and related support activities	323	167	3	164	1	*	1	0	1
Petroleum and coal products	324	1,050	194	856	5	1	4	*	4
Chemicals	325	142,366	28,847	113,518	15,660	3,450	12,210	766	11,444
Basic chemicals	3251	2,714	D	D	D	3	D	D	165
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,428	15	1,413	D	D	80	i	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	D	D	D	D	0	D
Pharmaceuticals and medicines	3254	133,039	28,319	104,720	14,765	3,411	11,353	703	10,651
Soap, cleaning compound, and toilet preparations	3256	2,978	D	D	D	1	D	0	D
Paint, coating, adhesive, and other chemicals	3255, 3259	D	D	1,195	D	D	29	19	9
Plastics and rubber products	326	3,288	37	3,251	227	8	219	25	194
Nonmetallic mineral products	327	1,454	19	1,435	37	8	29	3	26
Primary metals	331	1,117	18	1,099	30	10	20	r	20
Fabricated metal products	332	3,347	43	3,304	224	i	222	i	205
Machinery	333	18,658	412	18,246	1,273	56	1,218	673	545
Agricultural implement	33311	2,390	D	D	D	18	D	D	137
Semiconductor machinery	333242	5,402	12	5,390	50	2	48	14	34
Engine, turbine, and power transmission equipment	3336	2,745	D	D	D	13	D	235	D
Other machinery	other 333	8,122	134	7,987	748	22	r	725	D
Computer and electronic products	334	103,366	4,131	99,234	5,628	145	5,483	2,560	2,923
Communications equipment	3342	12,051	1,181	10,870	809	i	795	i	591
Semiconductor and other electronic components	3344	47,754	374	47,380	1,954	4	1,950	71	1,879
Navigational, measuring, electromedical, and control instruments	3345	D	D	10,105	2,796	125	2,671	2,246	425

TABLE 43

Domestic R&D performance, by source of funds, performer, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Paid for by the company			Paid for by others						
		Total	R&D performed by others (purchased and collaborative R&D)	R&D performed by the company	Total	R&D performed by others (subcontracted or passed-through R&D costs)	R&D performed by the company				
							Total	Paid for by the U.S. government	Paid for by non-U.S. government sources		
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,063	104	3,959	645	27	619	402	217		
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,173	3	2,170	2,071	95	1,976	1,824	152		
Other measuring and controlling devices	other 3345	D	D	3,976	80	3	77	20	57		
Other computer and electronic products	other 334	D	D	30,879	69	2	67	38	29		
Electrical equipment, appliances, and components	335	6,733	76	6,657	445	15	429	21	408		
Transportation equipment	336	50,738	4,270	46,468	26,759	1,969	24,790	19,934	4,857		
Motor vehicles, bodies, trailers, and parts	3361-63	34,689	3,967	30,722	2,363	204	2,159	D	D		
Aerospace products and parts	3364	14,026	240	13,786	23,335	1,765	21,570	18,855	2,715		
Aircraft, aircraft engine, and aircraft parts	336411-13	9,400	98	9,303	17,023	1,754	15,268	14,298	970		
Guided missile, space vehicle, and related parts	336414-15, 336419	4,625	142	4,483	6,312	11	6,302	4,557	1,745		
Military armored vehicle, tank, and tank components	336992	27	1	26	4	0	4	1	3		
Other transportation	other 336	1,997	63	1,935	1,057	0	1,057	D	D		
Furniture and related products	337	411	6	405	6	1	5	0	5		
Miscellaneous	339	24,087	1,055	23,032	D	D	350	77	273		
Medical equipment and supplies	3391	21,075	963	20,112	291	9	282	58	224		
Other miscellaneous manufacturing	3399	3,012	92	2,921	D	D	68	19	49		
Nonmanufacturing industries	21-23, 42-81	287,049	5,989	281,060	41,009	2,981	38,028	7,544	30,484		
Mining, quarrying, oil and gas extraction, and support activities	21	D	115	D	D	13	D	0	D		
Utilities	22	D	640	D	D	18	D	D	1		
Wholesale trade	42	D	137	D	45	4	41	1	40		
Electronic shopping and electronic auctions	454111-12	D	60	D	0	0	0	0	0		
Transportation and warehousing	48-49	D	38	D	D	1	D	D	D		
Information	51	184,538	3,146	181,392	993	45	947	176	772		
Publishing	511	50,945	1,272	49,674	732	39	693	102	591		
Newspaper, periodical, book, and directory publishers	5111	91	20	72	1	0	1	0	1		
Software publishers	5112	50,854	1,252	49,602	732	39	693	102	590		
Telecommunications	517	4,134	520	3,614	78	2	76	41	35		
Data processing, hosting, and related services	518	50,203	933	49,270	140	3	137	33	104		
Other information	other 51	79,256	422	78,834	42	*	42	0	42		

TABLE 43

Domestic R&D performance, by source of funds, performer, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Paid for by the company					Paid for by others							
		Total	R&D performed by others (purchased and collaborative R&D)	i	R&D performed by the company	Total	R&D performed by others (subcontracted or passed-through R&D costs)	R&D performed by the company						
								Total	Paid for by the U.S. government	Paid for by non-U.S. government sources				
Finance and insurance	52	17,520	347	i	17,173	49	0	49	0	49				
Real estate and rental and leasing	53	2,399	2	i	2,398	0	0	0	0	0				
Lessors of nonfinancial intangible assets (except copyrighted works)	533	6	i	1	i	5	0	0	0	0				
Other real estate and rental and leasing	other 53	2,394	1	r	2,393	0	0	0	0	0				
Professional, scientific, and technical services	54	39,859	1,226		38,633	39,017	i	2,878	i	36,139	i	7,273	28,866	i
Architectural, engineering, and related services	5413	3,100	189	i	2,912	1,097	126	971	475	497				
Computer systems design and related services	5415	19,304	427		18,878	3,759	102	3,656	897	2,760				
Scientific research and development services	5417	9,804	507		9,297	32,867	i	2,539	i	30,328	i	5,084	25,244	i
Research and development in nanotechnology	541713	201	22		179	110	7	102	71	31				
Research and development in biotechnology (except nanobiotechnology)	541714	3,157	241		2,916	7,409	99	7,310	701	6,610	i			
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,418	242		6,176	24,677	i	2,433	i	22,244	i	3,700	18,543	i
Research and development in the social sciences and humanities	541720	28	1	i	27	672	0	672	612	60				
Other professional, scientific, and technical services	other 54	7,650	104		7,547	1,294	110	1,184	818	366				
Health care services	621-23	D	201		D	D	3	D	D	49				
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,378	78		3,300	113	19	94	1	93				
All companies (number of domestic employees)	-	653,547	45,489		608,058	92,152	8,663	83,489	31,626	51,863				
Small companies														
10-19 ^a	-	D	D		4,009	D	D	1,269	495	774				
20-49	-	14,310	1,521		12,788	2,108	201	1,907	741	1,166				
Medium companies														
50-99	-	D	D		13,274	D	D	1,990	746	1,244				
100-249	-	27,984	3,140		24,844	3,664	660	3,003	1,402	1,601				
Large companies														
250-499	-	29,591	3,121		26,469	3,650	570	3,080	687	2,393				
500-999	-	31,026	2,019		29,007	3,168	373	2,795	679	2,116				
1,000-4,999	-	100,094	5,479		94,615	11,019	1,129	9,890	1,672	8,218				
5,000-9,999	-	57,432	3,415		54,018	4,874	182	4,692	2,573	2,118				

TABLE 43

Domestic R&D performance, by source of funds, performer, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Paid for by the company			Paid for by others							
		Total	R&D performed by others (purchased and collaborative R&D)	R&D performed by the company	Total	R&D performed by others (subcontracted or passed-through R&D costs)	R&D performed by the company					
							Total	Paid for by the U.S. government	Paid for by non-U.S. government sources			
10,000–24,999	–	107,863	11,792	96,071	27,508	i	2,437	25,072	i	1,960	23,111	i
25,000 or more	–	265,281	12,317	252,964	32,481		2,689	29,792		20,670	9,122	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 44

R&D paid for by the company and others and performed by the company outside of the United States, by selected location: 2022

(Millions of U.S. dollars)

Location	Total		Paid for by the company		Paid for by others	
Total	149,584		135,009		14,575	i
Puerto Rico ^a	271		248		23	
Canada	11,083		10,096		987	
Latin America and other Western Hemisphere ^b	5,945		5,234		711	i
Argentina	544	i	344		200	i
Brazil	1,623		1,445		178	i
Chile	271	i	239	i	32	i
Mexico	1,649		1,419		230	i
Other Latin American and Western Hemisphere locations	1,858	i	1,787	i	71	i
Africa	633		455		177	i
South Africa	344	i	179		165	i
Other African locations	288		276		12	i
Asia and Pacific	52,070		48,282		3,789	i
Australia	2,718		2,439		279	i
China	13,052		12,067		984	i
Hong Kong	566		542		24	i
India	18,266		17,567		699	i
Indonesia	39		37		2	i
Japan	5,293		4,394		899	i
Malaysia	1,233		1,214		19	i
New Zealand	266		220		45	i
Singapore	4,003		3,697		306	i
South Korea	1,972		1,770		203	i
Taiwan	3,276		3,109		166	
Thailand	386		360		25	i
Other Asian or Pacific locations	1,001	i	865		137	i
Europe	68,744		60,080		8,664	i
Austria	629		507		122	i
Belgium	3,502		3,248		254	i
Czechia	970		832		138	i
Denmark	974		888		86	
Finland	774		706		68	i
France	4,413		3,680		733	i
Germany	10,326		9,524		801	i
Hungary	435		305		131	i
Ireland	5,596		5,381		215	i
Italy	1,944		1,606		338	i
Luxembourg	427	i	D		D	
Netherlands	3,872		3,495		376	i
Norway	453		414		39	
Poland	1,484		1,258		226	i
Russia	870	i	696		173	i
Spain	1,932		1,589		343	i
Sweden	1,527		1,404		124	i
Switzerland	6,471		5,782		689	
Turkey	357	i	D		D	
United Kingdom	17,335		14,259		3,075	i
Other European locations	4,453		3,827		625	i
Middle East	10,429		10,230		199	i
Israel	10,025		9,847		178	i
Other Middle Eastern locations	404		384		20	i

TABLE 44

R&D paid for by the company and others and performed by the company outside of the United States, by selected location: 2022

(Millions of U.S. dollars)

Location	Total		Paid for by the company		Paid for by others	
Undistributed ^c	410	i	384	i	26	i

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

^a Puerto Rico is not included in the U.S. total due to its classification as a U.S. territory.

^b Other Western Hemisphere is defined as Argentina, Brazil, Chile, Mexico, and other Latin America.

^c Includes data reported that were not allocated to a specific country.

Note(s):

Detail may not add to total because of rounding. Country detail was not collected from companies reporting less than \$1 million of R&D paid for by the company or reporting less than \$1 million of R&D paid for by others. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 45-A

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part A): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Puerto Rico ^a	Canada	Austria	Belgium	Czechia	Denmark	Finland	France	Germany	Hungary	Ireland	Italy	Luxembourg	Netherlands	Norway	Poland	Russia	Spain	Sweden	Switzerland	Turkey	United Kingdom	Other European locations
All industries	21-23, 31-33, 42-81	149,584	271	11,083	629	3,502	970	974	774	4,413	10,326	435	5,596	1,944	427	3,872	453	1,484	870	i 1,932	1,527	6,471	357	i 17,335	4,453
Manufacturing industries	31-33	84,419	257	5,054	429	3,020	282	662	463	2,423	7,365	173	2,562	1,429	319	2,731	335	792	575	998	742	3,941	155	6,305	2,003
Food	311	1,463	D	61	7	18	3	5	D	59	47	D	4	23	0	27	16	7	17	28	4	39	7	154	68
Beverage and tobacco products	312	630	0	*	D	20	0	D	0	*	*	0	*	48	0	0	0	D	0	0	5	389	D	33	0
Textile, apparel, and leather products	313-16	113	0	D	1	D	2	0	5	14	6	*	0	8	0	4	0	D	0	1	0	*	0	2	D
Wood products	321	4	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paper	322	81	0	33	0	0	0	0	1	1	5	0	0	0	*	0	0	1	0	0	*	1	0	1	0
Printing and related support activities	323	2	0	0	0	0	0	0	0	0	0	0	0	0	0	*	0	0	0	0	0	0	0	0	0
Petroleum and coal products	324	247	0	D	*	D	*	*	*	D	3	D	0	3	0	*	*	0	0	*	*	0	0	94	*
Chemicals	325	25,061	114	1,043	139	2,601	76	i 200	83	833	1,811	53	i 710	474	139	2,021	53	183	320	i 424	189	2,582	104	i 2,313	1,002
Basic chemicals	3251	956	0	8	3	i 42	2	D	12	77	i 92	D	1	74	0	125	D	1	D	21	40	i 30	8	109	10
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	539	0	9	0	30	0	0	0	10	i 60	0	0	15	D	58	0	D	1	15	*	4	D	7	2
Pesticide, fertilizer, and other agricultural chemicals	3253	151	D	D	*	D	*	D	0	8	10	D	0	1	0	D	0	*	*	2	0	2	D	1	1
Pharmaceuticals and medicines	3254	22,266	D	983	133	2,420	73	i 149	67	681	1,414	51	i 706	378	D	1,789	D	175	317	i 383	148	2,513	94	i 2,069	980
Soap, cleaning compound, and toilet preparations	3256	917	D	23	1	102	*	0	*	49	213	1	*	5	0	19	*	3	2	3	0	28	1	107	3
Paint, coating, adhesive, and other chemicals	3255, 3259	232	0	D	3	D	0	0	3	8	23	D	2	1	0	D	0	D	D	1	*	6	D	20	7
Plastics and rubber products	326	682	0	12	0	7	2	D	D	78	157	*	D	39	D	8	0	2	D	15	3	13	D	67	22
Nonmetallic mineral products	327	159	0	17	0	0	*	0	0	11	25	0	0	0	0	0	0	6	2	0	0	1	*	1	5
Primary metals	331	19	0	*	0	0	0	0	0	0	3	0	*	0	0	0	3	*	i 0	0	*	0	0	3	3
Fabricated metal products	332	231	0	18	i 1	3	6	i 1	*	14	34	*	0	7	0	6	1	*	*	2	*	29	i 0	5	3
Machinery	333	5,914	1	r 205	28	64	i 8	138	106	345	874	7	7	248	0	86	65	29	7	125	105	118	4	433	45
Agricultural implement	33311	990	0	22	8	2	0	D	85	63	439	D	0	14	0	28	D	*	*	12	0	5	0	2	4
Semiconductor machinery	333242	1,636	0	0	12	47	i 0	*	0	7	48	i 0	*	9	i 0	0	0	0	0	0	*	23	i 0	27	16
Engine, turbine, and power transmission equipment	3336	1,071	D	42	2	4	*	D	1	105	82	1	D	29	0	5	1	1	1	71	11	39	4	170	D
Other machinery	other 333	2,217	D	141	6	10	7	28	20	170	304	D	D	196	0	54	D	28	6	41	94	52	*	234	D
Computer and electronic products	334	35,536	D	2,209	172	133	155	287	201	623	2,236	34	1,453	231	*	227	146	381	172	269	259	424	18	i 1,888	400
Communications equipment	3342	3,509	0	478	1	D	D	22	7	75	162	D	172	68	0	46	D	99	3	16	44	40	6	186	74
Semiconductor and other electronic components	3344	21,784	D	1,303	99	53	29	151	126	347	i 867	12	485	95	0	96	52	251	153	58	i 85	113	11	i 861	i 231

TABLE 45-A

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part A): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Puerto Rico ^a	Canada	Austria	Belgium	Czechia	Denmark	Finland	France	Germany	Hungary	Ireland	Italy	Luxembourg	Netherlands	Norway	Poland	Russia	Spain	Sweden	Switzerland	Turkey	United Kingdom	Other European locations					
Navigational, measuring, electromedical, and control instruments	3345	2,668	*	106	D	31	D	49	63	105	517	8	34	42	*	35	D	D	13	28	92	182	*	408	69					
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	429	*	7	*	7	*	*	*	18	31	*	*	6	*	7	*	1	*	*	13	53	*	147	16					
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	327	0	31	0	0	1	0	26	25	58	*	3	*	0	21	5	*	0	0	19	0	0	40	5					
Other measuring and controlling devices	other 3345	1,912	0	68	D	24	D	49	37	i	61	427	8	31	36	0	7	D	D	13	28	60	128	0	221	48				
Other computer and electronic products	other 334	7,575	D	322	D	D	D	65	5	96	690	D	762	27	0	51	*	D	2	166	38	90	*	432	25					
Electrical equipment, appliances, and components	335	1,575	0	333	31	7	1	1	6	54	124	D	6	116	0	29	1	30	D	3	1	50	1	127	47					
Transportation equipment	336	8,035	0	941	D	57	i	25	1	0	126	1,482	i	25	D	176	D	188	0	144	D	101	86	34	D	922	266			
Motor vehicles, bodies, trailers, and parts	3361-63	6,035	0	349	D	57	i	D	0	0	38	1,211	i	25	D	67	D	181	0	115	D	67	83	D	D	577	259			
Aerospace products and parts	3364	1,819	0	552	0	D	D	D	0	0	86	247	0	4	97	D	5	0	25	D	D	2	31	D	322	2				
Aircraft, aircraft engine, and aircraft parts	336411-13	653	0	59	0	*	D	0	0	0	26	147	0	0	91	D	2	0	25	D	D	2	5	D	117	D				
Guided missile, space vehicle, and related parts	336414-15, 336419	1,166	0	493	0	D	8	D	0	0	60	100	0	4	6	0	3	0	0	0	*	0	26	0	206	D				
Military armored vehicle, tank, and tank components	336992	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Other transportation	other 336	181	0	40	i	0	D	1	D	0	3	24	0	0	12	0	1	0	4	0	D	*	D	D	23	5				
Furniture and related products	337	36	0	3	0	0	0	0	0	0	8	4	0	0	0	0	0	0	0	0	0	0	0	0	6	13				
Miscellaneous	339	4,631	52	D	D	64	i	5	D	D	D	555	24	372	56	0	134	49	8	55	30	89	261	D	256	D				
Medical equipment and supplies	3391	4,234	52	101	40	64	i	5	5	59	245	517	24	372	47	i	0	133	49	8	55	30	79	259	3	i	215	109		
Other miscellaneous manufacturing	3399	397	0	D	D	0	*	D	D	D	38	0	0	9	0	1	0	*	0	0	10	2	D	41	D					
Nonmanufacturing industries	21-23, 42-81	65,165	14	i	6,029	201	482	687	312	312	1,991	2,961	263	3,034	515	i	108	i	1,141	119	692	295	i	934	785	2,530	201	i	11,030	2,450
Mining, quarrying, oil and gas extraction, and support activities	21	D	0	D	0	D	0	0	0	0	D	0	0	0	0	0	D	0	0	0	0	0	0	0	0	D	0			
Utilities	22	D	0	D	*	0	*	0	0	0	*	0	0	0	0	0	0	0	*	0	*	0	0	0	0	D	0			
Wholesale trade	42	D	0	D	0	0	0	0	0	0	*	18	i	0	0	0	0	*	i	0	0	0	0	0	0	1	0			
Electronic shopping and electronic auctions	454111-12	D	0	D	D	1	i	D	2	i	2	i	D	D	*	i	D	D	D	D	0	D	D	D	D	D	D			

TABLE 45-A

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part A): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Puerto Rico ^a	Canada	Austria	Belgium	Czechia	Denmark	Finland	France	Germany	Hungary	Ireland	Italy	Luxembourg	Netherlands	Norway	Poland	Russia	Spain	Sweden	Switzerland	Turkey	United Kingdom	Other European locations																			
Transportation and warehousing	48-49	121	0	87	0	0	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	0	0	*	1																			
Information	51	36,948	1	3,735	84	229	426	256	187	944	1,336	118	1,584	100	9	606	81	378	114	521	498	1,756	143	6,284	1,543																			
Publishing	511	12,330	*	1,562	39	56	222	152	83	238	438	24	315	D	4	123	57	D	65	193	364	D	D	1,269	516																			
Newspaper, periodical, book, and directory publishers	5111	* i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																			
Software publishers	5112	12,330	*	1,562	39	56	222	152	83	238	438	24	315	D	4	123	57	D	65	193	364	D	D	1,269	516																			
Telecommunications	517	201	0	D	0	D	*	0	0	0	38	i	0	6	0	0	1	*	0	0	D	D	1	0	12	D																		
Data processing, hosting, and related services	518	12,242	*	1,442	D	37	196	D	D	516	418	84	858	44	2	156	21	175	48	217	D	D	D	1,160	662																			
Other information	other 51	12,176	*	D	D	D	8	D	D	190	442	10	404	D	4	327	2	D	1	D	D	D	D	3,842	D																			
Finance and insurance	52	2,612	*	375	*	D	D	*	*	20	D	18	D	D	D	D	0	D	D	D	D	D	D	596	48																			
Real estate and rental and leasing	53	102	i	0	D	*	* i	* i	* i	0	6	i	D	0	D	D	0	*	0	1	0	* i	* i	0	0	D	* i																	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1	i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																		
Other real estate and rental and leasing	other 53	101	i	0	D	*	* i	* i	* i	0	6	i	D	0	D	D	0	*	0	1	0	* i	* i	0	0	D	* i																	
Professional, scientific, and technical services	54	19,028	i	12	i	1,427	108	i	233	i	255	55	i	122	890	i	1,100	126	i	272	i	357	i	D	490	D	282	i	178	i	355	i	171	i	746	D	3,601	i	793	i				
Architectural, engineering, and related services	5413	36	4	r	3	*	0	0	*	0	0	0	0	*	0	1	i	0	0	0	0	2	0	*	5	0																		
Computer systems design and related services	5415	4,575	4	i	514	4	21	79	8	18	125	350	D	78	57	D	33	D	62	7	i	61	14	138	D	409	126																	
Scientific research and development services	5417	13,571	i	4	i	788	i	103	i	212	i	176	i	46	i	104	685	i	695	i	113	i	192	i	288	i	4	428	34	216	i	171	i	285	i	142	i	606	37	i	2,904	i	647	i
Research and development in nanotechnology	541713	30	0	* i	0	0	0	0	0	0	0	* i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*																	
Research and development in biotechnology (except nanobiotechnology)	541714	4,073	i	0	201	i	5	37	i	14	i	10	6	121	i	201	i	16	i	5	64	i	0	37	i	5	43	i	30	i	92	i	14	i	537	8	1,163	i	104	i				
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	9,466	i	2	i	586	97	i	175	i	162	i	36	i	98	565	i	495	i	97	i	188	i	224	i	4	391	30	173	i	141	i	193	i	129	i	69	i	29	i	1,741	i	543	i
Research and development in the social sciences and humanities	541720	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																	
Other professional, scientific, and technical services	other 54	847	0	122	1	*	*	1	1	80	53	D	2	11	0	28	1	4	*	9	13	1	D	283	20	i																		

TABLE 45-A

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part A): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Puerto Rico ^a	Canada	Austria	Belgium	Czechia	Denmark	Finland	France	Germany	Hungary	Ireland	Italy	Luxembourg	Netherlands	Norway	Poland	Russia	Spain	Sweden	Switzerland	Turkey	United Kingdom	Other European locations							
Health care services	621-23	93	0	D	0	0	0	0	0	D	0	*	0	0	0	6	0	0	0	D	2	D	0	33	0							
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	146	1	D	D	D	0	0	0	D	D	0	D	D	0	D	0	0	D	D	0	0	D	D	D							
All companies (number of domestic employees)	-	149,584	271	11,083	629	3,502	970	974	774	4,413	10,326	435	5,596	1,944	427	3,872	453	1,484	870	i	1,932	1,527	6,471	357	i	17,335	4,453					
Small companies																																
10-19 ^b	-	260	0	54	i	*	9	D	D	0	2	4	*	*	* r	*	1	0	2	23	r	5	2	18	0	21	1					
20-49	-	941	1	89	r	D	*	D	3	3	r	3	D	8	6	*	5	3	18	r	2	r	5	1	38	0	53	29				
Medium companies																																
50-99	-	962	4	49	r	D	18	D	D	3	12	57	D	19	10	D	6	D	6	6	6	20	14	D	106	76	r					
100-249	-	2,017	2	241		16	19	13	D	2	50	107	10	64	22	D	35	0	15	15	52	27	27	3	235	132						
Large companies																																
250-499	-	4,240	0	271		20	21	r	2	25	4	109	142	21	63	95	0	87	D	40	4	55	42	610	D	324	263					
500-999	-	4,657	D	446		35	29		28	17	31	54	329	88	197	56	D	114	27	39	52	i	69	86	163	D	501	242				
1,000-4,999	-	24,407	D	2,613		46	237		233	257	185	1,000	1,896	59	i	1,083	209	D	439	D	282	111	328	311	722	135	i	3,021	940			
5,000-9,999	-	13,616	11	1,513		29	162		D	248	63	401	963	19		203	255	D	268	65	151	2	268	258	282	26	931	367				
10,000-24,999	-	32,036	108	1,624		153	627		146	122	172	1,457	1,983	140		894	i	703	1	656	102	262	185	i	593	290	723	61	4,319	i	875	i
25,000 or more	-	66,448	D	4,182		280	2,381		528	274	312	1,326	4,810	97	i	3,066	587	232	2,261	219	671	470	i	550	490	3,876	115	i	7,824	1,527		

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Puerto Rico is not included in the U.S. total due to its classification as a U.S. territory.^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Country detail was not collected from companies reporting less than \$1 million of R&D paid for by the company or reporting less than \$1 million of R&D paid for by others. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 45-B

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part B): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Argentina	Brazil	Chile	Mexico	Other Latin American locations	Australia	China	Hong Kong	India	Indonesia	Japan	Malaysia	New Zealand	Singapore	South Korea	Taiwan	Thailand	Other Asian or Pacific locations	Israel	Other Middle Eastern locations	South Africa	Other African locations	Undistributed ^a
All industries	21-23, 31-33, 42-81	149,584	544 i	1,623	271 i	1,649	1,858 i	2,718	13,052	566	18,266	39	5,293	1,233	266	4,003	1,972	3,276	386	1,001 i	10,025	404	344 i	288	410 i
Manufacturing industries	31-33	84,419	222	1,049	170 i	1,111	1,550 i	1,305	9,207	351	8,420	22	3,299	1,127	137	2,581	1,348	2,070	338	579 i	5,772	229	75	182	261 i
Food	311	1,463	26	122	12	68	88	46	118	2	50	6	6	5	6	22	3	1	20	18	*	6	20	12	D
Beverage and tobacco products	312	630	0	D	0	D	0	*	36	9	1	2	20	0	*	21	0	0	0	5	D	0	0	0	D
Textile, apparel, and leather products	313-16	113	0	1	0	D	D	2	12	11	*	0	*	0	0	1 i	1	*	*	15 i	0	0	0	*	D
Wood products	321	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 i
Paper	322	81	0	0	0	0	0	0	6 i	0	0	0	0	0	0	1	32 i	0	0	0	0	D	0	0	D
Printing and related support activities	323	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	* i
Petroleum and coal products	324	247	0	D	0	0	0	0	33	0	5	0	2	0	0	2	*	0	0	0	0	D	0	0	D
Chemicals	325	25,061	163	375	143 i	188	287	537	2,153	83	433	8	1,722	20	15	377	257	176 i	32	48	337	123	45	22	50 i
Basic chemicals	3251	956	3	26	1	10	3	4	103 i	1	9	2	12	1	2	49	2	3	1	1	5	15	4	1	8 i
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	539	D	17	0	4	D	2	96	4	9	*	27	*	0	3	11	1	2	2	0	7	*	*	1 i
Pesticide, fertilizer, and other agricultural chemicals	3253	151	3	19	2	4	1	2	4	8	D	1	1	*	*	D	*	*	1	1	0	0	*	*	D
Pharmaceuticals and medicines	3254	22,266	151	285	139 i	154	261	527	1,746	69	386	4	1,657	16	13	222 i	240	169 i	25	32	330	98	39	19	D
Soap, cleaning compound, and toilet preparations	3256	917	3	26	1	6	19	3	154	1	10 i	1	24	1	*	87	2	*	1	2	*	2	2	2	D
Paint, coating, adhesive, and other chemicals	3255, 3259	232	D	2	1	10	D	1	51	*	D	*	2	2	0	D	2	3	1	11	2	0	*	0	D
Plastics and rubber products	326	682	D	14	1	17	D	5	139 i	*	1	1	23	0	*	1	2 i	*	6	0	17	0	D	D	D
Nonmetallic mineral products	327	159	0	2	0	5	0	0	25	*	1	0	0	0	0	0	38	5	0	0	16	0	0	0	1 i
Primary metals	331	19	0	0	0	0	0	*	2	0	0	0	0	1	0	*	0	0	0	3	0	0	0	0	* i
Fabricated metal products	332	231	D	D	*	5	D	2	15	0	5	*	63	*	*	1	*	2	*	*	0	D	D	0	D
Machinery	333	5,914	4	127	1	78	4	58	607	7	598	1	155	59	17	269	206	172 i	9	10	452	18	D	D	D
Agricultural implement	33311	990	D	D	0	D	0	D	31	0	D	0	0	*	3	0	*	0	0	0	0	0	0	0	* i
Semiconductor machinery	333242	1,636	0	0	0	0	0	0	140 i	5	226 i	0	35 i	55	0	245	197	141 i	0	1	399 i	0	0	0	* i
Engine, turbine, and power transmission equipment	3336	1,071	0	11	*	9	2	27	127	*	149	1	47	0	10	2	0	0	5	*	1	11	0	D	0
Other machinery	other 333	2,217	D	D	1 i	D	2	D	309	2	D	*	72	3	5	21	8	31	4	8	51	7	D	D	D
Computer and electronic products	334	35,536	D	D	1	198	1,068 i	177	4,348	88	6,629	3	995	1,031	91	1,614	367	1,650	235	431 i	4,497	41	D	D	D
Communications equipment	3342	3,509	D	D	0	25 i	0	60	355	13	971	0	D	D	13	19 i	21	82	D	*	221	7	D	D	0

TABLE 45-B

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part B): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Argentina	Brazil	Chile	Mexico	Other Latin American locations	Australia	China	Hong Kong	India	Indonesia	Japan	Malaysia	New Zealand	Singapore	South Korea	Taiwan	Thailand	Other Asian or Pacific locations	Israel	Other Middle Eastern locations	South Africa	Other African locations	Undistributed ^a
Semiconductor and other electronic components	3344	21,784	D	D	*	151	D	25 i	3,114	36 i	4,882	1	614	740	D	1,105	228	1,030	D	361 i	3,313	6	0	D	D
Navigational, measuring, electromedical, and control instruments	3345	2,668	*	D	*	9	D	48	289	14	110	2	50	56	29	106	9	18	1 i	35	54	6	3	D	D
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	429	*	*	D	D	D	10	9	*	2	*	2	*	*	70	1	1	*	1	15	6	*	D	* i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	327	0	5	0	1	0	5	2	0	30	0	*	2	28	8	0	0	0	1	6	0	3	0	3 i
Other measuring and controlling devices	other 3345	1,912	*	D	D	D	D	33	278	14	78	2	48	54	*	28	8	17	* i	34	33	0	*	0	D
Other computer and electronic products	other 334	7,575	*	D	*	13	D	43	590	25	665	0	D	D	D	384	109	520	D	34	909	22	D	0	0
Electrical equipment, appliances, and components	335	1,575	0	49	*	64	1	3	272	3	75	*	41	*	1	32	*	20	10	2	25	1	D	0	D
Transportation equipment	336	8,035	3	249	*	445	4	344	976	D	313	0	72	*	0	168	381	26	21	D	5	6	D	D	D
Motor vehicles, bodies, trailers, and parts	3361-63	6,035	3	D	*	D	D	288	886	D	171	0	65	*	0	110 i	381	6	20	D	3	0	D	D	D
Aerospace products and parts	3364	1,819	0	D	0	D	D	55	89	*	137	0	7	0	0	59	*	*	1	3	2	6	0	0	D
Aircraft, aircraft engine, and aircraft parts	336411-13	653	0	D	0	D	D	D	D	0	D	0	7	0	0	3	*	*	*	0	0	D	0	0	D
Guided missile, space vehicle, and related parts	336414-15, 336419	1,166	0	D	0	D	0	D	D	*	D	0	*	0	0	56	0	*	*	3	2	D	0	0	0
Military armored vehicle, tank, and tank components	336992	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other transportation	other 336	181	0	0	0	0	0	*	1	0	5	0	0	0	0	0	0	19	0	0	0	0	D	0	D
Furniture and related products	337	36	0	0	0	D	0	0	0	0	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0
Miscellaneous	339	4,631	2 i	22 i	12 i	28	D	131	464	D	308	1 i	201	11	5	73	60	17	5	D	D	21 i	D	D	D
Medical equipment and supplies	3391	4,234	2 i	21 i	12 i	28	89 i	105	454	2 i	282	1 i	178	6 i	5	72	44	11	5	34 i	384	21 i	D	D	D
Other miscellaneous manufacturing	3399	397	0	*	0	*	D	26	10	D	27	0	23	5	*	1	16	6	0	D	D	0	0	0	D
Nonmanufacturing industries	21-23, 42-81	65,165	321 i	574 i	101	538	308	1,413	3,845	215 i	9,846	17	1,994 i	106	129	1,423	625 i	1,205	48 i	422	4,253	175 i	269 i	106	149 i
Mining, quarrying, oil and gas extraction, and support activities	21	D	0	0	0	0	0	D	0	0	D	0	D	0	0	0	0	0	0	0	0	0	D	0	D

TABLE 45-B

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part B): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Argentina	Brazil	Chile	Mexico	Other Latin American locations	Australia	China	Hong Kong	India	Indonesia	Japan	Malaysia	New Zealand	Singapore	South Korea	Taiwan	Thailand	Other Asian or Pacific locations	Israel	Other Middle Eastern locations	South Africa	Other African locations	Undistributed ^a																								
Utilities	22	D	0	*	0	D	0	*	*	0	0	*	0	0	*	0	0	0	D	0	D	0	D	0	0																								
Wholesale trade	42	D	0	0	0	0	D	0	D	*	D	0	0	0	0	0	0	0	0	0	D	0	0	0	D																								
Electronic shopping and electronic auctions	454111-12	D	2	i	D	D	D	D	D	D	D	1	i	D	D	1	i	D	D	D	D	D	D	*	i	0																							
Transportation and warehousing	48-49	121	0	0	0	0	0	D	D	*	0	0	0	0	0	0	0	0	0	0	D	0	0	0	1	i																							
Information	51	36,948	106	i	159	56	222	156	694	2,086	95	6,626	12	428	72	75	581	233	898	16	230	3,108	35	D	D	44	i																						
Publishing	511	12,330	D	D	D	26	D	D	1,267	D	2,558	D	112	64	25	192	162	241	13	133	1,226	17	6	37	D																								
Newspaper, periodical, book, and directory publishers	5111	*	i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	i																							
Software publishers	5112	12,330	D	D	D	26	D	D	1,267	D	2,558	D	112	64	25	192	162	241	13	133	1,226	17	6	37	D																								
Telecommunications	517	201	*	0	0	D	D	*	D	D	30	0	0	0	0	D	D	*	0	0	80	*	*	0	D																								
Data processing, hosting, and related services	518	12,242	96	i	49	3	183	116	303	483	2	3,443	D	52	7	42	90	D	27	D	88	791	10	D	D	34	i																						
Other information	other 51	12,176	D	D	D	D	D	D	D	D	595	D	264	1	8	D	D	630	D	9	1,011	7	D	D	0																								
Finance and insurance	52	2,612	1	i	D	D	D	10	44	i	63	D	823	*	D	D	D	D	*	30	46	D	D	D	0																								
Real estate and rental and leasing	53	102	i	0	*	i	0	*	i	*	i	1	i	D	0	D	*	i	*	i	1	0	*	*	0	*	i	*	i	*	r																		
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1	i	0	0	0	0	0	1	i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																							
Other real estate and rental and leasing	other 53	101	i	0	*	i	0	*	i	*	i	*	i	D	0	D	*	i	*	i	1	0	*	*	0	*	i	*	i	*	r																		
Professional, scientific, and technical services	54	19,028	i	212	i	224	i	34	i	276	i	107	i	323	i	1,218	29	i	1,695	i	4	i	938	i	D	36	i	407	i	D	284	i	31	i	144	i	D	D	182	i	20	i	71	i					
Architectural, engineering, and related services	5413	36	0	*	*	i	*	0	1	1	*	4	0	2	0	*	*	*	3	0	*	i	*	1	*	i	0	5	r																				
Computer systems design and related services	5415	4,575	13	47	1	i	46	36	r	44	248	*	942	2	r	63	D	2	52	D	155	i	5	r	13	r	686	11	11	6	58	i																	
Scientific research and development services	5417	13,571	i	199	i	166	i	31	i	186	i	68	i	261	i	956	i	28	i	702	i	2	i	864	i	18	i	34	i	343	i	193	i	120	i	25	i	131	i	162	i	15	i	166	i	12	i	7	i
Research and development in nanotechnology	541713	30	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	5	0	0	0	2	0	0	0	0																							
Research and development in biotechnology (except nanobiotechnology)	541714	4,073	i	58	i	37	12	i	48	i	18	i	119	i	443	12	i	178	*	i	194	i	4	i	17	i	22	i	68	i	24	i	4	i	9	i	80	i	1	i	12	i	0	1	i				

TABLE 45-B

R&D paid for by the company and others and performed by the company outside of the United States, by selected location, industry, and company size (part B): 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Total outside the United States	Argentina	Brazil	Chile	Mexico	Other Latin American locations	Australia	China	Hong Kong	India	Indonesia	Japan	Malaysia	New Zealand	Singapore	South Korea	Taiwan	Thailand	Other Asian or Pacific locations	Israel	Other Middle Eastern locations	South Africa	Other African locations	Undistributed ^a	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	9,466 i	140 i	129 i	20 i	138 i	51 i	141 i	491 i	17 i	524 i	2 i	670 i	14 i	18 i	321 i	120 i	96 i	21 i	121 i	80 i	14 i	153 i	12 i	6 i	
Research and development in the social sciences and humanities	541720	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Other professional, scientific, and technical services	other 54	847	*	11	2	44	3	18	13	*	46	*	10	*	*	12	17	7	*	*	D	D	6	1	1 i	
Health care services	621-23	93	0	D	0	0	0	D	D	0	0	0	D	1	0	1	0	0	0	D	0	0	0	0	D	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	146	0	D	D	*	D	D	1	D	D	0	0	0	0	0	*	*	r	*	D	D	D	0	0	D
All companies (number of domestic employees)	-	149,584	544 i	1,623	271 i	1,649	1,858 i	2,718	13,052	566	18,266	39	5,293	1,233	266	4,003	1,972	3,276	386	1,001 i	10,025	404	344 i	288	410 i	
Small companies																										
10-19 ^b	-	260	4 r	*	0	*	4 r	5	7	4	34	0	1	4	0	0	9	5	0	1 i	10	2	*	0	29 i	
20-49	-	941	10	11 r	*	10 r	35 r	24	265	6	48	2 r	4	5 r	3	2	9	47	5 r	2	45 r	1	3	*	65 i	
Medium companies																										
50-99	-	962	1	6	1	7	28 r	10	110	67 r	102	D	5	0	D	5	14	41	0	20	56	2	8	*	24 i	
100-249	-	2,017	D	D	5	15	D	28	188	13	234	0	21	5	3	16	39	114	1	23	145	10	1	1	28 i	
Large companies																										
250-499	-	4,240	7	39	1	60	28	36	479	31	477	D	60	10	D	159	159	120	*	33	306	6	6	2	8 i	
500-999	-	4,657	7 i	13	8	39	51	59	256	9	600	1	65	16	35	66	18	105	13	42	519	11	2	*	D	
1,000-4,999	-	24,407	55	139	10	214	59	415	1,912	113	3,513	5	322	85	26	739	187	364	118	460 i	1,403	20	21	3	D	
5,000-9,999	-	13,616	D	D	4	116	D	184	1,529	14	1,177	4	845	325 i	43	924	59	293	126	58	546	57	12	27	1 i	
10,000-24,999	-	32,036	245 i	426	37 i	340	490 i	581	2,801	79	5,619	9	1,605 i	82	69	749	657	877	47	80	795	72	145 i	33	3 i	
25,000 or more	-	66,448	200 i	911	204 i	847	618	1,376	5,505	231	6,463	16	2,365	701	76	1,344	822	1,310	75	283	6,201	224	147 i	223	D	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Includes data reported that were not allocated to a specific country.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Country detail was not collected from companies reporting less than \$1 million of R&D paid for by the company or reporting less than \$1 million of R&D paid for by others. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 46

Worldwide, foreign, and domestic capital expenditures and capital expenditures for R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide capital expenditures			Foreign capital expenditures			Domestic capital expenditures			Domestic capital expenditures for R&D			Domestic capital expenditures for R&D (type of property)					
		Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Land acquisition	Buildings and land improvement	Machinery and equipment	Capitalized software	Other intellectual property	All other
All industries	21-23, 31-33, 42-81	1,088,280	993,314	94,965	218,741	203,823	14,919	869,538	789,492	80,047	36,069	31,655	4,414	155	5,135	22,228	2,743	3,726	2,082
Manufacturing industries	31-33	446,684	415,504	31,180	136,573	130,849	5,725	310,111	284,655	25,456	23,717	20,988	2,729	100	3,790	14,713	1,466	2,144	1,504
Food	311	45,943	43,461	2,481	11,102	10,483	619	34,841	32,978	1,863	544	542	2	4	141	382	3	1	12
Beverage and tobacco products	312	8,780	7,965	815	2,738	2,705	33	6,041	5,260	782	76	74	2	*	7	66	2	*	1
Textile, apparel, and leather products	313-16	3,578	3,372	205	981	958	23	2,596	2,415	182	44	42	2	*	15	24	2	1	1
Wood products	321	3,032	3,030	2	76	76	0	2,956	2,954	2	40	39	1	0	2	34	2	*	2
Paper	322	5,474	5,471	3	436	436	*	5,037	5,035	3	266	266	*	0	2	264	*	0	*
Printing and related support activities	323	1,311	1,177	135	91	91	*	1,220	1,085	135	12	12	*	0	0	11	*	0	*
Petroleum and coal products	324	30,051	D	D	D	D	D	D	D	D	142	141	1	0	16	119	2	*	5
Chemicals	325	87,797	79,451	8,346	24,865	22,232	2,633	62,932	57,219	5,713	6,121	5,180	941	52	1,611	2,988	323	884	263
Basic chemicals	3251	25,088	22,971	2,117	7,543	5,995	1,548	17,545	16,976	569	392	390	2	10	159	216	1	3	4
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	6,029	5,964	65	1,349	1,348	1	4,680	4,617	63	171	168	3	*	11	137	17	*	6
Pesticide, fertilizer, and other agricultural chemicals	3253	2,620	2,398	223	217	D	D	2,403	D	D	55	54	1	1	7	44	*	2	1
Pharmaceuticals and medicines	3254	39,960	35,786	4,173	11,481	10,712	769	28,479	25,074	3,404	5,234	4,303	931	41	1,332	2,453	290	877	241
Soap, cleaning compound, and toilet preparations	3256	10,073	9,235	838	3,140	3,140	0	6,933	6,095	838	195	194	1	0	92	84	13	0	7
Paint, coating, adhesive, and other chemicals	3255, 3259	4,027	3,096	931	1,136	D	D	2,891	D	D	73	70	3	0	10	54	3	3	4
Plastics and rubber products	326	15,663	15,198	465	2,886	2,850	36	12,777	12,348	429	320	312	8	13	48	225	11	5	17
Nonmetallic mineral products	327	6,968	6,912	56	2,037	2,036	1	4,931	4,876	56	70	68	1	0	31	37	*	1	1
Primary metals	331	10,608	9,028	1,580	505	504	1	10,103	8,524	1,579	225	225	*	7	75	142	1	0	0
Fabricated metal products	332	8,412	7,975	437	892	873	19	7,520	7,102	418	300	274	27	2	10	251	5	17	16
Machinery	333	24,218	22,366	1,852	7,894	7,568	326	16,324	14,798	1,526	1,788	1,409	379	1	255	978	167	39	349

TABLE 46

Worldwide, foreign, and domestic capital expenditures and capital expenditures for R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide capital expenditures			Foreign capital expenditures			Domestic capital expenditures			Domestic capital expenditures for R&D			Domestic capital expenditures for R&D (type of property)					
		Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Land acquisition	Buildings and land improvement	Machinery and equipment	Capitalized software	Other intellectual property	All other
Agricultural implement	33311	2,915	2,532	383	890	889	1	2,026	1,643	383	141	121	20	0	12	106	15	7	1
Semiconductor machinery	333242	3,340	3,188	152	1,869	1,867	1	1,471	1,321	151	581	573	8	0	108	346	49	1	77
Engine, turbine, and power transmission equipment	3336	4,170	3,947	223	1,372	1,364	8	2,798	2,583	215	144	142	2	0	7	127	2	2	6
Other machinery	other 333	13,793	12,700	1,094	3,764	3,448	317	10,029	9,252	777	922	572	350	1	128	399	101	30	264
Computer and electronic products	334	90,642	86,611	4,031	43,084	42,671	413	47,559	43,940	3,619	8,444	7,749	695	2	721	6,106	514	788	312
Communications equipment	3342	4,728	3,053	1,675	873	749	123	3,855	2,304	1,551	482	384	99	1	D	307	71	D	D
Semiconductor and other electronic components	3344	58,413	57,302	1,111	31,979	31,928	51	26,434	25,374	1,060	4,981	4,666	315	1	185	3,846	239	491	220
Navigational, measuring, electromedical, and control instruments	3345	6,291	5,798	493	1,567	1,330	237	4,724	4,468	256	479	453	26	0	41	370	29	D	D
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	1,513	1,301	212	294	218	76	1,219	1,083	136	149	141	8	0	7	118	19	D	D
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	985	975	9	70	70	0	914	905	9	134	131	4	0	22	96	D	D	D
Other measuring and controlling devices	other 3345	3,793	3,521	272	1,202	1,042	161	2,591	2,480	111	195	181	14	0	12	156	D	D	D
Other computer and electronic products	other 334	21,210	20,458	753	8,665	8,663	2	12,545	11,794	751	2,503	2,247	256	0	D	1,583	175	D	D
Electrical equipment, appliances, and components	335	9,159	8,023	1,136	2,483	2,225	258	6,676	5,798	878	675	645	30	*	44	495	28	14	94
Transportation equipment	336	71,114	64,079	7,034	14,737	14,402	335	56,376	49,677	6,699	3,128	2,693	435	12	542	1,892	245	253	183
Motor vehicles, bodies, trailers, and parts	3361-63	54,675	48,240	6,435	11,949	11,892	57	42,726	36,348	6,378	2,159	1,761	398	8	339	1,218	193	250	152
Aerospace products and parts	3364	13,237	12,683	554	2,455	2,177	278	10,782	10,506	276	819	794	25	4	168	574	49	2	22
Aircraft, aircraft engine, and aircraft parts	336411-13	7,958	7,830	128	785	773	11	7,173	7,056	117	408	391	17	4	50	313	26	2	13

TABLE 46

Worldwide, foreign, and domestic capital expenditures and capital expenditures for R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide capital expenditures			Foreign capital expenditures			Domestic capital expenditures			Domestic capital expenditures for R&D			Domestic capital expenditures for R&D (type of property)					
		Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Land acquisition	Buildings and land improvement	Machinery and equipment	Capitalized software	Other intellectual property	All other
Guided missile, space vehicle, and related parts	336414-15, 336419	5,279	4,853	426	1,671	1,404	267	3,609	3,449	160	411	403	9	0	118	261	23	0	10
Military armored vehicle, tank, and tank components	336992	45	D	D	0	0	0	45	D	D	* i	* i	* i	0	* i	* i	* i	* i	* i
Other transportation	other 336	3,157	D	D	334	334	0	2,824	D	D	150	138	12 r	1	35	100	3	1 i	9
Furniture and related products	337	964	937	28	76	76	0	889	861	28	19	19	*	*	6	9	1	* r	4
Miscellaneous	339	22,971	D	D	D	D	D	D	D	D	1,503	1,299	204	7 i	264	689	161	139	243
Medical equipment and supplies	3391	17,410	16,223	1,187	5,993	5,787	206	11,416	10,436	980	1,259	1,075	183	7 i	246	525	111	134	236
Other miscellaneous manufacturing	3399	5,561	D	D	D	D	D	D	D	D	244	224	20 i	0	18	164	49 i	5 i	8 i
Nonmanufacturing industries	21-23, 42-81	641,595	577,810	63,785	82,168	72,974	9,194	559,428	504,837	54,591	12,353	10,667	1,686	55 i	1,345 i	7,515	1,277 i	1,582 i	578
Mining, quarrying, oil and gas extraction, and support activities	21	41,127	40,873 i	254 i	9,429 i	9,348 i	81 i	31,698	31,525 i	173 i	D	231 i	D	0	D	186 i	86 i	D	D
Utilities	22	129,020	127,887	1,133	1,473	1,473	0	127,547	126,414	1,133	D	D	20 i	0	0	D	31 i	0	D
Wholesale trade	42	7,813 i	7,691 i	122 i	D	D	2	D	D	121 i	49	44 i	5	* r	4	22 i	17 i	D	D
Electronic shopping and electronic auctions	454111-12	D	D	1,577	D	D	D	D	D	D	D	D	D	0	0	D	24 i	D	0
Transportation and warehousing	48-49	30,013	27,010	3,003 i	2,899 i	521	2,378 i	27,114	26,490	625 i	303	302	1 i	0	79	132	13	*	79
Information	51	256,553	216,635	39,918	38,299	32,489	5,810	218,255	184,146	34,108	7,889	7,088	802 i	13 i	765 i	5,062	878 i	886 i	285
Publishing	511	52,966	38,328	14,638	20,806	16,972	3,834	32,160	21,356	10,804	2,916	2,814	103 i	9 i	67 i	2,477	214	D	D
Newspaper, periodical, book, and directory publishers	5111	47	32	15	0	0	0	47	32	15	1 i	1 i	* r	0	0	* i	1 i	0	* i
Software publishers	5112	52,919	38,296	14,623	20,806	16,972	3,834	32,114	21,324	10,789	2,915	2,813	103 i	9 i	67 i	2,477	214	D	D
Telecommunications	517	93,881	78,985	14,897	464	426	38 i	93,417	78,558	14,859	487 i	178 i	309 i	0	61 i	116 i	309 i	0	*
Data processing, hosting, and related services	518	27,744	21,566	6,178	6,190	5,251	939 i	21,554	16,315	5,239	1,053	686	367 i	4	188	368	304	138 i	52 i
Other information	other 51	81,962	77,756	4,206	10,839	9,840	999	71,123	67,916	3,207	3,433 i	3,410 i	23	* i	449 i	2,101	50	D	D
Finance and insurance	52	29,255	20,891	8,363	2,614	2,377	237	26,641	18,515	8,126	59 i	48 i	11	0	6	39	5 i	8	1 i

TABLE 46

Worldwide, foreign, and domestic capital expenditures and capital expenditures for R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide capital expenditures			Foreign capital expenditures			Domestic capital expenditures			Domestic capital expenditures for R&D			Domestic capital expenditures for R&D (type of property)					
		Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Land acquisition	Buildings and land improvement	Machinery and equipment	Capitalized software	Other intellectual property	All other
Real estate and rental and leasing	53	22,173	22,134	39	1,088	1,088	0	21,085	21,046	39	145	143	2	0	7	135	3	0	*
Lessors of nonfinancial intangible assets (except copyrighted works)	533	9	5	4	0	0	0	9	5	4	*	*	*	0	*	*	*	0	0
Other real estate and rental and leasing	other 53	22,164	22,129	35	1,088	1,088	0	21,076	21,041	35	145	142	2	0	7	135	3	0	*
Professional, scientific, and technical services	54	32,407	24,935	7,473	4,886	4,705	181	27,522	20,230	7,292	2,370	2,102	269	42	479	1,311	216	165	158
Architectural, engineering, and related services	5413	3,685	3,316	368	210	209	1	3,475	3,107	368	91	83	8	0	5	62	11	2	11
Computer systems design and related services	5415	12,835	10,563	2,272	2,417	2,279	139	10,418	8,284	2,133	528	456	72	0	19	362	81	27	40
Scientific research and development services	5417	11,166	8,310	2,856	1,901	1,884	17	9,266	6,426	2,839	1,423	1,324	98	41	426	737	54	68	97
Research and development in nanotechnology	541713	157	143	14	30	22	8	127	121	5	21	17	4	*	*	16	*	4	0
Research and development in biotechnology (except nanobiotechnology)	541714	3,093	1,466	1,628	26	26	0	3,067	1,440	1,628	345	340	5	8	130	161	26	2	17
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	7,897	6,689	1,208	1,845	1,836	9	6,052	4,854	1,199	1,055	966	90	32	295	558	28	61	80
Research and development in the social sciences and humanities	541720	19	12	7	*	*	0	19	12	7	2	2	*	0	*	2	0	*	0
Other professional, scientific, and technical services	other 54	4,721	2,746	1,976	357	333	24	4,364	2,412	1,952	329	239	89	1	29	150	70	68	10
Health care services	621-23	2,660	2,412	248	87	77	10	2,573	2,336	238	38	34	3	0	*	20	2	15	*

TABLE 46

Worldwide, foreign, and domestic capital expenditures and capital expenditures for R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide capital expenditures			Foreign capital expenditures			Domestic capital expenditures			Domestic capital expenditures for R&D			Domestic capital expenditures for R&D (type of property)									
		Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Land acquisition	Buildings and land improvement	Machinery and equipment	Capitalized software	Other intellectual property	All other				
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	D	1,654	D	D	D	D	D	D	D	D	1	i	0	D	D	2	i	D	19	i	
All companies (number of domestic employees)	-	1,088,280	993,314	94,965	218,741	203,823	14,919	869,538	789,492	80,047	36,069	31,655	4,414	155	5,135	22,228	2,743	3,726	2,082				
Small companies																							
10-19 ^a	-	1,446	i 1,177	i 269	i 97	i 67	i 30	i 1,349	i 1,110	i 239	i 204	i 171	i 33	i 2	i 26	i 122	i 23	i 13	17				
20-49	-	7,440	6,250	1,190	742	707	35	6,698	5,543	1,154	847	734	114	18	87	583	48	i 50	62				
Medium companies																							
50-99	-	10,908	9,326	1,582	i 270	246	25	10,638	9,080	1,558	i 887	826	61	i 16	186	541	65	i 27	i 52				
100-249	-	18,109	15,656	2,453	2,810	2,727	83	15,299	12,928	2,371	1,540	1,351	190	8	i 268	949	125	110	80				
Large companies																							
250-499	-	19,195	16,566	2,629	3,808	3,598	210	15,387	12,967	2,419	1,322	1,155	167	3	i 262	724	132	123	78				
500-999	-	30,289	26,822	3,467	2,712	2,270	442	27,577	24,552	3,025	1,729	1,496	233	22	234	974	178	115	206				
1,000-4,999	-	112,088	102,051	10,036	20,756	19,330	1,426	91,332	82,722	8,611	4,944	4,421	523	40	878	2,933	i 473	i 325	296				
5,000-9,999	-	122,426	115,102	7,324	36,736	33,976	2,761	85,689	81,126	4,563	3,152	2,886	266	i 5	i 301	2,254	360	113	i 119				
10,000-24,999	-	251,493	230,683	20,810	46,829	42,073	4,756	204,664	188,610	16,054	7,313	6,066	1,246	26	1,226	4,286	429	999	346				
25,000 or more	-	514,887	469,682	45,204	103,981	98,830	5,151	410,906	370,853	40,053	14,131	i 12,551	i 1,581	16	i 1,666	i 8,863	909	i 1,850	i 826				

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. The "undistributed" column shown in prior years is no longer necessary because of processing improvements implemented beginning in 2015.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 47

Worldwide, domestic, and foreign total and R&D employment, by industry and company size: 2022

(Thousands and percent)

Industry and company size	NAICS code	Worldwide employees			Domestic employees			Foreign employees		
		Total	R&D	Percentage of R&D employees	Total	R&D	Percentage of R&D employees	Total	R&D	Percentage of R&D employees
All industries	21–23, 31–33, 42–81	36,453	3,186	8.7	24,092	2,110	8.8	12,361	1,076	8.7
Manufacturing industries	31–33	18,462	1,527	8.3	10,251	1,008	9.8	8,211	518	6.3
Food	311	2,138	46	2.2	1,393	30	2.2	745	16	2.1
Beverage and tobacco products	312	726	7	0.9	388	5	1.2	338	2	0.7
Textile, apparel, and leather products	313–16	343	6	1.9	189	5	2.6	154	2	1.0
Wood products	321	121	4	3.0	110	4	3.3	11	*	0.4
Paper	322	262	8	3.2	183	7	3.7	79	1	1.9
Printing and related support activities	323	120	2	1.6	96	2	1.9	23	*	0.2
Petroleum and coal products	324	146	6	4.0	94	4	4.2	51	2	3.8
Chemicals	325	2,534	302	11.9	1,446	217	15.0	1,088	85	7.8
Basic chemicals	3251	383	21	5.5	235	13	5.6	148	8	5.3
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	190	11	5.8	101	7	6.9	88	4	4.6
Pesticide, fertilizer, and other agricultural chemicals	3253	84	5	6.0	64	4	6.9	20	1	3.2
Pharmaceuticals and medicines	3254	1,139	233	20.5	664	172	25.9	475	61	12.9
Soap, cleaning compound, and toilet preparations	3256	442	19	4.4	220	12	5.6	222	7	3.2
Paint, coating, adhesive, and other chemicals	3255, 3259	296	12	4.1	161	9	5.5	135	3	2.5
Plastics and rubber products	326	715	30	4.2	490	22	4.5	225	8	3.5
Nonmetallic mineral products	327	239	7	3.1	141	6	4.3	98	1	1.2
Primary metals	331	225	8	3.6	175	8	4.3	50	1	1.1
Fabricated metal products	332	532	40	7.5	408	38	9.3	124	2	1.4
Machinery	333	1,942	167	8.6	941	105	11.1	1,001	62	6.2
Agricultural implement	33311	189	18	9.6	102	10	10.1	87	8	9.0
Semiconductor machinery	333242	124	28	22.9	41	14	34.6	83	14	17.2
Engine, turbine, and power transmission equipment	3336	341	26	7.6	139	15	11.1	202	10	5.1
Other machinery	other 333	1,287	95	7.4	659	65	9.9	628	30	4.7
Computer and electronic products	334	2,685	460	17.1	1,033	245	23.7	1,652	215	13.0
Communications equipment	3342	255	69	26.9	131	36	27.6	123	32	26.2
Semiconductor and other electronic components	3344	1,174	204	17.4	311	93	29.9	862	111	12.9
Navigational, measuring, electromedical, and control instruments	3345	587	77	13.1	319	53	16.5	268	24	9.0
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	129	20	15.6	103	16	16.1	26	4	13.7
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	87	20	22.4	66	16	24.0	21	4	17.4
Other measuring and controlling devices	other 3345	371	37	10.1	150	20	13.5	221	17	7.7
Other computer and electronic products	other 334	670	110	16.4	272	63	23.3	398	47	11.7
Electrical equipment, appliances, and components	335	759	42	5.5	373	27	7.3	386	14	3.7

TABLE 47

Worldwide, domestic, and foreign total and R&D employment, by industry and company size: 2022

(Thousands and percent)

Industry and company size	NAICS code	Worldwide employees			Domestic employees			Foreign employees		
		Total	R&D	Percentage of R&D employees	Total	R&D	Percentage of R&D employees	Total	R&D	Percentage of R&D employees
Transportation equipment	336	3,283	265	8.1	1,856	195	10.5	1,427	70	4.9
Motor vehicles, bodies, trailers, and parts	3361-63	1,988	164	8.3	896	110	12.3	1,092	54	4.9
Aerospace products and parts	3364	1,035	86	8.3	766	71	9.3	269	14	5.3
Aircraft, aircraft engine, and aircraft parts	336411-13	697	58	8.4	561	50	8.9	136	8	6.0
Guided missile, space vehicle, and related parts	336414-15, 336419	338	27	8.1	206	21	10.3	133	6	4.6
Military armored vehicle, tank, and tank components	336992	3	*	11.2	3	*	11.2	0	0	NA
Other transportation	other 336	257	15	5.8	191	12	6.5	66	2	3.7
Furniture and related products	337	157	5	2.9	124	4	3.4	33	*	1.1
Miscellaneous	339	1,536	122	7.9	811	85	10.5	726	37	5.1
Medical equipment and supplies	3391	1,173	102	8.7	573	69	12.1	600	33	5.5
Other miscellaneous manufacturing	3399	363	19	5.4	238	16	6.6	126	4	3.0
Nonmanufacturing industries	21-23, 42-81	17,991	1,660	9.2	13,840	1,102	8.0	4,150	558	13.4
Mining, quarrying, oil and gas extraction, and support activities	21	242	10	4.1	187	9	4.9	55	1	1.2
Utilities	22	344	5	1.6	335	5	1.6	9	*	2.1
Wholesale trade	42	641	22	3.4	524	21	4.0	117	1	0.7
Electronic shopping and electronic auctions	454111-12	D	D	D	D	77	D	D	D	D
Transportation and warehousing	48-49	1,462	19	1.3	1,183	18	1.5	279	1	0.3
Information	51	3,531	781	22.1	2,394	489	20.4	1,138	292	25.6
Publishing	511	826	258	31.3	480	145	30.2	346	114	32.8
Newspaper, periodical, book, and directory publishers	5111	5	1	12.0	5	1	12.6	*	0	0.0
Software publishers	5112	821	258	31.4	475	144	30.3	346	114	32.9
Telecommunications	517	573	13	2.2	518	11	2.0	55	2	3.5
Data processing, hosting, and related services	518	1,460	302	20.7	925	177	19.2	535	125	23.4
Other information	other 51	673	208	30.9	471	157	33.3	202	51	25.3
Finance and insurance	52	1,792	88	4.9	1,310	52	4.0	483	35	7.3
Real estate and rental and leasing	53	213	6	3.0	189	6	3.1	24	*	2.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1	*	5.9	1	*	4.0	*	*	19.9
Other real estate and rental and leasing	other 53	212	6	3.0	188	6	3.1	24	*	1.9
Professional, scientific, and technical services	54	2,696	549	20.4	1,646	376	22.9	1,049	173	16.5
Architectural, engineering, and related services	5413	418	70	16.7	328	69	21.0	90	1	0.9
Computer systems design and related services	5415	1,118	164	14.7	525	111	21.1	592	53	9.0
Scientific research and development services	5417	659	259	39.3	406	149	36.7	253	110	43.3
Research and development in nanotechnology	541713	4	2	41.9	3	1	40.7	*	*	56.3
Research and development in biotechnology (except nanobiotechnology)	541714	170	74	43.4	122	35	28.7	48	39	80.6

TABLE 47

Worldwide, domestic, and foreign total and R&D employment, by industry and company size: 2022

(Thousands and percent)

Industry and company size	NAICS code	Worldwide employees			Domestic employees			Foreign employees					
		Total	R&D	Percentage of R&D employees	Total	R&D	Percentage of R&D employees	Total	R&D	Percentage of R&D employees			
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	471	173	36.8	267	103	38.5	204	i	70	i	34.5	
Research and development in the social sciences and humanities	541720	14	10	72.3	14	10	72.3	*		*		69.5	
Other professional, scientific, and technical services	other 54	501	57	11.3	387	48	12.3	115		9		7.8	
Health care services	621-23	415	11	2.7	398	11	2.7	17		1		3.3	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	D	D	D	36	D	D		D		D	
All companies (number of domestic employees)	-	36,453	3,186	8.7	24,092	2,110	8.8	12,361		1,076		8.7	
Small companies													
10-19 ^a		-	100	37	37.3	86	34	39.3		14		3	24.6
20-49		-	311	98	31.5	267	89	33.4		44		9	20.4
Medium companies													
50-99		-	438	101	23.0	366	87	23.8		72		13	18.4
100-249		-	1,004	164	16.4	808	143	17.7		195		21	10.9
Large companies													
250-499		-	1,144	160	14.0	768	123	16.0		376		37	9.8
500-999		-	1,428	175	12.3	993	131	13.2		435		44	10.1
1,000-4,999		-	5,238	552	10.5	3,159	348	11.0		2,079		205	9.9
5,000-9,999		-	3,638	277	7.6	1,909	181	9.5		1,729		96	5.5
10,000-24,999		-	5,896	565	9.6	3,373	338	10.0		2,523		227	9.0
25,000 or more		-	17,256	1,057	6.1	12,363	636	5.1		4,893		421	8.6

* = amount < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; NA = not available.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 48

Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, R&D employment, and R&D cost per R&D employee, by industry and company size: 2022

(Millions of U.S. dollars, number of employees in thousands, and cost per employee in thousands of U.S. dollars)

Industry and company size	NAICS code	Company-performed R&D (US\$millions)			R&D employment (thousands)			Company-performed R&D per R&D employee (US\$thousands per employee)		
		Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign
All industries	21-23, 31-33, 42-81	841,131	691,547	149,584	3,186	2,110	1,076	264.0	327.8	139.0
Manufacturing industries	31-33	456,879	372,459	84,419	1,527	1,008	518	299.3	369.4	162.9
Food	311	8,605	7,143	1,463	46	30	16	185.8	235.4	91.6
Beverage and tobacco products	312	1,397	767	630	7	5	2	203.1	167.4	274.5
Textile, apparel, and leather products	313-16	748	635	113	6	5	2	116.2	130.3	72.2
Wood products	321	263	259	4	4	4	*	72.4	72.1	91.7
Paper	322	1,086	1,005	81	8	7	1	130.6	146.6	55.8
Printing and related support activities	323	167	165	2	2	2	*	86.8	88.5	32.6
Petroleum and coal products	324	1,107	860	247	6	4	2	189.6	219.5	128.5
Chemicals	325	150,790	125,728	25,061	302	217	85	499.4	578.4	296.4
Basic chemicals	3251	3,816	2,860	956	21	13	8	181.3	217.0	121.4
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	2,032	1,493	539	11	7	4	184.5	214.6	133.0
Pesticide, fertilizer, and other agricultural chemicals	3253	1,344	1,193	151	5	4	1	265.8	270.1	236.3
Pharmaceuticals and medicines	3254	138,339	116,073	22,266	233	172	61	593.2	676.0	362.1
Soap, cleaning compound, and toilet preparations	3256	3,803	2,886	917	19	12	7	196.0	234.1	129.7
Paint, coating, adhesive, and other chemicals	3255, 3259	1,456	1,223	232	12	9	3	119.2	139.2	67.9
Plastics and rubber products	326	4,151	3,470	682	30	22	8	137.4	155.8	85.7
Nonmetallic mineral products	327	1,623	1,464	159	7	6	1	222.1	239.3	133.5
Primary metals	331	1,139	1,120	19	8	8	1	140.1	147.8	35.0
Fabricated metal products	332	3,757	3,526	231	40	38	2	94.6	92.7	136.1
Machinery	333	25,378	19,464	5,914	167	105	62	151.9	185.6	95.1
Agricultural implement	33311	3,277	2,287	990	18	10	8	180.5	222.0	126.0
Semiconductor machinery	333242	7,074	5,438	1,636	28	14	14	248.9	386.2	114.1
Engine, turbine, and power transmission equipment	3336	4,097	3,026	1,071	26	15	10	159.0	196.0	103.7
Other machinery	other 333	10,930	8,713	2,217	95	65	30	115.4	134.0	74.8
Computer and electronic products	334	140,254	104,718	35,536	460	245	215	305.1	427.2	165.5
Communications equipment	3342	15,174	11,665	3,509	69	36	32	221.4	321.7	108.8
Semiconductor and other electronic components	3344	71,114	49,330	21,784	204	93	111	348.0	531.0	195.4
Navigational, measuring, electromedical, and control instruments	3345	15,445	12,777	2,668	77	53	24	200.9	242.9	109.9
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	5,007	4,578	429	20	16	4	249.0	277.8	118.3
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,473	4,146	327	20	16	4	229.4	262.0	89.0
Other measuring and controlling devices	other 3345	5,965	4,053	1,912	37	20	17	160.0	199.6	112.6
Other computer and electronic products	other 334	38,521	30,946	7,575	110	63	47	350.3	488.6	162.4
Electrical equipment, appliances, and components	335	8,661	7,086	1,575	42	27	14	208.1	260.3	109.3

TABLE 48

Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, R&D employment, and R&D cost per R&D employee, by industry and company size: 2022

(Millions of U.S. dollars, number of employees in thousands, and cost per employee in thousands of U.S. dollars)

Industry and company size	NAICS code	Company-performed R&D (US\$millions)			R&D employment (thousands)			Company-performed R&D per R&D employee (US\$thousands per employee)		
		Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign
Transportation equipment	336	79,294	71,259	8,035	265	195	70	299.2	366.2	114.0
Motor vehicles, bodies, trailers, and parts	3361-63	38,916	32,881	6,035	164	110	54	236.9	297.6	112.2
Aerospace products and parts	3364	37,175	35,356	1,819	86	71	14	434.4	495.7	127.7
Aircraft, aircraft engine, and aircraft parts	336411-13	25,224	24,571	653	58	50	8	433.3	490.8	80.1
Guided missile, space vehicle, and related parts	336414-15, 336419	11,951	10,785	1,166	27	21	6	436.9	507.3	191.3
Military armored vehicle, tank, and tank components	336992	31	30	1	*	*	0	102.4	99.6	NA
Other transportation	other 336	3,172	2,992	181	15	12	2	213.1	240.0	74.7
Furniture and related products	337	445	410	36	5	4	*	97.4	97.1	100.9
Miscellaneous	339	28,014	23,382	4,631	122	85	37	229.8	275.4	125.3
Medical equipment and supplies	3391	24,628	20,394	4,234	102	69	33	240.5	294.8	127.5
Other miscellaneous manufacturing	3399	3,385	2,989	397	19	16	4	173.7	189.9	105.9
Nonmanufacturing industries	21-23, 42-81	384,253	319,088	65,165	1,660	1,102	558	231.5	289.7	116.8
Mining, quarrying, oil and gas extraction, and support activities	21	1,008	D	D	10	9	1	102.2	D	D
Utilities	22	D	D	D	5	5	*	D	D	D
Wholesale trade	42	1,861	D	D	22	21	1	84.9	D	D
Electronic shopping and electronic auctions	454111-12	D	D	D	D	77	D	D	D	D
Transportation and warehousing	48-49	9,516	9,395	121	19	18	1	511.0	527.0	152.0
Information	51	219,288	182,340	36,948	781	489	292	280.8	372.5	126.7
Publishing	511	62,697	50,367	12,330	258	145	114	242.6	347.8	108.5
Newspaper, periodical, book, and directory publishers	5111	72	72	*	1	1	0	118.0	118.0	NA
Software publishers	5112	62,625	50,295	12,330	258	144	114	242.9	348.8	108.5
Telecommunications	517	3,891	3,690	201	13	11	2	311.2	347.8	106.1
Data processing, hosting, and related services	518	61,649	49,407	12,242	302	177	125	203.9	278.6	97.9
Other information	other 51	91,051	78,876	12,176	208	157	51	438.4	503.3	238.8
Finance and insurance	52	19,834	17,222	2,612	88	52	35	225.8	328.6	73.8
Real estate and rental and leasing	53	2,500	2,398	102	6	6	*	392.9	408.6	206.2
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	5	1	*	*	*	85.4	124.9	28.6
Other real estate and rental and leasing	other 53	2,494	2,393	101	6	6	*	396.0	410.5	216.1
Professional, scientific, and technical services	54	93,801	74,773	19,028	549	376	173	170.8	198.6	110.1
Architectural, engineering, and related services	5413	3,919	3,883	36	70	69	1	56.3	56.5	42.6
Computer systems design and related services	5415	27,108	22,534	4,575	164	111	53	165.0	203.3	85.5
Scientific research and development services	5417	53,196	39,625	13,571	259	149	110	205.6	265.7	123.9
Research and development in nanotechnology	541713	311	282	30	2	1	*	198.8	202.0	172.4
Research and development in biotechnology (except nanobiotechnology)	541714	14,299	10,226	4,073	74	35	39	193.8	291.9	105.1

TABLE 48

Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, R&D employment, and R&D cost per R&D employee, by industry and company size: 2022

(Millions of U.S. dollars, number of employees in thousands, and cost per employee in thousands of U.S. dollars)

Industry and company size	NAICS code	Company-performed R&D (US\$millions)			R&D employment (thousands)			Company-performed R&D per R&D employee (US\$thousands per employee)		
		Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign	Worldwide	Domestic	Foreign
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	37,886	28,420	9,466	173	103	70	218.7	276.5	134.4
Research and development in the social sciences and humanities	541720	700	698	2	10	10	*	69.3	70.2	10.9
Other professional, scientific, and technical services	other 54	9,577	8,730	847	57	48	9	169.2	183.1	94.7
Health care services	621-23	2,948	2,855	93	11	11	1	258.6	263.1	168.2
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,539	3,394	146	D	36	D	D	94.6	D
All companies (number of domestic employees)	-	841,131	691,547	149,584	3,186	2,110	1,076	264.0	327.8	139.0
Small companies										
10-19 ^a	-	5,537	5,277	260	37	34	3	148.3	155.7	75.6
20-49	-	15,636	14,695	941	98	89	9	159.5	165.1	104.1
Medium companies										
50-99	-	16,227	15,265	962	101	87	13	161.4	174.7	72.9
100-249	-	29,864	27,847	2,017	164	143	21	181.8	194.9	94.5
Large companies										
250-499	-	33,789	29,549	4,240	160	123	37	211.7	240.8	114.8
500-999	-	36,458	31,802	4,657	175	131	44	208.1	242.1	106.3
1,000-4,999	-	128,912	104,505	24,407	552	348	205	233.4	300.7	119.2
5,000-9,999	-	72,325	58,709	13,616	277	181	96	261.3	324.6	142.0
10,000-24,999	-	153,179	121,142	32,036	565	338	227	271.1	358.6	141.0
25,000 or more	-	349,204	282,756	66,448	1,057	636	421	330.4	444.4	158.0

* = amount < \$500,000 or < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Ratios were calculated using unrounded data. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 49

Worldwide, domestic, and foreign R&D employment, by sex, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Worldwide			Domestic			Foreign		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
All industries	21-23, 31-33, 42-81	3,186	2,232	954	2,110	1,501	609	1,076	731	345
Manufacturing industries	31-33	1,527	1,087	439	1,008	723	285	518	364	154
Food	311	46	25	21	30	17	13	16	8	8
Beverage and tobacco products	312	7	4	3	5	3	2	2	1	1
Textile, apparel, and leather products	313-16	6	4	3	5	3	2	2	1	1
Wood products	321	4	3	*	4	3	*	*	*	*
Paper	322	8	6	2	7	5	2	1	1	1
Printing and related support activities	323	2	1	*	2	1	*	*	*	*
Petroleum and coal products	324	6	4	2	4	3	1	2	1	1
Chemicals	325	302	149	152	217	110	107	85	39	45
Basic chemicals	3251	21	14	7	13	9	4	8	5	3
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	11	8	3	7	5	2	4	3	1
Pesticide, fertilizer, and other agricultural chemicals	3253	5	3	2	4	3	1	1	*	*
Pharmaceuticals and medicines	3254	233	107	126	172	81	91	61	26	35
Soap, cleaning compound, and toilet preparations	3256	19	8	11	12	5	7	7	3	4
Paint, coating, adhesive, and other chemicals	3255, 3259	12	9	4	9	6	2	3	2	1
Plastics and rubber products	326	30	23	7	22	17	5	8	6	2
Nonmetallic mineral products	327	7	6	2	6	5	1	1	1	*
Primary metals	331	8	7	1	8	6	1	1	*	*
Fabricated metal products	332	40	34	6	38	33	5	2	1	*
Machinery	333	167	140	27	105	89	16	62	51	11
Agricultural implement	33311	18	16	2	10	9	1	8	7	1
Semiconductor machinery	333242	28	24	5	14	12	2	14	12	2
Engine, turbine, and power transmission equipment	3336	26	22	4	15	13	2	10	9	2
Other machinery	other 333	95	78	17	65	55	10	30	23	6
Computer and electronic products	334	460	351	109	245	190	55	215	161	54
Communications equipment	3342	69	56	13	36	29	7	32	26	6
Semiconductor and other electronic components	3344	204	151	54	93	70	23	111	81	31
Navigational, measuring, electromedical, and control instruments	3345	77	58	19	53	40	12	24	18	6
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	20	15	5	16	12	4	4	3	1
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	20	16	4	16	13	3	4	3	1
Other measuring and controlling devices	other 3345	37	28	10	20	15	5	17	13	4
Other computer and electronic products	other 334	110	86	24	63	51	12	47	35	11
Electrical equipment, appliances, and components	335	42	34	8	27	22	5	14	12	3
Transportation equipment	336	265	213	52	195	156	38	70	57	14

TABLE 49

Worldwide, domestic, and foreign R&D employment, by sex, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Worldwide			Domestic			Foreign		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
Motor vehicles, bodies, trailers, and parts	3361-63	164	132	33	110	88	23	54	44	10
Aerospace products and parts	3364	86	71	15	71	59	12	14	12	3
Aircraft, aircraft engine, and aircraft parts	336411-13	58	48	10	50	42	9	8	7	1
Guided missile, space vehicle, and related parts	336414-15, 336419	27	23	5	21	18	4	6	5	1
Military armored vehicle, tank, and tank components	336992	*	*	*	*	*	*	0	0	0
Other transportation	other 336	15	10	4	12	9	4	2	2	1
Furniture and related products	337	5	4	1	4	3	1	*	*	* i
Miscellaneous	339	122	80	42	85	56	29	37	24	13
Medical equipment and supplies	3391	102	65	37	69	44	25	33	21	12
Other miscellaneous manufacturing	3399	19	14	5	16	12	4	4	3	1
Nonmanufacturing industries	21-23, 42-81	1,660	1,145	515	1,102	778	324	558	367	191
Mining, quarrying, oil and gas extraction, and support activities	21	10	9	1	9	8	1	1	1	*
Utilities	22	5	4	1	5	D	D	*	D	D
Wholesale trade	42	22	16	6	21	16	5	1	1	*
Electronic shopping and electronic auctions	454111-12	D	D	D	77	59	18	D	D	D
Transportation and warehousing	48-49	19	14	4	18	14	4	1	1	*
Information	51	781	574	207	489	360	129	292	214	77
Publishing	511	258	188	71	145	108	37	114	80	34
Newspaper, periodical, book, and directory publishers	5111	1	*	*	1	*	*	0	0	0
Software publishers	5112	258	187	71	144	107	37	114	80	34
Telecommunications	517	13	9	4	11	7	3	2	1	1
Data processing, hosting, and related services	518	302	220	82	177	126	51	125	94	31
Other information	other 51	208	158	50	157	119	38	51	39	12
Finance and insurance	52	88	57	30	52	35	17	35	22	13
Real estate and rental and leasing	53	6	4	2	6	D	D	*	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	*	*	*	*	*	*	*	*	0
Other real estate and rental and leasing	other 53	6	4	2	6	D	D	*	D	D
Professional, scientific, and technical services	54	549	336	214	376	244	132	173	91	81
Architectural, engineering, and related services	5413	70	51	19	69	50	18	1	1	*
Computer systems design and related services	5415	164	121	43	111	84	27	53	38	16
Scientific research and development services	5417	259	125	134	149	77	72	110	47	62
Research and development in nanotechnology	541713	2	1	*	1	1	*	*	*	*
Research and development in biotechnology (except nanobiotechnology)	541714	74	32	42	35	16	19	39	16	23
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	173	89	85	103	58	45	70	31	39
Research and development in the social sciences and humanities	541720	10	3	7	10	3	7	*	*	*

TABLE 49

Worldwide, domestic, and foreign R&D employment, by sex, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Worldwide			Domestic			Foreign		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
Other professional, scientific, and technical services	other 54	57	39	18	48	33	15	9	6	3
Health care services	621-23	11	6	6	11	5	5	1	*	*
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	D	D	36	D	D	D	D	D
All companies (number of domestic employees)	-	3,186	2,232	954	2,110	1,501	609	1,076	731	345
Small companies										
10-19 ^a	-	37	29	8	34	27	7	3	3	1
20-49	-	98	78	20	89	71	18	9	7	2
Medium companies										
50-99	-	101	78	22	87	69	19	13	9	4
100-249	-	164	126	39	143	109	34	21	16	5
Large companies										
250-499	-	160	115	45	123	88	35	37	27	10
500-999	-	175	127	49	131	94	37	44	32	12
1,000-4,999	-	552	391	161	348	246	102	205	145	60
5,000-9,999	-	277	199	78	181	128	53	96	71	24
10,000-24,999	-	565	367	198	338	224	114	227	143	85
25,000 or more	-	1,057	722	i 334	636	445	192	421	278	143

* = amount < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 50

Worldwide total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
All industries	21-23, 31-33, 42-81	36,453	3,186	2,199	184	701	287
Manufacturing industries	31-33	18,462	1,527	1,083	114	276	167
Food	311	2,138	46	26	3 i	13	8 i
Beverage and tobacco products	312	726	7	3	*	2	1
Textile, apparel, and leather products	313-16	343	6	3	*	3	1
Wood products	321	121	4	2	* i	1	1
Paper	322	262	8	5	*	2	2
Printing and related support activities	323	120	2	1	*	1	*
Petroleum and coal products	324	146	6	2	*	3	1
Chemicals	325	2,534	302	193	47	50	59
Basic chemicals	3251	383	21	11	3	9	2
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	190	11	7	1 i	3	1
Pesticide, fertilizer, and other agricultural chemicals	3253	84	5	4	1 i	1	1
Pharmaceuticals and medicines	3254	1,139	233	149	37	31	53
Soap, cleaning compound, and toilet preparations	3256	442	19	15	2	3	2
Paint, coating, adhesive, and other chemicals	3255, 3259	296	12	9	1 i	3	1
Plastics and rubber products	326	715	30	16	1 i	11	3
Nonmetallic mineral products	327	239	7	4	1	2	1
Primary metals	331	225	8	3	*	2	3
Fabricated metal products	332	532	40	16	1	18	6
Machinery	333	1,942	167	119	10	38	10
Agricultural implement	33311	189	18	15	*	3	1
Semiconductor machinery	333242	124	28	20	5	8	1
Engine, turbine, and power transmission equipment	3336	341	26	22	1	2	1
Other machinery	other 333	1,287	95	62	4	25	7
Computer and electronic products	334	2,685	460	384	27 i	46	29
Communications equipment	3342	255	69	57	3 i	6	5
Semiconductor and other electronic components	3344	1,174	204	178	14 i	21	5
Navigational, measuring, electromedical, and control instruments	3345	587	77	57	6 i	10	10
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	129	20	13	2 i	1	6
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	87	20	15	1	3	1
Other measuring and controlling devices	other 3345	371	37	29	3 i	6	3
Other computer and electronic products	other 334	670	110	92	4 i	8	10

TABLE 50
Worldwide total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
Electrical equipment, appliances, and components	335	759	42	26	4 i	11	5
Transportation equipment	336	3,283	265	202	10 i	41	23
Motor vehicles, bodies, trailers, and parts	3361-63	1,988	164	128	6 i	22 i	14 i
Aerospace products and parts	3364	1,035	86	66	4	14	6
Aircraft, aircraft engine, and aircraft parts	336411-13	697	58	43	3	11	4
Guided missile, space vehicle, and related parts	336414-15, 336419	338	27	23 i	1 i	2	2
Military armored vehicle, tank, and tank components	336992	3	*	*	* i	*	*
Other transportation	other 336	257	15	8	* i	4	3
Furniture and related products	337	157	5	2	* i	2	1
Miscellaneous	339	1,536	122	77	8	32	13
Medical equipment and supplies	3391	1,173	102	67	8	25	11
Other miscellaneous manufacturing	3399	363	19	10	*	7	3
Nonmanufacturing industries	21-23, 42-81	17,991	1,660	1,116	71 i	424	120
Mining, quarrying, oil and gas extraction, and support activities	21	242 i	10 i	4 i	* i	4 i	2 i
Utilities	22	344	5	3	* i	1	1
Wholesale trade	42	641 i	22 i	9 i	* i	8 i	5 i
Electronic shopping and electronic auctions	454111-12	D	D	93 i	D	D	5 i
Transportation and warehousing	48-49	1,462	19 i	12 i	* i	5	2 i
Information	51	3,531	781	579	36 i	152	50
Publishing	511	826	258	197	12 i	44	18
Newspaper, periodical, book, and directory publishers	5111	5	1	*	*	*	*
Software publishers	5112	821	258	196	12 i	43	18
Telecommunications	517	573	13	8	* i	3	1 i
Data processing, hosting, and related services	518	1,460	302	213	6 i	64	26
Other information	other 51	673	208	162	18	41	5
Finance and insurance	52	1,792	88 i	56 i	3 i	28	4
Real estate and rental and leasing	53	213	6	5 i	*	1	*
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1 i	* i	* i	0	* i	* i
Other real estate and rental and leasing	other 53	212	6	5 i	*	1	*
Professional, scientific, and technical services	54	2,696	549	327	29	177 i	46
Architectural, engineering, and related services	5413	418	70	47	2	18	5
Computer systems design and related services	5415	1,118	164	118	8 i	33	13
Scientific research and development services	5417	659	259	133	16	101 i	25 i

TABLE 50

Worldwide total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
Research and development in nanotechnology	541713	4	2	1	*	*	*
Research and development in biotechnology (except nanobiotechnology)	541714	170	74	32	5	40	1
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	471	173	97	11	60	16
Research and development in the social sciences and humanities	541720	14	10	2	*	1	8
Other professional, scientific, and technical services	other 54	501	57	29	3	25	3
Health care services	621-23	415	11	4	1	4	3
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	D	23	D	D	3
All companies (number of domestic employees)	-	36,453	3,186	2,199	184	701	287
Small companies							
10-19 ^b	-	100	37	25	4	10	3
20-49	-	311	98	60	10	30	9
Medium companies							
50-99	-	438	101	57	7	33	11
100-249	-	1,004	164	102	11	47	15
Large companies							
250-499	-	1,144	160	102	10	41	16
500-999	-	1,428	175	111	9	43	21
1,000-4,999	-	5,238	552	363	30	138	52
5,000-9,999	-	3,638	277	205	18	46	25
10,000-24,999	-	5,896	565	362	33	158	46
25,000 or more	-	17,256	1,057	812	53	155	90

* = amount < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Researchers include R&D scientists and engineers and their managers.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 51

Domestic total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
All industries	21-23, 31-33, 42-81	24,092	2,110	1,441	143	473	196
Manufacturing industries	31-33	10,251	1,008	690	86	205	113
Food	311	1,393	30	15	3 i	10	5
Beverage and tobacco products	312	388	5	2	*	2	1
Textile, apparel, and leather products	313-16	189	5	2	*	2	1
Wood products	321	110	4	2	* i	1	1
Paper	322	183	7	4	*	2	2
Printing and related support activities	323	96	2	1	*	1	*
Petroleum and coal products	324	94	4	1	*	2	1
Chemicals	325	1,446	217	145	38	38	35
Basic chemicals	3251	235	13	8	2	4	1
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	101	7	4	1 i	2	1
Pesticide, fertilizer, and other agricultural chemicals	3253	64	4	3	1 i	1	*
Pharmaceuticals and medicines	3254	664	172	115	31	26	31
Soap, cleaning compound, and toilet preparations	3256	220	12	8	1	3	1
Paint, coating, adhesive, and other chemicals	3255, 3259	161	9	6	1	2	*
Plastics and rubber products	326	490	22	11	1 i	8	3
Nonmetallic mineral products	327	141	6	3	1	2	1
Primary metals	331	175	8	3	*	2	3
Fabricated metal products	332	408	38	15	1	17	6
Machinery	333	941	105	70	7	28	7
Agricultural implement	33311	102	10	8	*	2	*
Semiconductor machinery	333242	41	14	9	4	4	1
Engine, turbine, and power transmission equipment	3336	139	15	13	1	2	1
Other machinery	other 333	659	65	39	2	21	5
Computer and electronic products	334	1,033	245	200	20 i	29	17
Communications equipment	3342	131	36	29	2 i	4	3
Semiconductor and other electronic components	3344	311	93	79	10 i	11	3
Navigational, measuring, electromedical, and control instruments	3345	319	53	37	5 i	8	7
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	103	16	11	2 i	1	5
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	66	16	12	1	3	1
Other measuring and controlling devices	other 3345	150	20	15	2 i	4	1
Other computer and electronic products	other 334	272	63	54	3 i	5	4

TABLE 51

Domestic total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
Electrical equipment, appliances, and components	335	373	27	18	2 i	7	2
Transportation equipment	336	1,856	195	144	7 i	32	19
Motor vehicles, bodies, trailers, and parts	3361-63	896	110	84	4 i	15	11
Aerospace products and parts	3364	766	71	54	3 i	12	5
Aircraft, aircraft engine, and aircraft parts	336411-13	561	50	36	2	10	4
Guided missile, space vehicle, and related parts	336414-15, 336419	206	21	17	1 i	2	2
Military armored vehicle, tank, and tank components	336992	3	*	*	* i	*	*
Other transportation	other 336	191	12	6	* i	4	2
Furniture and related products	337	124	4	2	*	2	1
Miscellaneous	339	811	85	53	6	22	10
Medical equipment and supplies	3391	573	69	45	6	17	8
Other miscellaneous manufacturing	3399	238	16	8	*	6	2
Nonmanufacturing industries	21-23, 42-81	13,840	1,102	752	56 i	267	82
Mining, quarrying, oil and gas extraction, and support activities	21	187	i 9	D	* i	D	D
Utilities	22	335	5	3	* i	D	D
Wholesale trade	42	524	i 21	D	* i	D	D
Electronic shopping and electronic auctions	454111-12	D	i 77	i 66	i D	D	D
Transportation and warehousing	48-49	1,183	i 18	i 12	i *	D	D
Information	51	2,394	489	369	27 i	93	28
Publishing	511	480	145	115	8 i	20	10
Newspaper, periodical, book, and directory publishers	5111	5	1	*	*	*	*
Software publishers	5112	475	144	114	8 i	20	10
Telecommunications	517	518	11	6	* i	3	i 1
Data processing, hosting, and related services	518	925	177	126	4 i	38	13
Other information	other 51	471	157	121	14	32	3 i
Finance and insurance	52	1,310	52	30	i 2	20	3
Real estate and rental and leasing	53	189	6	4	i *	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	1	i *	i *	i 0	* i	* i
Other real estate and rental and leasing	other 53	188	6	4	i *	D	D
Professional, scientific, and technical services	54	1,646	376	230	24	110	36
Architectural, engineering, and related services	5413	328	69	46	2	18	5
Computer systems design and related services	5415	525	111	76	6 i	26	9
Scientific research and development services	5417	406	149	85	14	44	i 20

TABLE 51

Domestic total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
Research and development in nanotechnology	541713	3	1	1	*	*	*
Research and development in biotechnology (except nanobiotechnology)	541714	122	35	16	3	18	1
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	267	103	66	10	26	12
Research and development in the social sciences and humanities	541720	14	10	2	*	1	8
Other professional, scientific, and technical services	other 54	387	48	24	2	22	2
Health care services	621-23	398	11	D	1	D	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	36	D	D	D	D
All companies (number of domestic employees)	-	24,092	2,110	1,441	143	473	196
Small companies							
10-19 ^b	-	86	34	22	4	9	3
20-49	-	267	89	53	9	27	8
Medium companies							
50-99	-	366	87	49	6	29	9
100-249	-	808	143	86	9	43	14
Large companies							
250-499	-	768	123	76	9	35	12
500-999	-	993	131	80	8	34	18
1,000-4,999	-	3,159	348	232	22	81	34
5,000-9,999	-	1,909	181	129	13	33	19
10,000-24,999	-	3,373	338	221	25	88	29
25,000 or more	-	12,363	636	493	38	94	49

* = amount < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Researchers include R&D scientists and engineers and their managers.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 52
Foreign total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
All industries	21-23, 31-33, 42-81	12,361	1,076	757	42	228	91
Manufacturing industries	31-33	8,211	518	393	27	71	54
Food	311	745	16	10	1	3	3
Beverage and tobacco products	312	338	2	1	*	1	*
Textile, apparel, and leather products	313-16	154	2	* i	* i	1	*
Wood products	321	11	*	*	*	*	*
Paper	322	79	1	1	*	*	*
Printing and related support activities	323	23	*	* i	*	*	*
Petroleum and coal products	324	51	2	1	*	1	*
Chemicals	325	1,088	85	48	8	13	24
Basic chemicals	3251	148	8	3	1	5	i *
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	88	4	2	*	1	*
Pesticide, fertilizer, and other agricultural chemicals	3253	20	1	*	* i	*	*
Pharmaceuticals and medicines	3254	475	61	33	6	5	i 23
Soap, cleaning compound, and toilet preparations	3256	222	7	6	1	*	*
Paint, coating, adhesive, and other chemicals	3255, 3259	135	3	3	*	1	*
Plastics and rubber products	326	225	8	5	* i	3	1
Nonmetallic mineral products	327	98	1	1	*	*	*
Primary metals	331	50	1	*	*	*	*
Fabricated metal products	332	124	2	1	*	*	*
Machinery	333	1,001	62	49	3	10	3
Agricultural implement	33311	87	8	7	*	1	*
Semiconductor machinery	333242	83	14	11	1	4	*
Engine, turbine, and power transmission equipment	3336	202	10	9	*	1	1
Other machinery	other 333	628	30	23	2	5	1 i
Computer and electronic products	334	1,652	215	185	7	17	13
Communications equipment	3342	123	32	28	1	2	2
Semiconductor and other electronic components	3344	862	111	99	4	10	2
Navigational, measuring, electromedical, and control instruments	3345	268	24	20	1	2	2
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	26	4	3	* i	*	1
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	21	4	3	* i	*	*
Other measuring and controlling devices	other 3345	221	17	14	1	2	1
Other computer and electronic products	other 334	398	47	38	1	2	6

TABLE 52

Foreign total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
Electrical equipment, appliances, and components	335	386	14	8	2	4	2
Transportation equipment	336	1,427	70	57	3	9	4
Motor vehicles, bodies, trailers, and parts	3361-63	1,092	54	44	2	7	3
Aerospace products and parts	3364	269	14	12	1	1	1
Aircraft, aircraft engine, and aircraft parts	336411-13	136	8	6	1	1	*
Guided missile, space vehicle, and related parts	336414-15, 336419	133	6	6	*	*	*
Military armored vehicle, tank, and tank components	336992	0	0	0	0	0	0
Other transportation	other 336	66	2	1	*	1	1
Furniture and related products	337	33	*	*	*	*	*
Miscellaneous	339	726	37	25	2	9	3
Medical equipment and supplies	3391	600	33	22	2	8	3
Other miscellaneous manufacturing	3399	126	4	2	*	1	*
Nonmanufacturing industries	21-23, 42-81	4,150	558	364	14	157	37
Mining, quarrying, oil and gas extraction, and support activities	21	55	1	D	*	D	D
Utilities	22	9	*	*	*	D	D
Wholesale trade	42	117	1	D	*	D	D
Electronic shopping and electronic auctions	454111-12	D	D	27	0	D	D
Transportation and warehousing	48-49	279	1	1	0	D	D
Information	51	1,138	292	211	9	59	22
Publishing	511	346	114	82	4	24	8
Newspaper, periodical, book, and directory publishers	5111	*	0	0	0	0	0
Software publishers	5112	346	114	82	4	24	8
Telecommunications	517	55	2	2	*	*	*
Data processing, hosting, and related services	518	535	125	86	2	26	13
Other information	other 51	202	51	41	3	9	1
Finance and insurance	52	483	35	27	*	8	1
Real estate and rental and leasing	53	24	*	*	0	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	*	*	*	0	*	0
Other real estate and rental and leasing	other 53	24	*	*	0	D	D
Professional, scientific, and technical services	54	1,049	173	97	5	66	10
Architectural, engineering, and related services	5413	90	1	1	*	*	*
Computer systems design and related services	5415	592	53	42	2	7	4
Scientific research and development services	5417	253	110	48	2	56	5

TABLE 52

Foreign total employment, R&D employment, and level of education of researchers, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total employment	Total R&D employment	Researchers ^a		R&D technicians and equivalent staff	Other R&D supporting staff
				Total	With PhD		
Research and development in nanotechnology	541713	*	*	*	* i	*	*
Research and development in biotechnology (except nanobiotechnology)	541714	48 i	39 i	16	1	23 i	* i
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	204 i	70 i	32	1	34 i	5 i
Research and development in the social sciences and humanities	541720	*	*	*	0	0	*
Other professional, scientific, and technical services	other 54	115	9	6	* i	3	1 i
Health care services	621-23	17	1	D	* i	D	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	D	D	*	D	D
All companies (number of domestic employees)	-	12,361	1,076	757	42 i	228 i	91
Small companies							
10-19 ^b	-	14	3	2	*	1	*
20-49	-	44	9	6	*	2	*
Medium companies							
50-99	-	72	13	8	1	4	1
100-249	-	195	21	16	1 i	4	1
Large companies							
250-499	-	376	37	26	1	7	4
500-999	-	435	44	31	2 i	9	3
1,000-4,999	-	2,079	205	131	8 i	57	18
5,000-9,999	-	1,729	96	77	4	13 i	6
10,000-24,999	-	2,523	227	141	8 i	70 i	16 i
25,000 or more	-	4,893	421	318	16	61 i	41

* = amount < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Researchers include R&D scientists and engineers and their managers.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 53
Domestic full-time equivalent R&D employees and researchers, by work status, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	FTE R&D employees ^a				FTE R&D scientists and engineers ^b							
		Total	Full-time R&D employees	Full-time employees working on R&D part time	Part-time employees working on R&D	Total	Full-time R&D employees	Full-time employees working on R&D part time	Part-time employees working on R&D				
All industries	21-23, 31-33, 42-81	1,941	1,639	275	27	i	1,316	1,152	153	i	11	i	
Manufacturing industries	31-33	925	817	99	9		634	583	47		4		
Food	311	27	24	2	*		14	14	1	i	*	i	
Beverage and tobacco products	312	4	3	1	*		2	2	*		*	i	
Textile, apparel, and leather products	313-16	4	3	1	*	i	2	1	*	i	*	i	
Wood products	321	3	2	1	0		1	1	*	i	0		
Paper	322	5	3	1	*		3	3	*		*		
Printing and related support activities	323	1	1	1	*		1	*	*		*		
Petroleum and coal products	324	4	3	*	*		1	1	*		*		
Chemicals	325	206	200	5	1		131	128	3		1		
Basic chemicals	3251	12	11	1	*		7	6	1		*		
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	6	6	*	*		4	4	*		*		
Pesticide, fertilizer, and other agricultural chemicals	3253	4	4	*	*		3	3	*		*		
Pharmaceuticals and medicines	3254	164	161	2	1		103	101	1	i	*		
Soap, cleaning compound, and toilet preparations	3256	11	10	1	*		8	8	*	i	*	i	
Paint, coating, adhesive, and other chemicals	3255, 3259	8	8	*	*		6	6	*		*		
Plastics and rubber products	326	19	13	5	1		10	8	2		*		
Nonmetallic mineral products	327	5	4	1	*	r	3	3	*		*	r	
Primary metals	331	5	3	2	i	*	r	2	2	1	*	i	
Fabricated metal products	332	28	13	14	*		11	6	5		*		
Machinery	333	92	69	22	1		63	48	14		*		
Agricultural implement	33311	9	9	*	*		7	7	*		*		
Semiconductor machinery	333242	14	i	13	i	1	i	9	i	9	i	*	i
Engine, turbine, and power transmission equipment	3336	14	7	8	*		13	5	7		*		
Other machinery	other 333	54	41	13	1		34	27	6		*		
Computer and electronic products	334	237	225	11	2		189	183	5		1		
Communications equipment	3342	36	34	2	*		28	27	1		*		
Semiconductor and other electronic components	3344	90	86	3	1		73	i	71	i	2	i	
Navigational, measuring, electromedical, and control instruments	3345	49	45	3	1		35	33	2		*		
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	16	16	*	*		11	10	*		*		
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	14	13	1	*		11	10	*		*		
Other measuring and controlling devices	other 3345	19	16	2	*		13	12	1		*		

TABLE 53

Domestic full-time equivalent R&D employees and researchers, by work status, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	FTE R&D employees ^a						FTE R&D scientists and engineers ^b									
		Total	Full-time R&D employees	Full-time employees working on R&D part time	Part-time employees working on R&D	Total	Full-time R&D employees	Full-time employees working on R&D part time	Part-time employees working on R&D								
Other computer and electronic products	other 334	63	60	3	*	54	53	1	i	*							
Electrical equipment, appliances, and components	335	26	23	2	1	16	15	1	i	*	i						
Transportation equipment	336	175	151	24	1	131	118	12		1	i						
Motor vehicles, bodies, trailers, and parts	3361-63	107	102	5	*	82	79	2		*							
Aerospace products and parts	3364	58	41	16	1	i	44	i	34	i	9	*	i				
Aircraft, aircraft engine, and aircraft parts	336411-13	44	29	14	*	i	32	23	8		*	i					
Guided missile, space vehicle, and related parts	336414-15, 336419	14	i	12	i	2	*	i	12	i	10	i	1	*	i		
Military armored vehicle, tank, and tank components	336992	*	*	*	0		*	i	*	i	*	i	0				
Other transportation	other 336	11	i	8	i	3	i	*	5	5	1	i	*	i			
Furniture and related products	337	3	1	2	*	2	1	1		1		*	i				
Miscellaneous	339	82	75	6	1	51	49	2		1							
Medical equipment and supplies	3391	68	64	3	1	44	43	1		1		1					
Other miscellaneous manufacturing	3399	14	11	3	*	7	6	1		*							
Nonmanufacturing industries	21-23, 42-81	1,016	821	175	i	19	i	682	569	106	i	7	i				
Mining, quarrying, oil and gas extraction, and support activities	21	7	i	5	i	2	i	*	i	4	i	3	i	1	i	*	i
Utilities	22	2	i	1	i	1	i	*	i	1	i	1	i	1	i	*	i
Wholesale trade	42	17	i	10	i	7	i	*	i	7	i	4	i	3	i	*	r
Electronic shopping and electronic auctions	454111-12	77	i	D		D		D		D		D		D			
Transportation and warehousing	48-49	17	i	14	i	3	i	*	i	11	i	9	i	2	i	*	i
Information	51	474	445	27	2	356	340	14		1							
Publishing	511	139	130	8	1	111	106	5		1							
Newspaper, periodical, book, and directory publishers	5111	1	1	*	*	*	*	*		0							
Software publishers	5112	138	130	7	1	111	106	5		1							
Telecommunications	517	10	i	8	i	2	*	6	i	5	i	1	*	r			
Data processing, hosting, and related services	518	171	156	15	1	119	112	7		*							
Other information	other 51	155	151	3	1	120	117	2		*							
Finance and insurance	52	43	i	28	i	14	i	1	i	26	i	22	i	4	i	*	i
Real estate and rental and leasing	53	6	6	*	*	4	i	4	i	*		*					
Lessors of nonfinancial intangible assets (except copyrighted works)	533	*	i	*	i	0	0	*	i	*	i	0	0				
Other real estate and rental and leasing	other 53	6	6	*	*	4	i	4	i	*		*					
Professional, scientific, and technical services	54	336	267	56	13	i	185	153	27		5	i					
Architectural, engineering, and related services	5413	46	23	21	2	32	17	14		1	i						

TABLE 53

Domestic full-time equivalent R&D employees and researchers, by work status, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	FTE R&D employees ^a						FTE R&D scientists and engineers ^b									
		Total	Full-time R&D employees	Full-time employees working on R&D part time	Part-time employees working on R&D	Total	Full-time R&D employees	Full-time employees working on R&D part time	Part-time employees working on R&D								
Computer systems design and related services	5415	102	89	11	2	69	61	7	i	1							
Scientific research and development services	5417	143	i	128	i	6	i	9	i	62	58	2	i	2	i		
Research and development in nanotechnology	541713	1		1		*		*		1	1	*	i	*			
Research and development in biotechnology (except nanobiotechnology)	541714	34	i	33	i	1		*	i	13	13	*		*			
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	98	i	91	i	4	i	2	i	47	i	44	i	2	i	1	i
Research and development in the social sciences and humanities	541720	10	i	3	i	1	i	6	i	2	i	1	i	*	i	1	i
Other professional, scientific, and technical services	other 54	45		27		18		*		21	16	5	i	*			
Health care services	621-23	10		8		2		*		4	3	D		D			
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	27		D		D		D		D	D	D		D			
All companies (number of domestic employees)	-	1,941		1,639		275		27	i	1,316	1,152	153	i	11		i	
Small companies																	
10-19 ^c	-	30		21		7		2		20	15	4		1			
20-49	-	76		52		21		2		46	36	9		1			
Medium companies																	
50-99	-	74		52		20		2		43	34	9		1		i	
100-249	-	119		87		30		2		72	58	13		1			
Large companies																	
250-499	-	109		88		18		2		68	59	8		1			
500-999	-	115		94		19		1		72	63	8		1		i	
1,000-4,999	-	318		280		34		3		213	193	17		2			
5,000-9,999	-	171		148		15		8	i	122	110	10		2		i	
10,000-24,999	-	318		286		29		3	i	204	191	12	i	1		i	
25,000 or more	-	613		530		80	i	3	i	456	391	62	i	2		i	

* = amount < 500 employees; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

FTE = full-time equivalent; NAICS = 2017 North American Industry Classification System.

^a Includes scientists and engineers; their managers; and technicians, technologists, and support staff.

^b Includes scientists and engineers and their managers.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 54

Domestic employment and R&D employment, by state: 2022

(Thousands)

State	Employees	
	Total	R&D
All states	24,092	2,110
Alabama	279	14
Alaska	25	1
Arizona	478	28
Arkansas	176	4
California	3,023	510
Colorado	468	43
Connecticut	266	22
Delaware	92	6
District of Columbia	52	4
Florida	1,121	51
Georgia	809	39
Hawaii	39	2
Idaho	103	11
Illinois	1,138	64
Indiana	553	32
Iowa	288	15
Kansas	245	15
Kentucky	355	7
Louisiana	161	5
Maine	60	3
Maryland	365	36
Massachusetts	548	106
Michigan	852	102
Minnesota	490	43
Mississippi	146	3
Missouri	414	21
Montana	37	3
Nebraska	173	9
Nevada	166	7
New Hampshire	96	13
New Jersey	652	67
New Mexico	69	4
New York	877	91
North Carolina	785	66
North Dakota	53	3
Ohio	917	58
Oklahoma	177	9
Oregon	293	30
Pennsylvania	828	68
Rhode Island	62	4
South Carolina	283	10
South Dakota	51	2
Tennessee	546	18
Texas	2,112	125
Utah	257	20
Vermont	32	2
Virginia	587	41
Washington	771	149
West Virginia	71	3

TABLE 54

Domestic employment and R&D employment, by state: 2022

(Thousands)

State	Employees	
	Total	R&D
Wisconsin	516	43
Wyoming	17	1
Undistributed ^a	1,122	79

^a Includes data reported that were not allocated to a specific state by multi-establishment companies. For single-establishment companies, data reported were allocated to the state in the address used to mail the survey form.

Note(s):

Detail may not add to total because of rounding. Beginning in survey year 2018, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 55

Foreign employment and R&D employment, by location: 2022

(Thousands)

Location	Employees	
	Total	R&D
Total	12,361	1,076
Puerto Rico ^a	53	1
Canada	655	71
Latin America and other Western Hemisphere ^b	2,076	54
Argentina	75	4 i
Brazil	387	15
Chile	42	1
Mexico	1,214	26
Other Latin American and Western Hemisphere locations	359	8
Africa	144	6
South Africa	65	4 i
Other African locations	79	2
Asia and Pacific	4,052	507
Australia	167	14
China	1,137	106
Hong Kong	47	3
India	1,362	274
Indonesia	85	1
Japan	277	27
Malaysia	124	10
New Zealand	18	2
Singapore	156	16
South Korea	105	11
Taiwan	118	24
Thailand	128	3
Other Asian or Pacific locations	327	17
Europe	3,549	359
Austria	27	3
Belgium	108	13
Czechia	84	9
Denmark	27	4
Finland	20	4
France	313	24
Germany	549	55
Hungary	64	5
Ireland	157	23
Italy	181	14
Luxembourg	15	2 i
Netherlands	129	11
Norway	23	2
Poland	257	15
Russia	72	6
Spain	163	16
Sweden	52	8
Switzerland	80	16
Turkey	52	3
United Kingdom	849	93
Other European locations	328	32
Middle East	196	38
Israel	87	34

TABLE 55

Foreign employment and R&D employment, by location: 2022

(Thousands)

Location	Employees	
	Total	R&D
Other Middle Eastern locations	109	4
Undistributed ^c	1,636 i	40 i

i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

^a Puerto Rico is not included in the U.S. total due to its classification as a U.S. territory.

^b Other Western Hemisphere is defined as Argentina, Brazil, Chile, Mexico, and other Latin America.

^c Includes data reported that were not allocated to a specific country.

Note(s):

Detail may not add to total because of rounding. Beginning in survey year 2018, statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D. No systematic item imputation was applied. These statistics include an adjustment to the weight to account for unit nonresponse.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 56

Domestic temporary R&D employment, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total	Researchers ^a	R&D technicians and equivalent staff	Other R&D supporting staff
All industries	21-23, 31-33, 42-81	303 i	179 i	84 i	41 i
Manufacturing industries	31-33	119 i	72 i	29 i	18 i
Food	311	4 i	1 i	1 i	1 i
Beverage and tobacco products	312	*	*	*	*
Textile, apparel, and leather products	313-16	* i	*	*	* i
Wood products	321	* i	* i	*	0
Paper	322	* i	*	*	* i
Printing and related support activities	323	* i	* i	* i	* i
Petroleum and coal products	324	2 i	* i	2 i	* i
Chemicals	325	45 i	30 i	7 i	8 i
Basic chemicals	3251	1 i	* i	* i	* i
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	*	* i	* i	* i
Pesticide, fertilizer, and other agricultural chemicals	3253	* i	* i	* i	* i
Pharmaceuticals and medicines	3254	40 i	28 i	5 i	7 i
Soap, cleaning compound, and toilet preparations	3256	3 i	1 i	1 i	1 i
Paint, coating, adhesive, and other chemicals	3255, 3259	*	*	*	* i
Plastics and rubber products	326	1 i	* i	* i	* i
Nonmetallic mineral products	327	11 i	4 i	5 i	2 i
Primary metals	331	*	*	*	*
Fabricated metal products	332	1 i	* i	* i	* i
Machinery	333	12 i	9 i	2 i	1 i
Agricultural implement	33311	1	1	* i	* i
Semiconductor machinery	333242	1 i	1 i	*	*
Engine, turbine, and power transmission equipment	3336	2 i	2 i	* i	* i
Other machinery	other 333	7 i	6 i	1 i	* i
Computer and electronic products	334	19 i	12 i	5 i	1 i
Communications equipment	3342	2	1	*	* i
Semiconductor and other electronic components	3344	9 i	6 i	3 i	1 i
Navigational, measuring, electromedical, and control instruments	3345	3 i	2 i	1	* i
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	* i	* i	* i	* i
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1	*	*	*
Other measuring and controlling devices	other 3345	2 i	2 i	*	* i
Other computer and electronic products	other 334	5 i	3 i	1 i	* i
Electrical equipment, appliances, and components	335	2 i	1 i	1 i	* i
Transportation equipment	336	9 i	6	2 i	1
Motor vehicles, bodies, trailers, and parts	3361-63	4	3	1 i	*
Aerospace products and parts	3364	4 i	2 i	1 i	* i
Aircraft, aircraft engine, and aircraft parts	336411-13	3 i	2 i	1 i	*
Guided missile, space vehicle, and related parts	336414-15, 336419	1	1	*	* i
Military armored vehicle, tank, and tank components	336992	* i	* i	* i	* i
Other transportation	other 336	*	*	* i	* i
Furniture and related products	337	*	*	*	*
Miscellaneous	339	13 i	8 i	3	2 i
Medical equipment and supplies	3391	12 i	7 i	3	2 i
Other miscellaneous manufacturing	3399	* i	* i	* i	*
Nonmanufacturing industries	21-23, 42-81	184 i	107 i	55 i	22 i
Mining, quarrying, oil and gas extraction, and support activities	21	* i	* i	* i	* i

TABLE 56

Domestic temporary R&D employment, by activity, industry, and company size: 2022

(Thousands)

Industry and company size	NAICS code	Total	Researchers ^a		R&D technicians and equivalent staff		Other R&D supporting staff	
Utilities	22	* i	*	i	*	i	*	i
Wholesale trade	42	* i	*	i	*	i	*	i
Electronic shopping and electronic auctions	454111-12	52	18		26		8	
Transportation and warehousing	48-49	2 i	1	i	1	i	*	i
Information	51	73 i	52	i	12	i	9	i
Publishing	511	17 i	9	i	4	i	3	i
Newspaper, periodical, book, and directory publishers	5111	*	*	i	*		0	
Software publishers	5112	16 i	9	i	4	i	3	i
Telecommunications	517	1 i	1	i	*	i	*	i
Data processing, hosting, and related services	518	10 i	7	i	2	i	1	i
Other information	other 51	45 i	35	i	6	i	4	i
Finance and insurance	52	16 i	12	i	4		*	i
Real estate and rental and leasing	53	2 i	1	i	1	i	1	i
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0		0		0	
Other real estate and rental and leasing	other 53	2 i	1	i	1	i	1	i
Professional, scientific, and technical services	54	33 i	19	i	10	i	4	i
Architectural, engineering, and related services	5413	1 i	1	i	*	i	*	i
Computer systems design and related services	5415	14 i	10	i	4	i	1	i
Scientific research and development services	5417	11 i	6	i	4	i	1	i
Research and development in nanotechnology	541713	* i	*	i	*	i	*	i
Research and development in biotechnology (except nanobiotechnology)	541714	4 i	2	i	2	i	*	i
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	7 i	4	i	2	i	1	i
Research and development in the social sciences and humanities	541720	* i	*	i	*	i	*	i
Other professional, scientific, and technical services	other 54	7 i	2	i	2	i	2	i
Health care services	621-23	2 i	2	i	*	i	*	i
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3 i	2	i	1	i	*	i
All companies (number of domestic employees)	-	303 i	179	i	84	i	41	i
Small companies								
10-19 ^b	-	3 i	2	i	1	i	*	i
20-49	-	7 i	4	i	2	i	1	i
Medium companies								
50-99	-	7 i	4	i	2		1	i
100-249	-	11 i	6	i	3	i	1	i
Large companies								
250-499	-	12 i	6	i	4	i	2	i
500-999	-	12 i	7	i	4	i	2	i
1,000-4,999	-	33 i	16	i	11	i	6	i
5,000-9,999	-	27 i	15	i	7	i	6	i
10,000-24,999	-	59 i	37	i	11	i	11	i
25,000 or more	-	133 i	82	i	39		11	i

* = amount < 500 employees; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Researchers include R&D scientists and engineers and their managers.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 57

R&D costs paid for by the company and others projected for 2023, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Projected worldwide R&D cost		Projected domestic R&D cost							Projected foreign R&D cost paid for by the company
		Paid for by the company	Paid for by others	Paid for by the company			Paid for by others				
				Total	Purchased and collaborative R&D	R&D performed by the company	Total	U.S. government	Non-U.S. government sources		
All industries	21-23, 31-33, 42-81	860,437	112,152 i	705,424	50,728	654,697	89,551	33,668	55,883 i	155,013	
Manufacturing industries	31-33	482,855	52,918	388,598	44,282	344,316	46,475	24,483	21,992	94,257	
Food	311	8,555	356	6,937	437	6,499	352	11	341	1,619	
Beverage and tobacco products	312	1,664	110	743	193	550	110	0	110	921	
Textile, apparel, and leather products	313-16	742	15	625	11	615	13	5 i	8	117	
Wood products	321	269	5	262	21	241	5	* i	4	7 i	
Paper	322	927	1 i	855	8	848	* i	0	* i	72	
Printing and related support activities	323	191 i	1 i	180 i	9	172 i	1 i	0	1 i	11 i	
Petroleum and coal products	324	974	8 i	743	486	258	4	*	4	231	
Chemicals	325	187,679	16,028	156,176	31,991	124,184	12,322	443	11,879	31,503	
Basic chemicals	3251	3,640	235	2,657	72	2,585	228	48	180 i	983	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	2,063	106 i	1,472	27	1,445	80 i	1	79 i	592	
Pesticide, fertilizer, and other agricultural chemicals	3253	1,256	D	1,035	117	918	D	0	D	221	
Pharmaceuticals and medicines	3254	175,109	15,078	146,705	31,404	115,301	11,417	382	11,035	28,405	
Soap, cleaning compound, and toilet preparations	3256	4,181	250	3,156	337	2,819	249	0	249	1,025	
Paint, coating, adhesive, and other chemicals	3255, 3259	1,430	D	1,151	34	1,117	D	11	D	279	
Plastics and rubber products	326	4,193	131	3,496	71	3,425	113	2 i	110 i	697 i	
Nonmetallic mineral products	327	1,552	37	1,382	21	1,361	37	6	31	170	
Primary metals	331	850	25 i	821	15	805	23 i	* i	23 i	29	
Fabricated metal products	332	3,720	233 i	3,504	167	3,337	196 i	27	169 i	217	
Machinery	333	26,443	1,540	19,514	508	19,006	1,281	648	633	6,929	
Agricultural implement	33311	4,470	164	2,609	241	2,368	160	4 r	156	1,861	
Semiconductor machinery	333242	6,924	75	5,352	9	5,343	57	18 i	39	1,572	
Engine, turbine, and power transmission equipment	3336	4,174	380	3,100	16	3,084	249	226	23	1,074	
Other machinery	other 333	10,876	920	8,453	242	8,211	815	399	415	2,422	
Computer and electronic products	334	148,686 i	7,262	110,913 i	4,344 i	106,569 i	6,002	2,839	3,162	37,773	
Communications equipment	3342	15,368	967 i	11,637	741 i	10,896	831 i	202	629 i	3,731	
Semiconductor and other electronic components	3344	75,522 i	2,123	52,077 i	483	51,594 i	2,053	65	1,988	23,445	
Navigational, measuring, electromedical, and control instruments	3345	12,819	4,082	10,056	264	9,792	3,038	2,532	506	2,763	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,078	1,815 i	3,688	121	3,568	854 i	609 i	245	389	
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,638	2,176	2,283	5	2,279	2,101	1,909	192	354	
Other measuring and controlling devices	other 3345	6,104	92	4,085	139	3,946	83	13 i	70	2,020	

TABLE 57

R&D costs paid for by the company and others projected for 2023, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Projected worldwide R&D cost		Projected domestic R&D cost							Projected foreign R&D cost paid for by the company
		Paid for by the company	Paid for by others	Paid for by the company			Paid for by others				
				Total	Purchased and collaborative R&D	R&D performed by the company	Total	U.S. government	Non-U.S. government sources		
Other computer and electronic products	other 334	44,978	i 89	37,144	i 2,857	i 34,287	i 80	40	40	7,834	i
Electrical equipment, appliances, and components	335	8,759	458	7,073	102	6,971	455	45	410	1,686	
Transportation equipment	336	57,653	26,324	50,374	4,731	45,643	25,258	20,388	4,871	7,279	
Motor vehicles, bodies, trailers, and parts	3361-63	41,146	2,994	34,989	4,415	30,574	2,472	103	2,369	6,158	
Aerospace products and parts	3364	14,719	22,241	13,726	263	13,463	21,728	19,244	i 2,484	993	
Aircraft, aircraft engine, and aircraft parts	336411-13	10,533	17,303	i 9,924	171	9,753	16,830	i 15,415	i 1,416	609	
Guided missile, space vehicle, and related parts	336414-15, 336419	4,186	4,938	3,802	92	3,710	4,898	3,829	1,068	384	
Military armored vehicle, tank, and tank components	336992	25	3	24	1	i 24	3	1	2	1	
Other transportation	other 336	1,763	i 1,085	1,635	i 53	1,583	i 1,056	1,040	15	128	
Furniture and related products	337	469	6	432	7	i 425	5	0	5	37	
Miscellaneous	339	29,527	378	24,567	1,161	23,407	299	68	231	4,960	
Medical equipment and supplies	3391	26,046	344	21,491	1,089	20,402	267	52	215	4,555	
Other miscellaneous manufacturing	3399	3,481	34	3,076	72	i 3,004	32	16	16	405	
Nonmanufacturing industries	21-23, 42-81	377,582	59,234	i 316,827	6,446	310,381	43,076	i 9,185	33,892	i 60,755	
Mining, quarrying, oil and gas extraction, and support activities	21	1,203	i 70	i 1,100	i 68	1,032	i 51	i 0	51	i 103	
Utilities	22	1,192	116	i 1,180	609	572	78	i 73	i 5	12	
Wholesale trade	42	1,912	i 51	i 1,822	i 249	i 1,573	i 45	i *	r 45	i 90	i
Electronic shopping and electronic auctions	454111-12	D	0	D	50	i D	0	0	0	D	
Transportation and warehousing	48-49	11,259	i D	11,114	i 59	11,055	i D	D	D	145	
Information	51	250,591	1,296	206,911	2,859	204,052	1,021	206	815	43,680	
Publishing	511	70,183	982	57,190	1,028	56,162	792	126	r 666	12,993	
Newspaper, periodical, book, and directory publishers	5111	103	i 1	i 100	i 18	i 82	1	i 0	1	i 3	
Software publishers	5112	70,080	981	57,090	1,010	56,081	791	126	r 665	12,990	
Telecommunications	517	4,488	D	4,302	510	3,792	66	i 43	r 23	186	
Data processing, hosting, and related services	518	70,943	177	55,503	942	54,562	124	37	87	15,440	
Other information	other 51	104,976	i D	89,916	i 379	89,536	i 38	i 0	38	i 15,061	i
Finance and insurance	52	21,906	85	19,035	358	i 18,677	28	0	28	2,872	
Real estate and rental and leasing	53	2,683	i 0	2,589	i 2	i 2,587	0	0	0	94	i
Lessors of nonfinancial intangible assets (except copyrighted works)	533	6	i 0	4	i 1	i 4	0	0	0	1	i
Other real estate and rental and leasing	other 53	2,677	i 0	2,585	i 1	r 2,584	0	0	0	92	i
Professional, scientific, and technical services	54	50,144	56,833	i 42,669	1,796	40,873	41,078	i 8,826	32,252	i 7,475	
Architectural, engineering, and related services	5413	3,411	1,019	3,324	130	3,195	946	565	381	87	

TABLE 57

R&D costs paid for by the company and others projected for 2023, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Projected worldwide R&D cost		Projected domestic R&D cost							Projected foreign R&D cost paid for by the company
		Paid for by the company	Paid for by others	Paid for by the company			Paid for by others				
				Total	Purchased and collaborative R&D	R&D performed by the company	Total	U.S. government	Non-U.S. government sources		
Computer systems design and related services	5415	24,873	3,826	19,853	483	19,370	3,746	1,011	2,735	5,019	
Scientific research and development services	5417	12,065	50,641 i	10,809	933	9,876	35,169 i	6,387	28,782 i	1,256 i	
Research and development in nanotechnology	541713	319	136	245	34	211	126	88	38	74	
Research and development in biotechnology (except nanobiotechnology)	541714	3,716	12,245 i	3,514	521	2,993	7,884	843	7,040 i	202	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	7,997	37,402 i	7,017	377	6,640	26,305 i	4,680	21,626 i	980 i	
Research and development in the social sciences and humanities	541720	33	858 i	33	1 i	32	854 i	776 i	79 i	0	
Other professional, scientific, and technical services	other 54	9,795	1,347	8,682	251	8,432	1,217	863	354	1,113	
Health care services	621-23	3,338 i	69	3,183 i	283 i	2,900 i	66	22	45	155 i	
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	D	D	D	113	D	D	D	D	D	
All companies (number of domestic employees)	-	860,437	112,152 i	705,424	50,728	654,697	89,551	33,668	55,883 i	155,013	
Small companies											
10-19 ^a	-	5,583	1,429	5,129	897	4,231 i	1,347	700	648 i	454	
20-49	-	18,141	3,058	15,808	2,179	13,629	1,924	796	1,128	2,333	
Medium companies											
50-99	-	18,200	2,414	16,575	2,011	14,564	2,132	838	1,294	1,624	
100-249	-	32,482	3,932	29,393	3,395	25,998	3,470	1,820	1,650	3,090	
Large companies											
250-499	-	36,634	4,008	31,459	3,490	27,969	3,554	789	2,765	5,176	
500-999	-	36,985	4,192	32,466	2,386	30,081	3,567	1,105	2,463	4,518	
1,000-4,999	-	138,102	11,760	110,925	5,754	105,171	10,003	1,173	8,831	27,178	
5,000-9,999	-	75,311	5,323	60,961	3,201 i	57,760	4,795	2,682	2,113 i	14,350	
10,000-24,999	-	138,792	38,920 i	111,938	13,312	98,626	27,595 i	2,274	25,321 i	26,855	
25,000 or more	-	360,207	37,116	290,771	14,104	276,668 i	31,163	21,491	9,672	69,436	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 58

Worldwide R&D paid for by the company and others and performed by the company, by industry and company size: 2009–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All industries	21–23, 31–33, 42–81	336,571	338,451	359,490	374,916	396,352	416,343	429,174	457,591	484,740	543,369	595,683	648,421	744,338	841,131
Manufacturing industries	31–33	236,858	243,611	253,821	261,697	276,110	285,661	287,895	303,044	314,167	339,076	348,904	375,180	411,692	456,879
Food	311	4,916	D	5,589	5,163	6,335	6,136	6,058	5,824	5,424	5,459	5,014	6,395	6,342	8,605
Beverage and tobacco products	312	933	D	D	D	1,358	1,423	1,529	1,076 - 1,654	1,769	1,628	1,755	1,901	2,139	1,397
Textile, apparel, and leather products	313–16	519	522	656	605	759	734	818	1,247	1,131	1,223	1,060	973	717	748
Wood products	321	283	254	211	282	222	341	198	166 - 751	174	206	193	193 - 200	447	263
Paper	322	NA	1,665	769	858	1,022	880	867	943	1,594	1,013	1,161	1,021	1,206	1,086
Printing and related support activities	323	217	269	212	291	258	238	198	223	236	246	422	297	221	167
Petroleum and coal products	324	NA	D	1,281	D	327	298	252	312	377	1,460 - 1,463	1,477 - 1,481	165 - 2,807	1,132	1,107
Chemicals	325	64,442	72,610	72,068	70,218	74,551	79,428	80,961	84,612	90,236	101,132	115,781	120,665	136,569	150,790
Basic chemicals	3251	NA	2,671	5,166	3,400	3,336	3,633	3,677	536 - 5,694	3,101	3,046	3,102	3,454	3,710	3,816
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	NA	1,038	1,117	D	1,794	1,842	1,780	332 - 5,490	805	2,435	1,695	1,745	1,969	2,032
Pesticide, fertilizer, and other agricultural chemicals	3253	NA	D	2,049	D	1,966	2,042	3,405	0 - 5,157	1,864	1,782 - 1,797	2,272 - 2,297	1,173	1,279	1,344
Pharmaceuticals and medicines	3254	53,456	60,537	58,866	58,920	62,480	66,731	D	73,193	79,004	88,776	103,636	108,843	124,493	138,339
Soap, cleaning compound, and toilet preparations	3256	NA	3,285	3,386	3,212	3,358	3,501	D	3,589	3,699	3,567	3,517	3,432	3,613	3,803
Paint, coating, adhesive, and other chemicals	3255, 3259	NA	D	1,485	D	1,617	1,679	1,664	1,806 - 1,830	1,764	1,508 - 1,529	1,531 - 1,562	2,017	1,505	1,456
Plastics and rubber products	326	2,982	2,515	2,640	4,446	4,576	4,519	2,906	4,583	4,626	3,170	3,348	3,143	3,750	4,151
Nonmetallic mineral products	327	1,153	1,596	1,428	1,588	1,578	1,599	1,487	1,474	1,485	1,567	1,699	1,902	1,730	1,623
Primary metals	331	993	802	763	818	700	770	711	662	862	990	721 - 747	848	974	1,139
Fabricated metal products	332	2,174	1,818	1,993	1,949	2,303	2,329	2,467	2,273	2,405	2,533	3,144	3,739	4,423	3,757
Machinery	333	11,156	12,403	18,312	17,462	15,420	15,089	16,827	15,958	16,626	19,279	19,283	20,529	23,090	25,378
Agricultural implement	33311	NA	D	1,570	2,142	2,243	D	2,152	2,189	2,132	2,730	2,777	2,451	2,774	3,277
Semiconductor machinery	333242	NA	2,469	2,727	1,357	3,645	3,434	3,812	4,138	4,530	5,077	5,374	5,836	6,648	7,074
Engine, turbine, and power transmission equipment	3336	NA	D	D	D	1,795	2,894	2,920	2,484	2,577	3,418 - 3,440	1,780	2,211	1,920	4,097
Other machinery	other 333	NA	6,566	D	D	7,736	D	7,943	7,147	7,387	8,030 - 8,057	9,352	10,031	11,748	10,930
Computer and electronic products	334	68,772	75,345	79,145	87,406	90,114	94,199	92,860	98,319	101,910	112,188	110,836	126,055	133,399	140,254
Communications equipment	3342	NA	17,069	15,197	18,877	20,392	22,048	23,049	16,124	15,568	16,467	15,814	15,483	15,965	15,174

TABLE 58

Worldwide R&D paid for by the company and others and performed by the company, by industry and company size: 2009–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Semiconductor and other electronic components	3344	26,082	29,354	32,146	38,300	40,611	42,028	40,348	41,789	41,362	45,795	48,175	56,207	64,684	71,114
Navigational, measuring, electromedical, and control instruments	3345	16,498	17,905	18,242	18,640	18,046	18,993	17,020	18,112	17,965	20,828	21,596	21,616	17,258	15,445
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	NA	4,548	4,987	4,999	2,837	5,049	3,599	3,553	3,702	1,167 - 14,309	4,621	3,371	3,591	5,007
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	NA	8,769	8,641	8,312	8,753	8,486	8,033	8,372	8,347	0 - 13,142	10,541	11,271	5,895	4,473
Other measuring and controlling devices	other 3345	NA	4,588	4,615	5,329	6,456	5,458	5,387	6,187	5,916	6,520	6,434	6,975	7,771	5,965
Other computer and electronic products	other 334	NA	11,017	13,559	11,589	11,065	11,130	12,443	22,294	27,016	29,099	25,251	32,748	35,492	38,521
Electrical equipment, appliances, and components	335	4,475	4,767	5,319	4,140	5,738	5,705	5,710	6,207	6,154	6,179	7,025	6,864	7,320	8,661
Transportation equipment	336	56,183	51,362	49,030	50,415	51,547	56,597	57,698	60,161	59,432	59,850	53,518	55,736	62,312	79,294
Motor vehicles, bodies, trailers, and parts	3361–63	NA	17,764	D	D	23,610	D	25,735	6,671 - 54,230	30,069	31,869 - 31,899	31,440	29,308	36,862	38,916
Aerospace products and parts	3364	36,409	31,627	26,858	D	25,684	D	29,113	3,240 - 50,799	26,189	25,006	18,943	23,453	22,313	37,175
Aircraft, aircraft engine, and aircraft parts	336411–13	NA	D	D	D	D	D	27,463	1,812 - 49,371	24,666	23,683	17,476	21,791	20,671	25,224
Guided missile, space vehicle, and related parts	336414–15, 336419	NA	D	D	1,425	D	D	1,649	1,428	1,523	1,323	1,467	1,662	1,642	11,951
Military armored vehicle, tank, and tank components	336992	NA	D	52	D	9	D	16	3 - 38	9	11	35	11	24	31
Other transportation	other 336	NA	D	D	D	2,245	D	2,834	2,653 - 2,690	3,164	2,936 - 2,961	3,100	2,964	3,113	3,172
Furniture and related products	337	433	407	347	383	401	422	477	381	470	418 - 444	444	456	466	445
Miscellaneous	339	NA	9,528	D	D	18,900	14,951	15,869	18,045	19,257	20,515	22,005	21,650 - 24,298	25,455	28,014
Medical equipment and supplies	3391	NA	7,461	D	10,311	15,938	12,091	13,166	15,387 - 15,400	16,470	17,443	19,068	19,893	22,394	24,628
Other miscellaneous manufacturing	3399	NA	2,066	D	D	2,962	2,860	2,703	2,646 - 2,657	2,788	3,072	2,937	1,758 - 4,406	3,061	3,385
Nonmanufacturing industries	21–23, 42–81	99,713	94,840	105,669	113,220	120,242	130,682	141,279	154,547	170,574	204,293	246,779	273,240	332,646	384,253
Mining, quarrying, oil and gas extraction, and support activities	21	NA	2,785	2,597	D	4,452	D	4,348	3,604	3,647	1,990	3,306	1,290	1,069	1,008
Utilities	22	NA	442	396	368	317	314	483	353	336	283	284	271	D	D
Wholesale trade	42	NA	1,145	1,697	2,165	459	D	1,723	489	0 - 12,105	883	1,298	1,098	1,852	1,861

TABLE 58

Worldwide R&D paid for by the company and others and performed by the company, by industry and company size: 2009–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Electronic shopping and electronic auctions	454111–12	NA	D	D	D	1,845	D	D	0 - 14,624	0 - 12,105	11,715 - 15,515	69 - 21,372	18,875 - 25,758	D	D
Transportation and warehousing	48–49	NA	124	159	186	D	692	416	495	1,221	2,562	9,952	6,217	7,281	9,516
Information	51	43,197	45,099	52,341	56,815	68,375	78,013	77,965	84,400	94,412	111,653	129,742	152,284	177,621	219,288
Publishing	511	33,171	33,883	36,310	36,947	43,821	46,806	42,190	42,156	42,368	39,890	39,918	42,677 - 42,710	49,218	62,697
Newspaper, periodical, book, and directory publishers	5111	NA	826	401	221	348	92	107	84	72	150	61	30 - 63	100	72
Software publishers	5112	NA	33,058	35,910	36,726	43,473	46,714	42,083	42,073	42,296	39,739	39,857	42,647	49,118	62,625
Telecommunications	517	1,609	2,043	2,267	2,787	3,112	3,830	3,648	3,617 - 3,659	3,828	3,827 - 3,833	119 - 46,668	3,505 - 3,538	3,912	3,891
Data processing, hosting, and related services	518	3,008	2,895	5,450	5,574	7,787	10,356	10,600	14,051 - 14,099	18,893	28,214 - 28,226	37,071	49,620	55,447	61,649
Other information	other 51	5,410	6,278	8,313	11,506	13,654	17,022	21,526	24,530	29,323	39,713	6,086 - 52,635	56,449	69,044	91,051
Finance and insurance	52	NA	2,568	3,943	4,159	4,999	4,748	6,359	8,468	8,582	8,347	10,081	13,820	22,876	19,834
Real estate and rental and leasing	53	NA	367	D	400	202	268	313	477	892	1,072	1,472	3,412	2,199	2,500
Lessors of nonfinancial intangible assets (except copyrighted works)	533	NA	NA	365	379	D	58	D	27	77	6	48	6 - 13	7	5
Other real estate and rental and leasing	other 53	NA	NA	D	21	D	210	D	450	814	1,066	1,423	3,399 - 3,406	2,192	2,494
Professional, scientific, and technical services	54	47,709	37,108	39,731	40,843	37,345	37,995	46,255	39,585 - 54,209	46,587	58,333	66,987	67,606	84,401	93,801
Architectural, engineering, and related services	5413	3,384	4,156	D	2,541	3,173	3,374	4,158	56 - 9,557	2,575	4,005	4,192	4,223	4,510	3,919
Computer systems design and related services	5415	15,310	12,458	13,181	13,404	10,535	12,579	17,227	15,483 - 20,617	17,190	20,378	26,357	21,242	24,909	27,108
Scientific research and development services	5417	19,307	16,408	19,295	20,225	18,478	17,870	20,630	20,194	22,635	28,620	30,131	35,171	47,138	53,196
Research and development in nanotechnology	541713	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	179	244	311
Research and development in biotechnology (except nanobiotechnology)	541714	8,492	6,266	7,985	8,364	5,889	4,898	7,114	6,062	6,076	8,428 - 8,442	8,884	8,745 - 9,233	12,856	14,299
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	10,129	9,591	10,697	11,261	11,794	12,291	12,807	13,409	15,680	19,507	20,473	25,569	33,468	37,886
Research and development in the social sciences and humanities	541720	686	551	613	600	795	682	709	723	879	672 - 683	774	190 - 678	569	700

TABLE 58

Worldwide R&D paid for by the company and others and performed by the company, by industry and company size: 2009–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other professional, scientific, and technical services	other 54	9,708	4,086	D	4,674	5,158	4,172 i	4,240	3,852	4,188	5,330	6,307	6,970	7,844	9,577
Health care services	621–23	NA	D	D	708 i	535 i	501 i	771 i	1,002	1,132	1,497	2,290	1,485	2,163	2,948
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	NA	NA	D	D	D	D	D	1,054 - 6,188 i	1,665	2,162 - 5,963	0 - 21,303	0 - 6,883	3,523	3,539
All companies (number of domestic employees) ^a	–	336,571	338,451	359,490	374,916	396,352	416,343	429,174	457,591	484,740	543,369	595,683	648,421	744,338	841,131
Micro companies															
5–9	–	NA	3,792	4,143	3,025 i	3,442 i	3,409 i	3,101 i	1,728 i	NA	NA	NA	NA	NA	NA
Small companies															
10–19	–	NA	NA	NA	NA	NA	NA	5,750 i	5,031 i	3,532	4,511	5,647	5,352	5,631	5,537
20–49	–	NA	NA	NA	NA	NA	NA	10,654 i	9,972	9,513	11,825	12,753	13,542	15,799	15,636
Medium companies															
50–99	–	13,785	9,470	9,834	9,728	9,289	10,677	11,946	9,639	10,635	13,095	14,566	13,810	15,232	16,227
100–249	–	14,365	12,989	13,354	13,665	14,980	15,081	14,964	16,160	18,584	20,486	21,707	27,382	25,955	29,864
Large companies															
250–499	–	12,315	11,439	14,573	12,693	13,379	13,675	14,837	14,751	16,522	21,971	21,517	23,862	28,269	33,789
500–999	–	12,124	11,794	11,388	12,955	13,663	15,422	17,442	16,601	20,173	20,309	26,988	24,460	34,739	36,458
1,000–4,999	–	54,600	60,782	63,801	62,729	69,212	71,679	71,259	79,017	79,494	83,959	92,592	107,102	116,273	128,912
5,000–9,999	–	27,461	34,453	32,578	41,006	43,087	51,305	48,399	49,479	54,572	61,047	62,772	61,221	77,879	72,325
10,000–24,999	–	61,681	50,710	61,593	60,544	60,844	63,818	70,864	81,547	87,965	108,249	111,685	111,585	132,811	153,179
25,000 or more	–	118,424	125,067	132,719	144,097	152,547	155,180	159,959	173,666	183,750	197,916	225,456	260,105	291,751	349,204

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; NA = not available.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey did not include companies with fewer than 5 domestic employees from 2008 to 2016 and does not include fewer than 10 domestic employees beginning in 2017.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Beginning with survey year 2011, the composition of the Other nonmanufacturing industry changed. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 59

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All industries	21–23, 31–33, 42–81	290,680	282,505	279,289	290,240	302,759	323,107	340,539	355,671	378,590	396,979	443,633	491,434	538,870	608,429	691,547
Manufacturing industries	31–33	203,755	196,441	199,147	202,363	208,577	222,718	231,705	236,170	249,999	255,602	274,315	284,673	309,021	333,362	372,459
Food	311	2,100	4,099	D	4,393	4,087	5,021	4,854 i	4,828	4,830	4,588	4,595	4,179	5,234 - 5,245	5,152	7,143
Beverage and tobacco products	312	780	477	D	D	D	827	920	1,006	1,076 - 1,099	1,098	1,113	1,082	1,169	1,247	767
Textile, apparel, and leather products	313–16	815	439	482	608	553	662	631	748	1,166 i	959	1,005	903	822	630	635
Wood products	321	273	280	252	211	280	220	336 i	195	166 - 204	173	203	186	185 - 192	444	259
Paper	322	NA	NA	1,341	676	752	920	723	766	854	1,327	933	1,059	928	1,139	1,005
Printing and related support activities	323	349	210	231	181	256 i	252 i	234	196 i	219 i	231	242	412 i	287	194 i	165
Petroleum and coal products	324	NA	NA	D	D	888	281	234	214	268	324	1,269	1,306	0 - 2,641	957	860
Chemicals	325	58,250	54,753	58,343	55,853	56,748	62,086	66,134	68,032	71,803	75,733	84,367	97,180	101,359	112,806	125,728
Basic chemicals	3251	NA	NA	1,810	D	2,705	2,620	2,849	3,042	0 - 5,157	2,544	2,443	2,360	2,697	2,713	2,860
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	NA	NA	783	798	997	1,197	1,154	1,201	0 - 5,157	541	1,636 - 1,662	1,172	1,233	1,389 i	1,493
Pesticide, fertilizer, and other agricultural chemicals	3253	NA	NA	D	D	D	1,691 i	1,743 i	D	0 - 5,157	1,469	1,460	1,822 - 1,846	961 - 1,173	1,156	1,193
Pharmaceuticals and medicines	3254	48,131	46,415	49,469	46,308	47,851	52,790	56,482	57,332	62,346 - 67,504	66,870	74,815	87,735	92,050	103,534	116,073
Soap, cleaning compound, and toilet preparations	3256	NA	NA	2,400	2,476	2,342	2,434	2,548	2,579	2,800	2,860	2,720	2,760	2,665	2,742	2,886
Paint, coating, adhesive, and other chemicals	3255, 3259	NA	NA	D	1,290	D	1,354	1,357 i	D	1,500 - 1,523	1,450	1,265 - 1,294	1,302 - 1,334	1,540 - 1,753	1,271	1,223
Plastics and rubber products	326	1,817	2,388	2,129	2,278	3,585	3,647	3,614	2,549	3,752	3,722	2,742	2,857	2,616	3,143	3,470
Nonmetallic mineral products	327	1,556	1,098 i	1,314 i	1,175	1,327 i	1,329 i	1,445 i	1,259	1,289	1,304	1,385	1,507 i	1,696 i	1,532	1,464
Primary metals	331	695	863	681	655	741	618	677	625	592	747	839	663	816	925	1,120
Fabricated metal products	332	2,419	2,057	1,727	1,857	1,827 i	2,194 i	2,107 i	2,273 i	2,094	2,234	2,316	2,866	3,390	4,044	3,526
Machinery	333	10,104	9,226	10,260	14,725	13,752	12,586	12,106	13,539	12,718	13,341	14,770	15,182	16,243	17,747	19,464
Agricultural implement	33311	NA	NA	1,345	1,277	1,546	1,597	1,578	1,531	1,565	1,565	1,872	1,920	1,807 - 1,811	1,867	2,287
Semiconductor machinery	333242	NA	NA	2,173	2,351	1,291	3,194	2,941	3,214	3,411	3,737	4,166	4,459	4,809	5,349	5,438
Engine, turbine, and power transmission equipment	3336	NA	NA	1,430	4,273	4,336	1,448	2,356	2,515	2,060	649 - 2,579	2,483	1,301	1,653 - 1,657	1,374	3,026
Other machinery	other 333	NA	NA	5,312	6,824	6,579	6,347	5,229	6,280	5,683	5,459 - 7,388	6,249	7,503	7,969	9,157	8,713
Computer and electronic products	334	60,464	55,856	61,623	62,438	66,290	68,629	73,256	72,182	77,451	78,003	83,948	85,571	99,523	101,830	104,718

TABLE 59

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communications equipment	3342	NA	NA	13,875	12,335	14,352	15,663	18,345	19,424	13,156	12,492	13,090	12,497 - 12,503	12,096	12,555	11,665
Semiconductor and other electronic components	3344	22,324	20,023	23,011	24,237	28,218	30,176	31,668	30,451	31,413	30,373	30,232 - 43,377	35,178	43,184	48,134	49,330
Navigational, measuring, electromedical, and control instruments	3345	15,460	14,318	15,747	15,852	15,918	15,119	15,871	14,202	14,885	14,325	4,671 - 17,814	17,644	18,505	13,676	12,777
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	NA	NA	4,189	4,430	4,413	2,634	3,975	2,676	2,632	2,632	0 - 13,142	3,342	2,874	3,119	4,578
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	NA	NA	8,293	8,066	7,734	8,106	7,861	7,360	7,532	7,379	0 - 13,142	9,662	10,587	5,301	4,146
Other measuring and controlling devices	other 3345	NA	NA	3,265	3,356	3,772	4,379	4,035	4,165	4,722	4,314	4,672	4,640	5,044	5,256	4,053
Other computer and electronic products	other 334	NA	NA	8,990	10,014	7,801	7,671	7,372	8,105	17,997	20,814	22,811	20,244 - 20,254	25,738	27,465	30,946
Electrical equipment, appliances, and components	335	3,143	3,317	3,320	3,624	3,078	4,133	4,323	4,359	4,771	4,319	4,487	5,282	5,029	5,463	7,086
Transportation equipment	336	50,552	48,209	42,940	41,094	42,340	43,648	46,977	49,286	51,569	50,698	52,446	45,482	49,223	54,651	71,259
Motor vehicles, bodies, trailers, and parts	3361–63	NA	NA	D	D	D	16,733	18,518	19,113	0 - 47,558	23,542	25,393	24,223	23,516 - 23,521	30,144	32,881
Aerospace products and parts	3364	36,941	34,563	29,857	26,086	24,874	24,783	26,292	27,440	1,423 - 48,982	24,154	24,301	18,358	22,944	21,602	35,356
Aircraft, aircraft engine, and aircraft parts	336411–13	NA	NA	24,777	24,839	23,454	D	25,002	25,793	0 - 47,558	22,629 - 24,155	22,978	16,891	21,291	19,978	24,571
Guided missile, space vehicle, and related parts	336414–15, 336419	NA	NA	5,080	1,247	1,420	D	1,290	1,647	1,424	0 - 1,524	1,323	1,467	1,652	1,623	10,785
Military armored vehicle, tank, and tank components	336992	NA	NA	D	51	D	9	18	16	3 - 38	9	11	35	11	D	30
Other transportation	other 336	NA	NA	D	D	D	2,124	2,148	2,716	2,549 - 2,586	2,993	2,741	2,866	2,748 - 2,753	D	2,992
Furniture and related products	337	477	395	374	319	360	374	377	452	359	430	409	409	418	428	410
Miscellaneous	339	NA	NA	D	D	D	15,292	12,757	13,662	14,988	16,370	17,245	18,546	17,431 - 20,077	21,031	23,382
Medical equipment and supplies	3391	NA	NA	6,459	7,796	8,333	12,741	10,309	11,353	12,647 - 12,660	13,930	14,559	16,022	16,071	18,394	20,394
Other miscellaneous manufacturing	3399	NA	NA	D	D	D	2,551	2,449	2,309	2,329 - 2,340	2,439	2,686	2,524	1,360 - 4,006	2,636	2,989
Nonmanufacturing industries	21–23, 42–81	86,926	86,064	80,142	87,877	94,183	100,389	108,834	119,501	128,591	141,377	169,318	206,761	229,849	275,067	319,088

TABLE 59

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Mining, quarrying, oil and gas extraction, and support activities	21	NA	NA	2,545	2,365	3,031	4,000	4,633	4,012	3,296	3,292	1,827	2,716	1,165 - 1,167	D	D
Utilities	22	NA	NA	425	358	348	294	313	480	351	326	275	275	264	D	D
Wholesale trade	42	NA	NA	1,092	1,556	2,053	452	339	1,698	467	0 - 9,599	851	1,186	1,053	D	D
Electronic shopping and electronic auctions	454111-12	NA	NA	D	949	1,353	1,356	1,388	D	0 - 9,499	0 - 9,599	11,652	17,176	0 - 14,518 - 20,878	D	D
Transportation and warehousing	48-49	NA	NA	95	132	178	D	679	403	488	1,214	2,548	9,890	6,180	7,208	9,395
Information	51	37,695	35,953	37,088	42,697	46,900	56,608	64,277	65,457	70,946	80,120	94,507	110,665	129,379	148,069	182,340
Publishing	511	28,427	26,838	26,957	28,411	29,067	34,365	36,621	33,348	33,459	33,868	32,716	32,973	34,994 - 35,027	38,935	50,367
Newspaper, periodical, book, and directory publishers	5111	NA	NA	770	372	219	342	88	98	79	66	131	61	30 - 63	100	72
Software publishers	5112	NA	NA	26,187	28,039	28,848	34,023	36,533	33,250	33,379	33,802	32,585	32,912	34,964	38,835	50,295
Telecommunications	517	1,684	1,523	1,912	2,169	2,729	3,049	3,768	3,607	3,568 - 3,611	3,733	3,696	0 - 46,548	3,411 - 3,444	3,835	3,690
Data processing, hosting, and related services	518	6,567	2,741	2,753	5,111	4,914	7,156	9,062	9,355	9,344 - 14,099	16,623	23,472	31,146	41,468	45,623	49,407
Other information	other 51	1,016	4,850	5,466	7,006	10,190	12,039	14,826	19,147	19,820 - 24,532	25,896	34,623	46,548	49,473	59,676	78,876
Finance and insurance	52	NA	NA	2,101	3,447	3,530	4,412	4,122	5,409	7,331	7,611	7,425	8,906	12,280	20,415	17,222
Real estate and rental and leasing	53	NA	NA	330	343	363	191	262	300	475	772 - 852	1,021	1,368	3,249	2,096	2,398
Lessors of nonfinancial intangible assets (except copyrighted works)	533	NA	NA	NA	324	342	58	55	68	27	0 - 79	6	45	7	D	5
Other real estate and rental and leasing	other 53	NA	NA	NA	19	21	133	207	232	448	773	1,015	1,323	3,242	D	2,393
Professional, scientific, and technical services	54	37,954	42,380	31,798	33,307	34,121	30,926	31,461	38,601	33,839 - 43,338	36,024	45,575	52,318	53,937	65,668	74,773
Architectural, engineering, and related services	5413	3,422	3,258	4,008	3,114	2,483	3,132	3,309	4,100	0 - 9,499	2,525	3,463 - 4,007	4,154	4,202	4,471	3,883
Computer systems design and related services	5415	12,146	13,351	10,359	10,938	11,006	9,241	11,053	14,334	15,484	13,702	16,553	20,988	17,932	20,295	22,534
Scientific research and development services	5417	17,913	16,402	13,712	15,713	16,415	14,219	13,324	16,249	14,778	16,029	20,225	21,218	25,164	33,520	39,625
Research and development in nanotechnology	541713	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	175 - 180	228	282
Research and development in biotechnology (except nanobiotechnology)	541714	NA	7,809	5,537	7,043	7,387	4,492	3,459	5,594	4,445	4,207	5,848	6,119	5,868 - 6,356	8,473	10,226

TABLE 59

Domestic R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	NA	7,916	7,628	8,058	8,431	8,935	9,187	9,950	9,613	10,946	13,707	14,333	18,445	24,255	28,420
Research and development in the social sciences and humanities	541720	NA	676	547	612	598	792	678	705	719	876	671	766	184 - 676	564	698
Other professional, scientific, and technical services	other 54	4,474	9,370	3,720	3,542	4,216	4,334	3,775	3,918	3,579	3,770	4,788 - 5,332	5,958	6,639	7,382	8,730
Health care services	621–23	NA	NA	1,049	542	672	528	501	758	848	921	1,475	2,266	1,456 - 1,475	D	2,855
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	NA	NA	NA	2,181	1,635	D	857	D	1,055	1,503	2,163	0 - 17,176	0 - 6,356	D	3,394
All companies (number of domestic employees) ^a	–	290,680	282,505	279,289	290,240	302,759	323,107	340,539	355,671	378,590	396,979	443,633	491,434	538,870	608,429	691,547
Micro companies																
5–9	–	NA	NA	3,614	4,060	2,926	3,390	3,314	2,983	1,583	NA	NA	NA	NA	NA	NA
Small companies																
10–19	–	NA	NA	NA	NA	NA	NA	NA	5,674	4,930	3,390	4,383	5,509	5,064	5,272	5,277
20–49	–	NA	NA	NA	NA	NA	NA	NA	10,281	9,635	9,084	11,255	12,301	12,938	14,892	14,695
Medium companies																
50–99	–	9,351	13,277	8,781	9,295	9,100	8,939	10,130	11,538	9,275	10,164	12,412	13,829	13,014	14,368	15,265
100–249	–	14,662	12,791	11,631	12,303	12,454	13,704	13,606	13,586	14,860	17,205	18,611	19,667	25,331	23,580	27,847
Large companies																
250–499	–	10,219	11,330	10,194	13,013	11,387	12,021	12,228	13,686	12,978	14,312	19,775	18,799	20,977	24,611	29,549
500–999	–	11,886	10,131	10,053	9,993	11,499	12,013	13,129	15,005	14,441	17,736	17,753	24,062	21,273	29,914	31,802
1,000–4,999	–	46,336	44,197	49,108	51,110	50,311	55,974	57,336	57,998	63,431	64,838	68,764	75,990	88,584	95,324	104,505
5,000–9,999	–	24,764	21,769	27,546	24,452	30,708	31,657	38,327	38,858	40,530	40,340	45,509	50,852	49,376	62,303	58,709
10,000–24,999	–	48,737	51,239	41,853	49,107	50,226	51,103	54,452	59,330	66,032	73,540	86,463	88,144	88,512	104,406	121,142
25,000 or more	–	100,820	97,056	99,291	102,222	110,042	119,493	122,533	126,732	140,895	146,369	158,707	182,282	213,801	233,760	282,756

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; NA = not available.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey did not include companies with fewer than 5 domestic employees from 2008 to 2016 and does not include fewer than 10 domestic employees beginning in 2017.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey year 2008, industry classification was based on the 2002 NAICS. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Beginning with survey year 2011, the composition of the Other nonmanufacturing industry changed. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 60

Foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All industries	21–23, 31–33, 42–81	61,475	54,066	59,162	69,251	72,157	73,245	75,804	73,503	79,001	87,761	99,736	104,248	109,551	135,908	149,584
Manufacturing industries	31–33	46,572	40,417	44,464	51,458	53,120	53,392	53,955	51,725	53,045	58,565	64,761	64,230	66,159	78,330	84,419
Food	311	596	817	1,006	1,195	1,076	1,315	1,282	1,231	994	835	865	835	1,150 - 1,161	1,190	1,463
Beverage and tobacco products	312	123	455	783	599	532	531	503	523	0 - 555	671	516	674	732	893	630
Textile, apparel, and leather products	313–16	367	80	39	49	52	98	103	70	81	172	218	157	152	86	113
Wood products	321	4	2	3	1	2	2	5	3	0 - 555	1	3	7	8	4	4
Paper	322	274	257	324	93	106	103	158	102	89	267	80	101	93	67	81
Printing and related support activities	323	9	7	38	30	35	6	3	2	4	5	4	9	10	27	2
Petroleum and coal products	324	D	156	D	D	D	46	64	38	44	53	192 - 194	171 - 176	165	175	247
Chemicals	325	13,990	9,689	14,267	16,215	13,470	12,464	13,294	12,929	12,809	14,503	16,766	18,601	19,305	23,764	25,061
Basic chemicals	3251	1,198	797	861	D	695	716	784	636	537	557	603	742	758	997	956
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	224	260	255	319	D	597	688	579	333	264	774 - 798	523	512	580	539
Pesticide, fertilizer, and other agricultural chemicals	3253	371	D	D	D	D	275	299	D	0 - 5,157	396	321 - 337	450	0 - 212	123	151
Pharmaceuticals and medicines	3254	10,862	7,041	11,068	12,557	11,069	9,690	10,249	D	5,688 - 10,846	12,133	13,962	15,900	16,793	20,959	22,266
Soap, cleaning compound, and toilet preparations	3256	965	873	884	910	870	924	952	D	789	839	847	757	767	871	917
Paint, coating, adhesive, and other chemicals	3255, 3259	370	D	D	195	210	263	321	D	307	314	235 - 259	227	264 - 477	234	232
Plastics and rubber products	326	341	595	386	362	861	929	905	358	831	904	428	491	527	607	682
Nonmetallic mineral products	327	106	54	282	253	261	249	155	228	185	181	181	192	205	198	159
Primary metals	331	114	130	121	108	77	82	94	86	69	116	151	58 - 85	32	49	19
Fabricated metal products	332	188	117	91	135	122	109	222	194	179	171	216	278	349	378	231
Machinery	333	1,929	1,930	2,143	3,587	3,710	2,833	2,984	3,288	3,239	3,285	4,509	4,101	4,286	5,343	5,914
Agricultural implement	33311	399	391	D	293	596	646	D	621	625	566	858	857	640 - 644	907	990
Semiconductor machinery	333242	366	285	296	376	66	451	493	599	727	793	911	915	1,027	1,299	1,636
Engine, turbine, and power transmission equipment	3336	92	83	D	D	D	347	537	405	424	0 - 1,928	935 - 958	479	554 - 558	546	1,071
Other machinery	other 333	1,072	1,170	1,254	D	D	1,389	D	1,664	1,464	0 - 1,928	1,781 - 1,807	1,850	2,062	2,591	2,217
Computer and electronic products	334	15,774	12,917	13,722	16,708	21,117	21,485	20,943	20,678	20,868	23,907	28,240	25,264	26,531	31,569	35,536
Communications equipment	3342	2,951	2,862	3,194	2,863	4,525	4,730	3,702	3,625	2,967	3,076	3,377	3,312 - 3,316	3,387	3,411	3,509

TABLE 60

Foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Semiconductor and other electronic components	3344	7,075	6,058	6,343	7,909	10,082	10,434	10,360	9,896	10,377	10,989	2,418 - 15,563	12,996 i	13,023	16,550	21,784
Navigational, measuring, electromedical, and control instruments	3345	2,308	2,180	2,158	2,390	2,722	2,927	3,122	2,819	3,227	3,640	3,015 - 16,157	3,952	3,112	3,581	2,668
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	838	522	360	557	586	202	1,073	923	922	1,069	1,168 i	1,280 i	497	472	429
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	D	508	475	575	578	647	625	673	840	968	0 - 13,142	878	684	594	327
Other measuring and controlling devices	other 3345	D	1,149	1,324	1,258	1,557	2,077	1,423	1,222	1,465	1,603	1,848	1,794	1,931	2,516	1,912
Other computer and electronic products	other 334	3,440	1,817	2,027	3,546	3,788	3,395	3,759	4,338	4,297	6,202 i	6,287	4,997 - 5,007 i	7,010	8,027	7,575
Electrical equipment, appliances, and components	335	1,162	1,158	1,447	1,695	1,062	1,605	1,382	1,351	1,436	1,835	1,692	1,742	1,835	1,857	1,575
Transportation equipment	336	10,267	7,974	8,422	7,936	8,075	7,899	9,621	8,412	8,592	8,734	7,404	8,036	6,513	7,662	8,035
Motor vehicles, bodies, trailers, and parts	3361–63	8,448	6,023	D	D	D	6,877	D	6,622	6,672	6,527	6,476 - 6,506	7,217	5,787 - 5,792	6,718	6,035
Aerospace products and parts	3364	1,816	1,846	1,770	772	D	901	D	1,672	1,817	2,035	705	585	509	711	1,819
Aircraft, aircraft engine, and aircraft parts	336411–13	1,742	1,760	D	D	D	D	D	1,670	1,813	511 - 2,036	705	585	500	693	653
Guided missile, space vehicle, and related parts	336414–15, 336419	74	85	D	D	5	D	D	2	4	0 - 1,524	1	*	10	18	1,166
Military armored vehicle, tank, and tank components	336992	0	D	D	1	0	0	D	0	0	0	0	0	0	D	1
Other transportation	other 336	3	D	D	D	D	121	D	118	104	171	195 - 221	234	211 - 216	D	181
Furniture and related products	337	27	38	33	28	23	28	45	25	22	40	9 - 33	35	39	38	36
Miscellaneous	339	D	4,044	D	D	D	3,608	2,194	2,207	3,057	2,888	3,271	3,459	4,215 - 4,226	4,424	4,631
Medical equipment and supplies	3391	766	3,813	1,003	D	1,978	3,197	1,782	1,813	2,739	2,539	2,884	3,046	3,821	4,000	4,234
Other miscellaneous manufacturing	3399	D	231	D	D	D	411	412	394 i	317 i	348	386	413	393 - 404	425	397
Nonmanufacturing industries	21–23, 42–81	14,903	13,648	14,698	17,792	19,037	19,853	21,849	21,778	25,956	29,196	34,975	40,018	43,391	57,578	65,165
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	239	232	D	452	D	336	308	355 i	163	589	123 - 125 i	D	D
Utilities	22	6	13	17	38	21	23	1	3	1	10	8	9	6	D	D
Wholesale trade	42	509	D	53	141 i	112 i	7	D	25 i	21 i	0 - 2,590	32	112	45	D	D
Electronic shopping and electronic auctions	454111–12	NA	NA	D	D	D	490	D	D	0 - 5,132 i	2,590	0 - 3,863 i	63 - 4,198 i	69 - 4,891 i	4,345 - 4,891 i	D

TABLE 60

Foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Transportation and warehousing	48–49	2	1	29	28	8	D	13	13	7	7	14	62	37	73	121
Information	51	7,657	7,243	8,011	9,644	9,915	11,767	13,736	12,508	13,454	14,292	17,146	19,077	22,905	29,552	36,948
Publishing	511	6,301	6,332	6,926	7,899	7,880	9,456	10,185	8,842	8,698	8,500	7,174	6,945	7,683	10,284	12,330
Newspaper, periodical, book, and directory publishers	5111	27	47	55	29	2	6	4	9	4	6	19	0	0	*	*
Software publishers	5112	6,274	6,285	6,871	7,870	7,878	9,450	10,181	8,833	8,693	8,494	7,154	6,945	7,683	10,284	12,330
Telecommunications	517	175	86	131	98	59	63	61	41	49	96	131 - 138	120	94	77	201
Data processing, hosting, and related services	518	1,089	266	142	339	661	631	1,294	1,245	0 - 4,710	2,270	4,742 - 4,753	5,924	8,152	9,824	12,242
Other information	other 51	93	559	812	1,308	1,316	1,616	2,196	2,378	0 - 4,710	3,427	5,090	6,087	6,976	9,367	12,176
Finance and insurance	52	74	518	467	496	628	587	625	950	1,136	971	923	1,175	1,540	2,461	2,612
Real estate and rental and leasing	53	65	28	37	D	38	11	6	13	2	40 - 120	51	104	163	103	102
Lessors of nonfinancial intangible assets (except copyrighted works)	533	NA	NA	NA	41	37	D	3	D	*	0 - 79	0	4	0 - 6	D	1
Other real estate and rental and leasing	other 53	NA	NA	NA	D	*	D	3	D	2	41	51	101	157 - 164	D	101
Professional, scientific, and technical services	54	6,150	5,328	5,309	6,424	6,723	6,418	6,534	7,653	5,744 - 10,877	10,563	12,758	14,669	13,668	18,733	19,028
Architectural, engineering, and related services	5413	200	126	148	D	57	41	65	58	57	50	0 - 542	37	20	39	36
Computer systems design and related services	5415	2,164	1,959	2,099	2,243	2,398	1,293	1,525	2,893	0 - 5,132	3,488	3,825	5,369	3,310	4,614	4,575
Scientific research and development services	5417	3,544	2,905	2,696	3,581	3,810	4,259	4,546	4,380	5,416	6,606	8,394	8,913	10,007	13,618	13,571
Research and development in nanotechnology	541713	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 - 4	16	30
Research and development in biotechnology (except nanobiotechnology)	541714	NA	683	729	942	977	1,398	1,438	1,520	1,616	1,869	2,580 - 2,594	2,764	2,877	4,383	4,073
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	NA	2,213	1,962	2,638	2,830	2,859	3,103	2,858	3,796	4,733	5,801	6,140	7,124	9,214	9,466
Research and development in the social sciences and humanities	541720	NA	9	5	1	2	3	4	3	4	3	1 - 12	8	2 - 6	5	2
Other professional, scientific, and technical services	other 54	241	338	366	D	458	825	398	322	273	418	0 - 542	349	331	463	847
Health care services	621–23	1	10	D	D	36	7	*	12	154	211	22	24	10 - 29	D	93

TABLE 60

Foreign R&D paid for by the company and others and performed by the company, by industry and company size: 2008–22

(Millions of U.S. dollars)

Industry and company size	NAICS code	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71– 72, 81	NA	NA	NA	D	D	D	D	D	0 - 5,132	162	0 - 3,800	0 - 4,131	0 - 527	D	146
All companies (number of domestic employees) ^a	–	61,475	54,066	59,162	69,251	72,157	73,245	75,804	73,503	79,001	87,761	99,736	104,248	109,551	135,908	149,584
Micro companies																
5–9	–	NA	NA	178	83	99 i	52 i	95 i	118 i	145	NA	NA	NA	NA	NA	NA
Small companies																
10–19	–	NA	NA	NA	NA	NA	NA	NA	76	101	142	128	138	288	359	260
20–49	–	NA	NA	NA	NA	NA	NA	NA	373	337	429	569	452	604	907	941
Medium companies																
50–99	–	976	509	688 i	539	628	351	547	407	364	471	684	737	796	864	962
100–249	–	1,735	1,574	1,358 i	1,051	1,212	1,276	1,475	1,378	1,300	1,379	1,875	2,040	2,052	2,374	2,017
Large companies																
250–499	–	1,178	985	1,245	1,561	1,306	1,359	1,446	1,151	1,773	2,210	2,196	2,718	2,884	3,657	4,240
500–999	–	1,753	1,992	1,741	1,396	1,455	1,650	2,293	2,437	2,159	2,437	2,557	2,925	3,187	4,825	4,657
1,000–4,999	–	11,350	10,403	11,674	12,691	12,419	13,238	14,343	13,261	15,587	14,656	15,195	16,602	18,518	20,949	24,407
5,000–9,999	–	7,000	5,692	6,907	8,126	10,298	11,430	12,979	9,541	8,949	14,232	15,538	11,919	11,845	15,576	13,616
10,000–24,999	–	11,785	10,442	8,856	12,485	10,317	9,741	9,366	11,534	15,515	14,425	21,787	23,541	23,073	28,406	32,036
25,000 or more	–	24,671	21,368	25,777	30,497	34,056	33,054	32,647	33,226	32,771	37,381	39,208	43,175	46,304	57,991	66,448

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%; NA = not available.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey did not include companies with fewer than 5 domestic employees from 2008 to 2016 and does not include fewer than 10 domestic employees beginning in 2017.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey year 2008, industry classification was based on the 2002 NAICS. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Beginning with survey year 2011, the composition of the Other nonmanufacturing industry changed. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 61

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All business activities	21100–81000	328,040	311,170	316,262	336,629	352,951	376,974	399,656	412,590	440,429	471,440	523,512	570,184	613,845	716,646	799,154
Oil and gas extraction	21100	1,215	1,223	1,268	1,379	D	1,487	1,308	1,486	1,089	986	0 - 23,467	902	790	681	524
Mining	21200	NA	D	75	128	92	114	56	71	63	170	114	0 - 25,025	114	102 i	158 i
Support activities for mining, including oil and gas	21300	NA	993	1,638	1,386	1,814	1,749	1,995	1,831	1,380	1,577	951 i	1,650 i	928	660	882 i
Utilities	22100	NA	1,607	903	639	686	615	549	726	515	501	0 - 23,467	415	424	740	D
Construction	23000	NA	198	918	269	393 i	307	297	700	276	501	691	880	1,069	746	752
Food manufacturing	31100	2,983	4,039	4,478	4,970	4,635	7,028	6,842	5,892	6,073	5,827	5,806	5,905	6,334	6,397	7,646
Beverage manufacturing	31210	605	564	926	668	641	772	753	728	787 i	851	762	723	817	942	894
Tobacco manufacturing	31220	D	792	800	717	662	668	672	681	731	853	722	807	821	999	990
Textile, apparel, and leather products manufacturing	31990	NA	673	658	712	759	787	780	847	1,333	1,093	1,155	965	918	661	688
Wood products manufacturing	32100	264	304	239	208	D	244	336 i	251	0 - 7,094	263	297	0 - 25,025	271	506	340
Paper manufacturing	32200	1,130	1,144	1,231	1,156	1,362	1,588	1,614	D	1,555	1,743	1,592	1,784	1,531	1,840	1,637
Printing and related support activities	32300	297	241	244	265	356 i	391	390	321	340	286	359	468	395	360	398
Petroleum refineries	32401	NA	NA	708	591	807	558	617	526	625	567	640	0 - 25,025	0 - 26,968	537	558
Asphalt paving, roofing, and saturated materials manufacturing	32402	NA	NA	35	39	45	123	78	75	93	137	134	134	225	174	D
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	NA	NA	403	415	382	488	460 i	416	339	383	258	0 - 25,025	238	220	319
Basic chemicals manufacturing	32510	3,806	2,978	3,133	3,614	4,271	4,136	4,036	3,505	3,579	3,576	3,540	3,267	3,776	4,033	4,019
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	1,152	1,459	1,444	1,228	1,437	1,383	1,771	1,703	1,401	1,200	1,743	1,803	1,800	1,757	1,833
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	2,100	1,990	1,722	2,333	2,307	2,364 i	2,508 i	D	2,338 i	2,479 i	3,196 i	2,919	1,696	1,829	1,874
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing ^c	32541	70,016	68,588	71,603	67,688	69,473	68,318	68,846	63,606	69,518	71,762	77,733	80,548	81,181	95,179	88,109
In vitro diagnostic substances manufacturing ^c	32542	1,988	1,159	1,207	1,544	1,371 i	1,066	1,159	972	1,286	1,567	1,381	1,582	1,913	2,033	2,198

TABLE 61

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	NA	NA	NA	NA	NA	10,356	14,947	23,172	24,458	30,555	36,012	41,733	43,753	54,314	69,445
Soap, cleaning compound, and toilet preparations manufacturing	32591	2,787	2,883	3,147	3,472	3,266	3,406	3,493	3,353	3,361	3,257	3,380	3,196	3,053	3,215	3,461
Paint, adhesive, and other chemical manufacturing	32592	2,152	2,320	2,238	2,011	2,087	1,979	2,131	D	2,121	2,094	1,666	1,747	1,775	1,765	1,780
Plastics and rubber products manufacturing	32600	2,536	2,842	3,128	3,689	3,739	3,586	3,592	3,251	3,926	3,904	3,643	3,491	3,501	3,803	4,108
Clay and glass products manufacturing	32710	966 i	312	1,056 i	920 i	1,154 i	1,077	1,130	1,145	1,198	1,345	1,521	1,511	1,647	1,598	1,582
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	738	555	522	590	621	618 i	800	601	652	443	446	543	432	434	455
Primary metal manufacturing	33100	NA	840	933	783	882	792	853	719	0 - 7,094	714	808	849	987	1,107	1,270
Fabricated metal products manufacturing	33200	2,935	2,438	1,971	2,471	2,517	2,460	2,560	2,521	2,562	2,695	2,798	3,110	3,980	4,662	3,916
Agricultural machinery and equipment manufacturing	33311	1,404	1,507	1,523	1,430	1,893	2,055	1,990	1,916	1,977	1,867	2,440	2,458	2,208	2,302	2,848
Construction machinery manufacturing	33312	581	653	682	875	816	1,693	1,729	1,556	1,462	1,588	1,880 i	1,871	1,525	1,895	1,910
Mining, oil, and gas field machinery and equipment manufacturing	33319	NA	1,629	1,765	2,204	2,589	1,942 i	1,462	2,115	1,528	1,586	1,739	1,300	1,308	1,475	1,552
Semiconductor machinery manufacturing	33321	2,553	1,978	2,279	2,574	1,266 i	3,500	3,363	3,459	3,688	3,996	4,465	4,687	5,082	6,409	7,051
Industrial machinery manufacturing (except semiconductor machinery)	33322	1,191	853	806	1,128	1,031	1,006	1,237	1,181	893	1,222	0 - 23,467	1,406	1,131	1,394	1,516
Photographic and photocopying equipment manufacturing	33331	NA	852	270	757	25 i	108	25	114	59	52	67	0 - 25,025	171	77	D
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	NA	977	1,268	1,143	1,621	1,661	2,251	1,947	0 - 7,094	2,245	2,263	2,169	1,951	2,400	2,980
Digital cameras manufacturing	33333	NA	NA	NA	NA	NA	NA	33	587 i	519	571	274	458	364 i	303	238
Engine, turbine, and power transmission equipment manufacturing	33360	2,386	1,589	3,481	3,623	4,068	3,870	3,346	2,626	2,641	3,164	2,756	0 - 25,025	2,942	2,761	3,143
Metalworking and other general purpose machinery manufacturing	33390	2,039	1,618	1,998	2,359	1,916	2,052	2,585	2,728	2,591	2,547	2,996	2,860	3,222	3,163	3,393
Computers and peripheral equipment manufacturing and magnetic and optical media ^d	33412	NA	13,094	12,672	13,319	14,716	15,113	13,437	16,547	23,130	27,553	27,801	25,331	31,371	35,180	37,324
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	6,739	7,758	9,010	9,530	9,335	9,622	10,526	12,366	10,715	10,403	11,487	11,254	10,135	10,475	10,509
Radio, television, and wireless communication equipment manufacturing	33422	5,958	5,181	5,719	4,383	4,773	5,967	5,848 i	3,542	2,839	2,482	0 - 23,467	2,475	2,329	3,916	4,422

TABLE 61

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	2,482	1,352	715	1,092	2,111	1,826	1,782	1,844	i 1,660	1,977	0 - 23,467	2,192	2,497	837	811
Audio and video equipment manufacturing	33430	773	977	1,352	1,019	1,081	1,108	1,282	1,587	1,535	1,252	1,461	1,686	1,667	1,945	2,118
Semiconductor and other electronic components manufacturing	33440	29,911	26,118	29,457	32,354	38,109	40,001	41,125	39,810	40,585	41,053	44,130	46,545	55,227	62,242	72,075
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	3,822	2,544	3,046	3,230	3,494	3,816	4,330	3,875	4,053	3,865	4,815	4,646	4,470	4,907	5,440
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	1,845	2,229	2,417	2,161	2,337	2,564	2,424	2,033	2,614	2,378	3,136	3,198	2,921	1,898	3,235
Measuring and control instruments manufacturing (not listed elsewhere)	33459	3,458	4,425	4,579	4,566	4,871	5,308	5,424	5,637	5,662	5,505	5,469	5,430	5,733	6,091	6,357
Electrical equipment, appliances, and components manufacturing	33500	4,687	4,229	4,500	4,768	4,773	5,272	5,501	5,313	5,905	6,177	5,456	6,455	6,511	6,522	7,834
Motor vehicles manufacturing	33610	18,296	13,165	14,524	17,011	18,362	17,743	18,984	18,357	20,573	22,481	23,693	21,666	20,639	28,583	31,676
Motor vehicle body and trailer manufacturing	33620	70	96	190	73	98	i 107	i 104	160	118	47	99	0 - 25,025	117	189	218
Motor vehicle parts manufacturing	33630	5,401	4,158	4,310	4,681	4,736	5,600	7,146	7,285	6,801	7,621	8,852	9,459	9,089	9,414	9,299
Aircraft manufacturing	33641	4,053	7,390	4,430	4,512	4,716	i 4,373	4,221	4,859	5,639	4,671	6,467	5,404	4,993	5,342	5,475
Aircraft engine and engine parts manufacturing	33642	2,433	1,765	1,978	2,136	D	1,787	2,068	i D	7,094	1,455	1,759	1,474	1,310	3,223	2,751
Other aircraft parts and auxiliary equipment manufacturing	33643	1,222	1,135	1,825	1,752	3,121	3,270	2,980	3,482	3,047	3,239	2,054	1,347	1,412	1,302	2,082
Guided missiles, space vehicles, and related parts manufacturing	33644	1,402	1,176	1,132	1,050	659	487	877	1,034	954	1,055	1,210	1,140	1,906	950	2,755
Railroad rolling stock manufacturing	33651	195	83	177	165	237	224	363	310	224	251	213	0 - 25,025	299	246	330
Ship and boat building	33660	151	i 616	i 608	154	143	i 192	489	251	618	157	144	0 - 25,025	154	161	281
Motorcycle, bicycle, and parts manufacturing	33691	199	194	186	234	197	231	283	320	335	355	429	437	489	547	506
Military armored vehicle, tank, and tank components manufacturing	33692	107	228	182	118	135	90	159	202	130	367	i 23,467	i 381	275	437	i 429
All other transportation equipment manufacturing	33699	176	135	232	367	437	425	361	430	478	505	521	496	546	538	432
Furniture and related products manufacturing	33700	511	495	402	344	431	433	455	509	411	479	467	517	522	521	475
Medical equipment and supplies manufacturing	33910	11,587	11,457	13,226	13,701	14,259	15,264	14,317	15,145	15,939	17,055	16,832	18,877	19,383	22,097	24,067

TABLE 61

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	2,976	2,793	2,341	2,698	D	2,976	2,816	D	3,121	3,130	3,415	3,052	3,744	3,720	3,786
Merchant wholesalers, durable goods	42300	449	923 i	714	711	1,277 i	589	516	1,551	637	448	771 i	702	835	1,332 i	1,226
Merchant wholesalers, nondurable goods	42400	257	365 i	348	605	699 i	327	209	484	219	273	322	0 - 25,025	529	734 i	781
Wholesale electronic markets and agents and brokers (business to business)	42500	14	43 i	19 i	70	173 i	18	D	35	24	0 - 12,866 i	89 i	0 - 25,025 i	61	52	170 r
Retail trade (except electronic shopping and electronic auctions)	44000	NA	50	164	74	100 i	120	65	D	120	119	263	0 - 25,025	0 - 26,968	580 i	432
Electronic shopping and electronic auctions	45411	NA	NA	753	D	1,749	1,284	D	D	8,200 i	0 - 12,866	0 - 23,467 i	0 - 25,025 i	0 - 26,968 i	15,678 i	15,976 i
Transportation	48000	NA	319	211	111	199	377	412	229 i	123	722	2,080	9,072	0 - 26,968	5,995	6,883
Couriers, messengers, and express delivery services	49200	D	14	6	D	D	90	348	D	394	425	451	290	949	1,172	D
Warehousing and storage	49300	26	17	19	16	17	4	3	D	0	82	79	162 i	35	24	D
Newspaper, periodical, book, and directory publishers (except Internet)	51110	180	748	853	408 i	257 i	339 i	103	117	87	99	175	88	74	105	D
Software publishers (except Internet) ^e	51120	31,369	26,362	28,457	29,992	31,209	35,047	41,052	36,040	34,699	31,400	32,842	31,525	30,456	37,548	43,881
Motion picture and sound recording (except Internet)	51200	104	135	93	67	67	38	83 i	12	20	42 i	155	0 - 25,025	86	36	102 r
Broadcasting (except Internet)	51500	NA	89	100	115	165 i	179	206	306	347	460	424	500	0 - 26,968 i	D	452
Wired telecommunications carriers	51710	673	D	1,499 i	1,685	1,631 i	1,012 i	1,166	1,269 i	1,180	1,027	476	428	504	598	622
Wireless telecommunications carriers (except satellite)	51720	532 i	186	724 i	815 i	860 i	1,732 i	2,500	1,192 i	1,458 i	1,969	2,439	2,641	2,414	2,974	3,065
Satellite telecommunications	51740	153	108	229	114	163	176	134	705 i	746	625	476	486	0 - 26,968	529	640
Other telecommunications (not listed elsewhere)	51790	501	351	338	462	399	377	330	536	362	381	745	0 - 25,025	501	378	340
Data processing, hosting, and related services ^e	51800	NA	2,889	3,051	5,293	4,406	4,381	5,402	6,895	7,040	6,975	7,699	9,985	12,675	15,108	13,572
Cloud computing applications and Internet-based software services	51801	NA	NA	NA	NA	NA	4,344	6,730	6,801	11,913	19,581	24,607	33,733	47,436	53,479	64,350
Other information services, including Internet publishing, broadcasting, and Web search portals ^e	51910	NA	5,519	7,270	9,456	12,998	15,433	17,443	25,330	27,524	32,484	43,287	53,057	60,972	73,561	96,932

TABLE 61

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Finance: banking and credit intermediation	52200	NA	D	1,235	1,703	2,454	3,238	3,553	3,299	5,171	5,657	4,975	5,718	9,013	13,704	12,137
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	NA	678	903	1,347	1,110	1,323	1,147	1,597	1,683	1,785	1,445	1,654	2,061	5,133	5,262
Insurance carriers and related activities	52400	NA	798	611	872	1,429	1,772	1,069	1,573	1,444	1,430	0 - 23,467	2,596	2,967	4,008	2,529
Real estate	53100	20	32	3	13	27	105	199	288	440	253	380	0 - 25,025	372	680	793
Rental and leasing services	53200	NA	129	146	51	59	94	80	80	106	i	571	i	699	1,067	2,925
Lessors of nonfinancial intangible assets, including patent licensing	53300	80	259	268	369	437	100	97	104	45	97	24	i	71	75	95
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	NA	D	505	705	i	535	696	1,128	1,587	1,052	1,130	1,426	2,040	2,611	2,960
Architectural, engineering, and related services	54130	1,742	1,115	1,390	1,380	1,232	1,495	1,649	2,449	1,975	1,795	2,575	0 - 25,025	2,592	3,007	3,864
Specialized design services	54140	75	76	65	283	157	i	81	42	13	26	133	0 - 23,467	0 - 25,025	0 - 26,968	97
Computer systems design and related services ^e	54150	11,476	12,292	11,528	13,673	13,909	i	12,577	13,288	14,090	14,864	13,998	18,287	22,535	17,395	19,970
Management, scientific, and technical consulting services	54160	1,110	2,246	1,380	1,618	2,066	i	1,428	1,681	1,531	1,668	1,591	2,443	1,689	1,995	3,033
Research and development services in the social sciences and humanities	54172	NA	96	8	19	64	36	47	15	0 - 7,094	i	348	27	28	0 - 26,968	38
Research and development services in biotechnology ^{c,f}	54173	NA	6,850	2,601	6,238	6,294	1,723	1,344	2,387	1,176	930	1,147	1,244	1,633	2,319	3,392
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	NA	3,208	1,447	2,751	3,166	2,143	3,040	3,197	2,767	2,226	2,324	2,750	5,706	5,042	5,828
Research and development services in nanotechnology	54175	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	122	i	173
Advertising and related services	54180	37	1,950	422	97	375	i	390	424	452	373	412	1,160	i	1,262	i
Professional, scientific, and technical services (not listed elsewhere)	54190	439	1,036	543	1,242	1,199	1,627	810	944	622	695	912	1,266	1,574	1,417	2,055
Management of companies and enterprises	55100	11	40	23	43	18	76	43	D	20	71	0 - 23,467	0 - 25,025	51	39	D
Administrative and support services	56100	NA	419	640	348	609	589	459	375	588	1,558	2,668	3,575	3,806	3,369	4,404
Waste management and remediation services	56200	NA	15	684	20	D	23	D	D	8	0 - 12,866	0 - 23,467	0 - 25,025	0 - 26,968	513	r

TABLE 61

Worldwide R&D paid for by the company and performed by the company and others, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Offices of physicians	62110	40	37	371	36	42 i	43	39	28	70	102 i	113	196	195	143	D
Medical and diagnostic laboratories	62150	903	246	409	287	364	347	410	424	0 - 7,094 i	855	1,739 i	2,104	1,630 i	2,478	3,554
Other ambulatory health care services (ambulance, dental, home health care)	62199	NA	47	145 i	15	45 i	52	37	39	23	70	48	150	83	304	331
Hospitals and nursing care facilities	62200	NA	62 i	68	2	2 i	2	2	4	6	18	0 - 23,467	0 - 15,636	0 - 26,968	7	9
Social assistance services	62400	NA	D	15	13	36	47	17	2	2	6	13	0 - 25,025	0 - 26,968	D	7
Arts, entertainment, and recreation	71000	NA	161	137	85	70	29	103 i	50	45	42	45	479	0 - 26,968	90	D
Accommodation and food services	72000	NA	50	119	84	149 i	163	D	106	76	62	126	0 - 25,025	0 - 26,968	456	D
Other services (not listed elsewhere)	81000	NA	89	465	345	484	405	550	669	0 - 7,094	0 - 12,866	0 - 23,467	507	581	D	8,738 i
Undistributed ^g	-	10,660	14,175	5,373 i	D	491	359 i	69	0	0	0	0	0	0	0	0

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%; NA = not available.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System (NAICS) industry definitions.

^c Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 32543, Biotechnology-based pharmaceutical and biological products (except diagnostic substances).

^d Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2014 and beyond: 33333, Digital cameras manufacturing.

^e Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 51801, Cloud computing applications and Internet-based software services.

^f Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2020 and beyond: 54175, Research and development services in nanotechnology.

^g Includes data reported that were not allocated to a business activity.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey year 2008, industry classification was based on the 2002 NAICS. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All business activities	21100–81000	10,976,518	10,221,923	12,204,773	12,874,185	12,975,886	13,279,075	13,409,822	12,201,595	12,246,930	12,878,032	14,493,394	14,927,124	14,743,459	17,446,295	18,865,332
Oil and gas extraction	21100	271,493	153,939	212,469	331,320	271,983	250,884	241,227	141,687	117,720	108,940	178,064	58,355 - 1,966,830	119,554	185,348	275,133
Mining	21200	NA	D	38,302	57,661	43,857	54,531	D	D	29,976	23,057	44,867	18,307	15,388	85,646	i 37,560
Support activities for mining, including oil and gas	21300	NA	45,184	61,062	68,523	79,788	100,175	129,989	74,421	44,705	64,412	84,366	89,793	53,234	45,305	229,576
Utilities	22100	NA	317,243	310,768	348,763	318,893	324,150	356,225	346,925	309,116	407,052	4,778 - 1,152,314	304,369	288,293	344,089	386,256
Construction	23000	NA	42,287	93,305	107,286	107,685	94,057	91,507	64,463	52,363	69,900	87,053	93,308	99,450	82,315	95,779
Food manufacturing	31100	475,588	630,500	694,763	690,698	688,804	941,309	844,673	744,318	705,021	789,784	718,760	785,374	812,493	918,909	1,066,413
Beverage manufacturing	31210	143,008	129,396	141,259	180,153	167,003	164,270	166,544	170,059	155,459	146,561	138,524	119,571	151,446	182,652	191,226
Tobacco manufacturing	31220	28,970	134,972	133,993	140,998	130,759	69,191	D	D	64,978	72,291	67,629	70,749	72,251	83,747	79,958
Textile, apparel, and leather products manufacturing	31990	NA	56,131	68,515	66,416	89,086	70,260	66,546	83,170	109,296	88,817	84,900	24,172 - 1,932,647	80,328	76,154	80,551
Wood products manufacturing	32100	34,563	27,826	28,342	24,165	32,908	42,472	51,879	33,713	0 - 373,524	36,180	41,001	41,880	43,544	68,705	72,546
Paper manufacturing	32200	139,953	110,534	136,302	144,064	142,335	146,748	148,797	D	129,369	146,927	157,969	0 - 2,264,461	138,023	151,387	157,882
Printing and related support activities	32300	26,426	37,743	37,398	32,823	32,152	29,576	34,227	42,885	31,310	47,910	36,015	65,568	i 36,283	35,766	35,490
Petroleum refineries	32401	NA	NA	837,945	954,108	911,784	968,046	787,825	512,224	415,433	325,034 - 733,821	586,670	565,849	379,018	588,514	826,911
Asphalt paving, roofing, and saturated materials manufacturing	32402	NA	NA	7,566	8,872	8,563	14,504	11,150	10,324	12,322	16,662	17,798	18,422	2,927 - 841,993	24,936	15,062
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	NA	NA	32,282	43,514	D	23,425	22,348	20,440	15,665	20,790	16,008	11,434	8,950	14,714	24,621
Basic chemicals manufacturing	32510	273,809	179,494	243,193	299,476	473,666	i 278,661	270,287	212,951	264,935	231,673	262,007	228,984	168,370 - 731,814	331,610	324,442

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	89,805	94,915	108,693	88,762	97,410	95,249	108,867	92,708	91,399	92,324	128,075	111,483	96,372	133,253	157,618
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	40,337	71,003	51,940	47,381	57,246	67,823	68,738	72,737	58,476	74,274	83,310	67,388	67,401	78,043	92,610
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing ^c	32541	582,910	438,687	471,763	577,607	594,394	577,930	569,968	564,398	608,453	636,157	669,845	555,403	707,534	827,580	920,920
In vitro diagnostic substances manufacturing ^c	32542	22,317	16,940	20,637	25,005	27,022	13,871	25,365	14,159	7,892 - 171,885	15,915	17,050	9,160 - 594,175	6,845 - 845,912	19,790	22,958
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	NA	NA	NA	NA	NA	40,409	56,454	84,437	0 - 373,524	90,419	110,160	126,736	125,500	157,261	155,946
Soap, cleaning compound, and toilet preparations manufacturing	32591	142,212	151,565	167,258	170,417	166,942	185,266	196,651	180,201	164,810	179,865	192,314	178,596	181,974	181,438	205,686
Paint, adhesive, and other chemical manufacturing	32592	113,118	104,308	103,452	120,242	128,998	113,108	128,730	107,146	118,885	124,026	131,768	122,393	121,528	126,396	147,517
Plastics and rubber products manufacturing	32600	162,401	161,057	193,471	243,447	265,623	219,020	241,780	201,164	232,466	229,347	227,659	207,637	238,278	271,443	291,741
Clay and glass products manufacturing	32710	36,417	27,803	37,853	34,184	36,960	39,365	34,863	39,676	47,603	41,355	48,534	39,769	34,268	41,720	53,398
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	48,680	35,530	31,789	32,864	40,193	42,592	35,322	35,377	34,503	29,688	41,567	46,610	43,556	43,959	47,659
Primary metal manufacturing	33100	NA	124,478	197,315	179,318	176,544	161,443	128,532	103,093	121,321	100,279	158,304	162,531	106,419	135,248	190,656

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Fabricated metal products manufacturing	33200	188,359	132,465	161,593	179,228	207,423	199,678	235,784	194,098	165,184	175,986	203,494	183,323	195,877	483,438	289,113
Agricultural machinery and equipment manufacturing	33311	48,185	46,695	53,946	43,410	59,651	68,793	63,617	53,559	51,776	60,038	67,224	36,554 - 621,568	57,346	68,446	116,944
Construction machinery manufacturing	33312	32,109	23,195	30,685	42,974	43,355	63,344	65,348	56,090	49,267	60,563	74,106	80,257	70,436	76,097	96,367
Mining, oil, and gas field machinery and equipment manufacturing	33319	NA	69,074	75,563	101,549	110,356	84,384	76,466	73,725	48,023	65,286	86,513	68,944	55,005	51,221	58,825
Semiconductor machinery manufacturing	33321	20,019	10,505	21,588	25,960	9,973	24,420	27,333	24,653	30,749	38,320	47,008	24,628 - 609,643	49,316	67,019	78,428
Industrial machinery manufacturing (except semiconductor machinery)	33322	26,984	21,368	30,723	44,666	42,619	39,357	51,615	39,189	37,659	38,252	44,624	38,113	48,714	60,122	45,172
Photographic and photocopying equipment manufacturing	33331	NA	7,471	D	D	307 i	7,502	9,162	8,602	6,775 - 170,768	6,849	0 - 1,147,536	836	1,452 - 564,897	1,393	1,504
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	NA	49,546	76,811	73,896	90,814	97,984	111,674	101,920	113,832	100,874	116,411	115,647	93,227	113,309	141,474
Digital cameras manufacturing	33333	NA	NA	NA	NA	NA	NA	15	D	5,579 i	5,947 i	0 - 1,147,536	3,372	0 - 1,108,164	2,079	1,862
Engine, turbine, and power transmission equipment manufacturing	33360	86,660	46,879	84,686	112,562	120,116	146,129	D	85,560	87,887	106,205 i	95,099	55,890 - 640,904	103,427	129,909	131,474
Metalworking and other general purpose machinery manufacturing	33390	90,067	66,350	95,017	112,947	125,495	105,487	149,607	140,673	116,838	117,535	124,745	101,458	95,205	123,693	112,404

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Computers and peripheral equipment manufacturing and magnetic and optical media ^d	33412	NA	273,429	330,020	342,416	304,309	307,523	297,193	282,890	414,641	452,483	479,840	453,517	454,726	544,421	582,618
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	48,816	66,123	87,159	64,811	64,652	75,886	72,421	202,399	i 76,218	74,054	80,804	0 - 2,264,461	70,067	72,885	73,401
Radio, television, and wireless communication equipment manufacturing	33422	76,167	64,808	79,675	92,884	136,470	148,680	168,774	i D	39,937 - 203,930	37,092	0 - 1,147,536	37,124	34,494	44,127	52,154
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	17,976	13,324	12,856	21,004	15,949	23,299	14,548	15,997	0 - 373,524	13,808	14,852 - 257,625	15,898	18,845	11,014	12,125
Audio and video equipment manufacturing	33430	13,212	15,041	22,242	11,476	17,926	19,596	18,333	38,954	i 35,473	3,724 - 417,696	11,671	15,984	16,339	12,414	10,567
Semiconductor and other electronic components manufacturing	33440	220,272	196,399	296,058	336,789	332,771	320,780	350,779	D	323,512	373,892	464,768	0 - 2,264,461	418,715	456,183	464,211
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	41,395	27,437	29,041	38,560	39,590	43,130	43,537	44,739	46,152	44,317	54,101	i 50,472	45,536	42,143	45,547
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	38,474	55,866	68,907	47,701	63,724	66,326	67,154	58,670	59,653	65,730	i 72,999	73,068	78,660	36,394	79,806

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Measuring and control instruments manufacturing (not listed elsewhere)	33459	57,989	78,228	88,305	84,368	99,774	97,153	102,909	101,098	102,226	91,098	80,604	85,037	94,116	109,875	107,583
Electrical equipment, appliances, and components manufacturing	33500	154,206	129,174	160,532	165,156	164,998	182,490	198,505	195,327	213,284	185,233	189,043	219,931	202,458	204,034	212,115
Motor vehicles manufacturing	33610	521,541	399,125	476,726	539,595	541,730	615,136	539,139	646,110	693,548	616,741	700,801	618,116	460,577	559,394	802,708
Motor vehicle body and trailer manufacturing	33620	D	15,688	23,105	15,325	34,284	25,913	32,719	23,229	63,232	20,086	26,219	45,941	30,285	40,182	49,712
Motor vehicle parts manufacturing	33630	163,993	126,638	242,201	224,450	228,418	269,022	379,492	294,414	238,521	270,643	284,735	291,175	241,892	289,839	305,466
Aircraft manufacturing	33641	97,635	75,960	89,235	121,480	97,484	154,241	139,924	148,986	136,497	128,861	190,692	144,845	120,777	112,229	110,740
Aircraft engine and engine parts manufacturing	33642	42,829	37,086	34,925	42,514	40,376	54,024	48,134	D	38,176	42,340	60,557	54,264	42,789	101,024	61,021
Other aircraft parts and auxiliary equipment manufacturing	33643	30,319	36,714	41,704	56,509	44,556	60,520	84,966	97,198	85,111	103,682	67,880	58,258	68,808	59,196	60,734
Guided missiles, space vehicles, and related parts manufacturing	33644	D	51,326	D	D	16,554	17,200	30,237	31,776	30,600	37,204	51,013	35,217	43,681	45,508	71,703
Railroad rolling stock manufacturing	33651	7,248	3,639	9,075	8,870	14,255	12,639	19,679	19,353	14,852	13,416	14,083	13,505	16,856	14,268	18,751
Ship and boat building	33660	16,461	37,439	D	D	23,966	16,927	39,049	15,426	33,496 - 134,100	22,538	16,295	24,056	18,200	20,537	24,871
Motorcycle, bicycle, and parts manufacturing	33691	8,423	6,677	6,646	8,948	7,829	11,331	9,142	9,067	9,507	9,107	4,253 - 1,151,789	4,030 - 1,912,506	9,727	13,450	15,840
Military armored vehicle, tank, and tank components manufacturing	33692	13,341	10,136	D	6,239	4,893	4,354	7,502	D	77 - 229,474	11,306	18,524	15,404	10,764	17,818	9,620
All other transportation equipment manufacturing	33699	9,513	6,332	13,008	13,415	18,469	28,933	12,026	14,565	14,435	14,658	21,096	17,727	21,050	18,786	19,355
Furniture and related products manufacturing	33700	43,401	35,821	37,487	39,031	43,719	41,407	45,760	43,530	43,362	47,260	48,896	51,330	56,126	53,789	45,066

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Medical equipment and supplies manufacturing	33910	164,066	159,611	243,406	304,215	217,549	237,729	234,177	235,706	244,748	250,637	271,188	301,591	516,551	353,777	357,531
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	122,669	114,088	101,526	D	118,660	140,793	134,415	D	131,728	135,910	170,909	117,115	99,609 - 663,053	148,001	118,100
Merchant wholesalers, durable goods	42300	412,269	313,095	334,004	214,772	246,702	378,550	180,014	260,038	221,852	165,345	247,956	163,818	180,636	273,549	229,972
Merchant wholesalers, nondurable goods	42400	340,956	273,118	280,982	496,309	587,019	571,742	698,182	547,921	512,867	506,120	633,916	593,435	651,694	1,239,623	1,334,714
Wholesale electronic markets and agents and brokers (business to business)	42500	2,600	8,684	3,347	4,722 i	115,452 i	53,497	86,215	41,905	60,197	50,155	435 - 1,147,971	5,355	20,646	26,930	19,093
Retail trade (except electronic shopping and electronic auctions)	44000	NA	206,489	223,211	104,922	257,466	156,839	442,527	210,412	296,019	322,049	537,429	662,767	685,526	596,528	709,793
Electronic shopping and electronic auctions	45411	NA	NA	D	D	88,213	96,577	D	130,399	110,617 - 274,610	198,755	191,380 - 434,154 i	168,466 - 753,481 i	212,452 - 775,897 i	276,345	289,431
Transportation	48000	NA	D	182,535	109,842	139,615	95,821	117,267	D	0 - 373,524	278,263	277,801	387,962	41,226 - 880,292	262,513	349,211
Couriers, messengers, and express delivery services	49200	D	D	47,619	D	D	D	170,934	D	187,345	136,436	90,988	2,034	0 - 1,108,164	126,902	136,529
Warehousing and storage	49300	31,235	1,536	24,457	22,885	3,983	13,530	2,585	D	4,652	15,714	0 - 1,147,536	15,943	17,093	5,304	9,583
Newspaper, periodical, book, and directory publishers (except Internet)	51110	17,053	24,528	26,671	30,831	33,557 i	17,955	10,520	7,008	8,704	6,010	0 - 1,147,536	7,146	1,490 - 840,557	7,077	6,805
Software publishers (except Internet) ^e	51120	210,186	195,833	214,359	230,898	237,602	266,587	278,159	272,944	256,293	231,880	244,928	237,538	238,637	265,037	337,227
Motion picture and sound recording (except Internet)	51200	16,774	20,697	18,011	14,964	9,467	20,861	D	7,142	9,353	8,936	37,326	46,569	36,032	37,675	12,890
Broadcasting (except Internet)	51500	NA	39,734	53,313	44,029	67,429	81,499	D	74,473	84,879	88,160	151,227	185,522	168,015	161,118	158,111

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Wired telecommunications carriers	51710	D	187,439	210,704	268,345	223,829	181,992	230,630	216,588	181,904	222,699	129,766	139,245	150,710	156,939	155,830
Wireless telecommunications carriers (except satellite)	51720	135,248	154,682	138,479	156,696	193,408	D	247,759	D	172,416	201,063	264,219	264,976	254,772	275,173	285,959
Satellite telecommunications	51740	19,330	12,662	16,021	2,783	3,056	D	3,581	44,400	61,927	57,588	53,333	51,337	191 - 839,257	34,161	19,759
Other telecommunications (not listed elsewhere)	51790	5,603	9,122	7,737	18,803	17,803	18,504	6,507	14,561	8,524	16,040	12,551 - 255,324	13,862 - 598,877	0 - 1,108,164	15,309	13,999
Data processing, hosting, and related services ^e	51800	NA	36,196	38,523	60,641	95,872	i	58,502	79,017	76,345	77,859	141,006	97,846	102,549	139,219	124,648
Cloud computing applications and Internet-based software services	51801	NA	NA	NA	NA	NA	27,442	D	33,792	57,770	98,224	167,679	220,609	323,373	368,147	420,679
Other information services, including Internet publishing, broadcasting, and Web search portals ^e	51910	NA	41,660	77,319	39,551	45,729	65,134	102,254	94,541	113,123	160,826	191,042	215,354	0 - 1,108,164	337,362	382,286
Finance: banking and credit intermediation	52200	NA	D	1,068,703	631,129	673,238	i	347,139	364,224	400,369	472,203	536,280	629,461	634,637	646,408	619,954
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	NA	148,454	148,014	152,435	104,915	107,027	74,030	75,325	72,115	102,310	20,889 - 1,168,425	97,894	129,317	160,108	152,571
Insurance carriers and related activities	52400	NA	294,233	281,344	280,278	358,159	397,971	380,117	420,526	372,903	312,922	0 - 1,147,536	37,829 - 1,946,303	914,179	955,635	695,361
Real estate	53100	D	7,738	D	D	D	D	D	8,537	9,292	10,114	11,565	222 - 1,908,697	11,838	28,902	41,353
Rental and leasing services	53200	NA	32,231	36,299	23,830	29,033	35,488	21,986	29,238	14,235	21,642	3,607 - 1,151,143	12,718	10,152	35,636	52,555

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Lessors of nonfinancial intangible assets, including patent licensing	53300	D	1,835	1,927	2,709	2,890	11,404 i	2,125	2,150	1,468	3,513	0 - 1,147,536	1,672	3,190 - 566,635	8,944	2,956
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	NA	D	16,188	D	11,315	14,588	22,315	22,259	19,526	21,336	24,044	28,797	29,251	30,913	35,086
Architectural, engineering, and related services	54130	42,680	96,534	147,309	102,126	114,240 i	125,923	134,541	139,846	103,412	84,387	102,795	126,787	95,342	103,770	113,539
Specialized design services	54140	D	6,504	3,976	2,581	3,646 i	3,614	2,165	D	706	4,584 i	25,655	12,684	1,441 - 564,885	543	D
Computer systems design and related services ^e	54150	210,916	216,477	224,026	377,919 i	272,065	249,600	272,937	243,790	249,430	223,281	251,167	238,436	225,488	275,540	269,016
Management, scientific, and technical consulting services	54160	52,497	60,125	43,190	76,910	85,161	81,834	93,077	92,120	63,143	49,057	69,344	58,335	59,529	72,300	88,637
Research and development services in the social sciences and humanities	54172	NA	980	1,170	827	D	1,301	992	D	1,131	1,185	941	1,233	1,016	1,545	1,431
Research and development services in biotechnology ^{c,f}	54173	NA	22,354 i	8,493	8,657	11,316	12,390	17,543	10,962	9,026	9,340	3,772 - 1,151,308	4,159 - 1,912,634	13,755	18,486	16,585
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	NA	19,858	18,840	23,446	33,296	36,913	32,703	36,038	37,997	37,955	41,855	49,247	54,288	61,532	64,757
Research and development services in nanotechnology	54175	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	360 i	317	570
Advertising and related services	54180	D	48,883	12,992 i	D	52,764	D	D	D	44,669 - 208,661	107,640	140,254	84,187 - 669,202	101,594 - 665,038	260,524	D
Professional, scientific, and technical services (not listed elsewhere)	54190	19,146	30,323	35,320	50,949	63,254	47,353	32,811	30,775	12,204 - 176,196	31,239	21,496	23,047	2,694 - 841,760	31,870	41,536

TABLE 62

Worldwide sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Management of companies and enterprises	55100	828	2,333	3,613	17,275	5,435	177,880	9,213	16,180	11,794 i	18,180	13,915	13,249	11,906 i	13,680 i	13,644
Administrative and support services	56100	NA	35,867	45,135	32,735	50,684 i	44,004	243,644	50,037	55,602	49,518	66,944	27,043 - 1,935,519	63,580	62,343	98,358
Waste management and remediation services	56200	NA	6,242	14,172	8,182	6,564	6,245	4,766	24,985	27,470	22,609	88,502	11,624	2,614 - 566,058	18,632 r	1,481
Offices of physicians	62110	7,492	25,752	24,133	23,844	35,513	36,233	19,041	36,724	40,586	61,118	50,891	102,827	65,786	43,937	40,303
Medical and diagnostic laboratories	62150	20,968	15,216	37,950	17,047	21,038	17,914	5,919	20,904	27,539 i	28,636	39,514 i	38,605	52,096	59,027	64,051
Other ambulatory health care services (ambulance, dental, home health care)	62199	NA	8,127	8,487	D	3,361 i	10,919	5,274	5,651	0 - 229,395	10,819	176 - 1,147,712	22,636	30,620	34,480	22,210
Hospitals and nursing care facilities	62200	NA	D	D	D	D	D	26,866	27,616	32,896	32,276	35,119	25,798	0 - 839,065	19,707	15,163
Social assistance services	62400	D	286	448	326	249	1,065	1,338	63	77	112	0 - 1,147,536	0 - 1,908,473	1,826	D	123
Arts, entertainment, and recreation	71000	NA	17,339	16,089	16,023	18,344	D	D	18,677	17,509 - 181,502	24,540	34,697	37,590	14,473 - 577,917	17,955	33,195
Accommodation and food services	72000	NA	D	69,474	39,421	88,878 i	107,255	46,228	76,898	66,849	26,196	54,566	84,342	52,991	64,270	61,543
Other services (not listed elsewhere)	81000	NA	15,585	43,778	129,084	57,612	142,029	78,365	70,781	237,671	0 - 413,972	0 - 1,147,536	18,845 - 1,927,321	20,962 - 860,028	D	286,430
Less: intersegment eliminations	-	381,031	237,743	234,289	281,460	309,288	301,615	316,930	240,217	226,993	196,040	255,127	182,826	215,518	223,649	228,057
Undistributed ^g	-	1,092,275	1,590,109	516,754	598,369 i	167,240 i	D	4,602	9,547 i	0	0	8 i	0	0	0	0

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%; NA = not available.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.^b Business codes and descriptions are based on 2017 North American Industry Classification System (NAICS) industry definitions.^c Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 32543, Biotechnology-based pharmaceutical and biological products (except diagnostic substances).^d Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2014 and beyond: 33333, Digital cameras manufacturing.^e Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 51801, Cloud computing applications and Internet-based software services.^f Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2020 and beyond: 54175, Research and development services in nanotechnology.^g Includes data reported that were not allocated to a business activity.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey year 2008, industry classification was based on the 2002 NAICS. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All business activities	21100–81000	7,796,340	7,448,495	8,831,739	9,059,299	9,260,168	9,663,848	9,785,269	9,084,789	9,151,764	9,583,098	10,680,515	11,279,821	11,186,163	13,126,409	14,184,308
Oil and gas extraction	21100	127,788	61,582	85,797	178,926	124,569	120,495	124,534	71,385	58,231	51,790	91,319	0 - 1,908,473	80,519	114,652	163,855
Mining	21200	NA	D	33,072	38,109	24,837	38,270	22,962	37,589	19,449	17,583	25,823	16,117	13,997	37,586	37,098
Support activities for mining, including oil and gas	21300	NA	23,022	34,840	42,645	51,327	72,553	97,302	47,711	25,825	39,547	54,528	52,894	28,321	30,030	142,631
Utilities	22100	NA	D	301,613	337,871	309,573	316,082	347,997	336,457	304,643	400,104	0 - 1,147,536	299,495	286,720	340,383	381,945
Construction	23000	NA	27,180	81,641	88,626	64,402	60,516	66,835	49,892	45,660	64,968	79,414	85,005	89,040	77,993	91,210
Food manufacturing	31100	394,404	503,047	501,332	494,683	503,915	693,438	608,765	541,557	520,546	617,230	527,904	570,617	583,246	676,200	798,579
Beverage manufacturing	31210	83,691	78,740	84,764	95,236	83,774	106,580	109,397	D	111,431	96,676	92,210	78,312	104,710	123,816	115,934
Tobacco manufacturing	31220	28,680	32,431	31,357	29,645	27,706	35,864	36,177	31,715	34,196	35,945	35,691	38,302	41,250	46,573	45,741
Textile, apparel, and leather products manufacturing	31990	NA	45,893	56,890	52,532	68,545	55,066	51,532	70,105	89,019	66,734	59,379	0 - 1,908,473	56,466	55,062	60,625
Wood products manufacturing	32100	28,183	26,213	25,241	22,344	28,764	36,703	44,706	28,998	0 - 229,395	31,890	34,871	35,769	40,414	63,407	67,441
Paper manufacturing	32200	100,057	80,030	99,820	103,867	101,033	106,399	106,178	108,659	95,481	110,534	118,261	0 - 1,908,473	104,667	118,818	124,483
Printing and related support activities	32300	22,678	33,532	32,163	26,809	26,267	26,281	29,178	35,056	26,808	39,492	31,019	55,231	32,668	30,803	29,142
Petroleum refineries	32401	NA	NA	540,612	581,297	578,075	639,569	521,504	336,271	245,323	325,035	332,542	362,266	235,874	367,550	524,316
Asphalt paving, roofing, and saturated materials manufacturing	32402	NA	NA	7,549	8,781	8,489	13,260	8,873	9,694	9,088	13,350	11,426	12,622	0 - 839,065	20,765	13,970
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	NA	NA	21,658	20,509	20,440	13,722	12,852	11,797	10,565	15,821	13,238	10,453	8,479	11,622	19,780
Basic chemicals manufacturing	32510	158,621	103,950	150,240	206,723	344,515	198,843	195,066	154,351	205,221	164,502	181,046	0 - 228,985	168,371	229,321	218,383

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	60,269	61,805	64,684	58,263	68,104	67,845	73,542	61,729	58,345	56,121	76,816	71,460	57,050	76,141	97,304
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	28,010	47,317	41,528	33,380	40,317	45,660	55,122	D	41,963	55,687	53,085	55,218	56,536	68,605	77,915
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing ^c	32541	445,985	309,750	324,266	414,284	428,486	415,199	414,154	410,983	463,633	486,877	510,204	384,923	539,429	605,058	695,247
In vitro diagnostic substances manufacturing ^c	32542	15,353	9,805	12,835	13,735	14,646	8,141	14,006	6,219	7,893	9,215	8,119	9,161	0 - 839,065	10,874	12,587
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	NA	NA	NA	NA	NA	36,856	48,419	71,205	0 - 229,395	0 - 90,420	96,814	111,134	114,261	119,302	121,621
Soap, cleaning compound, and toilet preparations manufacturing	32591	69,942	71,452	81,151	70,851	82,518	87,034	101,458	94,015	83,083	94,133	107,951	98,948	100,249	103,111	114,703
Paint, adhesive, and other chemical manufacturing	32592	63,149	62,724	60,506	64,497	79,372	67,504	73,975	68,020	73,446	78,668	86,077	79,965	78,245	80,283	89,469
Plastics and rubber products manufacturing	32600	118,523	114,191	137,777	173,290	194,568	153,705	165,082	156,033	175,524	162,892	171,981	147,603	177,138	201,836	219,412
Clay and glass products manufacturing	32710	24,394	19,014	25,143	21,754	20,164	22,987	21,577	23,739	30,753	27,302	29,698	24,222	19,882	26,747	32,522

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	43,373	31,599	24,141	24,235	33,359	33,428	25,941	27,882	28,170	25,524	36,064	40,811	37,413	36,806	41,983
Primary metal manufacturing	33100	NA	97,493	161,558	148,670	153,926	137,000	104,419	90,956	105,884	82,674	124,934	124,538	82,316	113,960	165,814
Fabricated metal products manufacturing	33200	142,788	102,595	119,246	130,090	155,294	160,359	168,139	150,860	129,779	128,532	149,664	132,941	146,085	407,226	223,838
Agricultural machinery and equipment manufacturing	33311	27,543	25,669	29,904	29,258	35,667	45,717	36,857	32,054	30,092	38,891	37,208	36,555	36,338	43,522	87,131
Construction machinery manufacturing	33312	18,228	13,180	19,480	25,854	31,853	42,912	41,256	35,668	34,984	39,464	44,655	49,631	44,963	46,512	65,182
Mining, oil, and gas field machinery and equipment manufacturing	33319	NA	33,167	39,264	53,050	60,556	46,949	43,531	37,351	21,606	31,187	46,305	41,573	22,622	28,128	33,391
Semiconductor machinery manufacturing	33321	9,091	4,765	11,918	15,018	6,839	10,807	11,067	8,215	15,676	20,114	21,685	24,629	26,327	28,909	32,719
Industrial machinery manufacturing (except semiconductor machinery)	33322	19,452	15,372	21,762	29,736	31,127	29,265	35,077	32,599	25,317	27,103	31,884	28,414	37,552	47,265	34,475
Photographic and photocopying equipment manufacturing	33331	NA	5,392	3,927	4,791	D	6,885	7,246	7,124	6,776	5,993	0 - 1,147,536	710	1,453	1,198	1,310
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	NA	33,493	48,407	43,626	54,363	64,333	71,628	74,207	76,436	68,201	77,939	80,289	66,337	78,381	102,937
Digital cameras manufacturing	33333	NA	NA	NA	NA	NA	NA	15	D	0 - 5,580	1,423	0 - 1,147,536	1,762	0 - 839,065	1,987	1,751

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Engine, turbine, and power transmission equipment manufacturing	33360	58,560	30,093	46,693	68,243	74,148	89,526	45,367	50,302	51,113	57,548	49,399	55,891	52,429	67,282	71,986
Metalworking and other general purpose machinery manufacturing	33390	54,007	43,998	58,532	71,081	86,258	81,492	98,230	99,506	78,310	78,019	86,306	75,128	70,191	85,203	76,483
Computers and peripheral equipment manufacturing and magnetic and optical media ^d	33412	NA	136,666	167,290	174,898	143,492	180,146	165,617	153,211	211,415	196,854	214,860	211,233	215,119	239,272	259,306
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	26,447	35,592	40,631	32,334	34,783	39,026	40,004	92,411	i 44,009	41,110	44,162	0 - 1,908,473	40,721	40,367	41,700
Radio, television, and wireless communication equipment manufacturing	33422	46,641	46,769	61,641	55,217	82,027	94,606	i 96,564	i D	39,938	i 31,253	0 - 1,147,536	30,685	27,772	36,901	43,975
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	11,185	8,644	8,841	12,452	13,908	16,604	12,801	14,671	0 - 229,395	11,789	14,853	14,423	16,620	8,176	9,153
Audio and video equipment manufacturing	33430	10,969	10,929	19,142	7,296	14,633	14,832	13,162	D	25,739	i 0 - 413,972	6,363	7,797	13,077	9,269	7,750
Semiconductor and other electronic components manufacturing	33440	119,612	117,302	138,124	151,590	146,764	123,263	162,118	172,062	160,152	182,769	232,283	0 - 1,908,473	238,282	D	215,736

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	28,976	18,709	19,647	25,057	27,605	31,248	28,949	29,150	31,400	24,211	31,286	32,355	28,477	28,086	31,452
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	33,348	46,237	57,639	40,372	53,425	52,990	55,142	48,787	47,874	53,371	63,110	62,411	62,584	33,473	65,564
Measuring and control instruments manufacturing (not listed elsewhere)	33459	37,609	42,753	50,643	49,752	58,909	52,984	55,954	61,158	62,658	60,242	52,440	56,172	62,458	70,193	68,690
Electrical equipment, appliances, and components manufacturing	33500	106,551	85,758	105,982	106,576	110,094	133,238	141,600	143,695	139,311	120,116	115,004	145,779	132,963	132,741	155,881
Motor vehicles manufacturing	33610	346,591	274,985	329,874	373,194	375,113	459,721	385,647	526,522	561,193	207,956 - 616,742	580,129	495,402	355,452	424,989	646,444
Motor vehicle body and trailer manufacturing	33620	9,363	15,184	22,168	14,423	31,982	25,726	32,146	23,083	62,848	19,322	25,616	42,353	25,694	35,506	45,343
Motor vehicle parts manufacturing	33630	97,433	77,528	146,257	125,593	130,372	155,179	244,948	192,928	148,781	185,890	202,526	195,569	156,265	174,779	188,088
Aircraft manufacturing	33641	97,973	69,001	81,666	111,748	91,545	145,641	132,472	139,909	130,676	121,866	181,703	139,087	114,601	D	105,653
Aircraft engine and engine parts manufacturing	33642	35,056	24,737	25,563	27,491	26,706	46,618	41,051	D	36,861	40,556	35,583	32,679	29,626	70,560	43,526
Other aircraft parts and auxiliary equipment manufacturing	33643	21,141	26,755	31,157	43,898	34,541	47,588	68,545	77,236	68,063	83,469	56,053	47,651	0 - 68,810	50,607	50,348
Guided missiles, space vehicles, and related parts manufacturing	33644	38,114	D	25,391	35,889	14,656	14,770	27,872	29,343	30,261	35,725	46,748	32,443	38,371	42,741	69,381

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Railroad rolling stock manufacturing	33651	6,354	2,763	7,095	i 7,204	11,800	10,875	16,122	16,100	11,092	8,252	8,576	8,090	9,422	i 10,639	i 14,057
Ship and boat building	33660	14,880	D	10,531	11,647	22,778	i 15,008	32,077	i 13,569	33,497	i 20,861	14,316	21,987	16,334	18,387	22,844
Motorcycle, bicycle, and parts manufacturing	33691	8,078	6,282	6,081	7,422	7,067	10,406	7,777	7,687	6,276	i 5,423	0 - 1,147,536	0 - 1,908,473	5,569	6,785	9,683
Military armored vehicle, tank, and tank components manufacturing	33692	13,092	9,674	9,072	5,755	4,668	4,190	i 4,895	4,304	0 - 229,395	i 9,662	i 15,846	i 13,847	9,397	16,026	8,817
All other transportation equipment manufacturing	33699	7,131	5,438	11,079	11,066	16,258	15,809	D	11,472	11,940	11,554	17,803	16,188	19,170	16,662	16,896
Furniture and related products manufacturing	33700	36,218	31,479	32,876	32,881	37,447	i 35,446	39,675	38,024	37,737	43,394	44,459	46,013	48,923	46,357	40,303
Medical equipment and supplies manufacturing	33910	105,647	102,585	169,760	225,177	136,664	160,263	155,890	154,650	166,341	165,204	28,416 - 271,189	200,521	404,214	232,955	233,231
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	80,689	84,846	71,000	78,674	80,879	93,078	90,517	95,353	86,197	96,947	104,968	87,408	99,610	100,001	86,126
Merchant wholesalers, durable goods	42300	238,101	196,341	206,240	171,815	221,488	353,401	i 161,500	232,112	194,976	142,659	225,389	147,049	155,289	247,170	211,711
Merchant wholesalers, nondurable goods	42400	274,190	239,385	247,311	266,388	349,833	362,965	457,745	387,489	359,871	349,751	454,966	438,340	519,753	1,043,215	i 1,113,372
Wholesale electronic markets and agents and brokers (business to business)	42500	2,481	D	3,331	3,008	65,076	i 33,264	65,562	21,530	59,653	49,844	0 - 1,147,536	5,104	19,913	26,645	18,811

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Retail trade (except electronic shopping and electronic auctions)	44000	NA	D	195,958	70,424	214,728	i 128,479	400,192	196,896	278,755	305,293	481,549	582,400	608,344	549,530	663,944
Electronic shopping and electronic auctions	45411	NA	NA	32,624	40,254	53,712	59,174	43,787	i D	110,618	0 - 198,757	191,381	i 168,467	i 212,453	D	201,078
Transportation	48000	NA	D	95,591	83,912	107,212	87,113	111,576	D	0 - 229,395	223,375	219,221	299,220	0 - 839,065	206,331	268,274
Couriers, messengers, and express delivery services	49200	D	D	36,420	D	D	D	123,456	D	141,429	103,001	68,939	2,014	0 - 839,065	D	89,141
Warehousing and storage	49300	28,723	1,296	23,982	21,910	3,157	12,235	1,971	2,305	3,358	9,877	0 - 1,147,536	8,407	11,392	D	7,198
Newspaper, periodical, book, and directory publishers (except Internet)	51110	12,383	16,369	18,917	22,488	26,549	i 15,003	8,481	5,743	7,263	4,383	0 - 1,147,536	5,584	0 - 839,065	5,389	5,408
Software publishers (except Internet) ^e	51120	121,028	118,001	129,649	132,970	136,905	154,237	163,059	159,688	155,068	133,983	148,758	142,948	149,525	164,870	234,972
Motion picture and sound recording (except Internet)	51200	10,053	14,356	11,375	9,824	7,281	i 13,722	D	5,203	6,863	6,353	32,874	43,304	33,951	36,546	11,525
Broadcasting (except Internet)	51500	NA	34,110	45,779	39,563	59,926	73,283	59,724	64,390	70,169	71,335	126,122	145,840	131,465	125,374	132,670
Wired telecommunications carriers	51710	99,917	D	209,490	261,484	216,736	181,127	227,778	213,921	179,239	220,350	127,438	137,019	146,787	153,019	152,529
Wireless telecommunications carriers (except satellite)	51720	134,162	153,937	138,473	156,525	193,254	205,148	247,714	210,820	172,357	200,979	264,216	264,970	253,127	274,485	280,885
Satellite telecommunications	51740	14,005	6,743	i 15,845	2,430	2,822	3,143	3,518	43,812	61,622	57,292	53,242	51,266	0 - 839,065	32,953	19,185
Other telecommunications (not listed elsewhere)	51790	4,374	8,108	7,222	15,929	14,610	16,325	5,973	13,669	7,684	14,142	12,552	13,863	0 - 839,065	14,542	13,448

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Data processing, hosting, and related services ^e	51800	NA	29,903	31,417	51,197	82,997	i 49,201	67,167	64,916	59,491	57,183	114,191	69,067	69,419	91,759	93,420
Cloud computing applications and Internet-based software services	51801	NA	NA	NA	NA	NA	19,455	26,461	26,654	44,759	77,556	131,826	171,301	226,651	255,925	306,220
Other information services, including Internet publishing, broadcasting, and Web search portals ^e	51910	NA	27,907	47,397	28,424	28,760	36,613	57,405	53,823	75,332	100,436	114,010	121,756	0 - 839,065	184,883	208,969
Finance: banking and credit intermediation	52200	NA	D	992,651	601,628	631,902	i 305,994	317,147	312,954	342,319	399,822	479,807	577,362	570,871	D	545,867
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	NA	D	113,669	117,167	88,244	83,913	54,342	60,239	55,068	83,537	0 - 1,147,536	67,833	94,101	127,622	117,734
Insurance carriers and related activities	52400	NA	282,640	265,110	265,293	349,252	363,799	347,710	398,746	353,842	294,467	0 - 1,147,536	0 - 1,908,473	883,433	937,882	673,915
Real estate	53100	6,053	D	4,615	4,727	8,069	8,227	10,128	8,449	9,235	0 - 10,116	10,982	0 - 1,908,473	11,837	28,901	41,353
Rental and leasing services	53200	NA	D	27,719	18,597	21,801	26,614	15,330	23,848	0 - 14,237	13,623	0 - 1,147,536	8,245	6,966	25,954	42,843
Lessors of nonfinancial intangible assets, including patent licensing	53300	D	1,484	1,702	2,350	2,125	10,764	i 1,608	1,982	1,386	2,785	0 - 1,147,536	1,615	3,191	7,106	1,806
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	NA	D	14,565	7,394	9,093	11,974	18,498	i 18,538	16,708	18,581	21,142	25,650	26,928	28,216	32,895

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Architectural, engineering, and related services	54130	37,749	81,565	113,603	65,209	94,868	i 80,859	85,535	90,666	76,622	65,138	84,645	110,265	81,025	87,874	96,845
Specialized design services	54140	3,325	D	3,522	2,353	3,301	i 2,714	1,487	769	638	2,356	i 7,284	3,763	1,442	488	6,853
Computer systems design and related services ^e	54150	124,832	140,234	143,787	224,144	167,759	158,858	168,793	165,417	176,418	152,680	154,615	152,057	0 - 225,490	195,833	177,086
Management, scientific, and technical consulting services	54160	33,588	36,811	28,351	52,489	57,925	59,508	84,830	75,668	55,608	42,098	49,590	50,339	54,262	66,117	70,657
Research and development services in the social sciences and humanities	54172	NA	978	1,168	820	934	1,297	969	1,042	1,124	1,179	934	1,144	1,003	1,544	1,425
Research and development services in biotechnology ^{c,f}	54173	NA	18,691	i 7,194	7,388	9,769	10,689	15,872	9,381	6,548	6,476	0 - 1,147,536	0 - 1,908,473	9,660	12,341	11,551
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	NA	16,041	15,845	19,094	27,670	32,098	27,450	30,843	30,737	28,218	31,661	38,345	41,259	46,131	49,874
Research and development services in nanotechnology	54175	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	360	i 316	568
Advertising and related services	54180	14,574	D	11,336	i 21,227	27,500	34,889	34,379	38,454	44,670	52,884	72,957	84,188	101,595	D	145,767
Professional, scientific, and technical services (not listed elsewhere)	54190	15,690	28,298	33,134	46,048	53,969	38,936	24,808	28,026	12,205	29,190	16,673	19,059	0 - 839,065	28,757	37,294

TABLE 63

Domestic sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Management of companies and enterprises	55100	752	2,310	3,347	11,847	4,131	176,993	8,497	D	11,172	i	16,588	12,189	13,209	11,701	i	13,575	i	13,623
Administrative and support services	56100	NA	29,045	25,660	22,146	38,874	i	26,981	214,331	23,581	27,504	26,915	38,514	0 - 1,908,473	55,368	53,074	85,197		
Waste management and remediation services	56200	NA	D	13,971	7,223	6,080	5,650	4,152	23,159	25,561	21,206	84,142	11,343	2,615	18,024	r	1,479		
Offices of physicians	62110	7,492	25,751	24,133	23,844	35,513	36,233	19,041	36,724	40,586	61,117	50,891	102,827	65,786	43,937	40,282			
Medical and diagnostic laboratories	62150	19,930	14,359	36,288	15,778	19,655	17,027	5,024	19,415	25,614	i	27,361	35,193	34,474	47,851	53,351	56,103		
Other ambulatory health care services (ambulance, dental, home health care)	62199	NA	D	8,333	D	3,334	i	10,919	5,274	5,651	0 - 229,395	0 - 1,147,536	22,444	26,984	D	21,668			
Hospitals and nursing care facilities	62200	NA	D	7,831	16,084	870	i	1,227	26,866	27,485	32,609	32,276	35,118	25,798	0 - 839,065	19,707	15,163		
Social assistance services	62400	D	D	448	326	249	1,036	1,336	63	77	112	0 - 1,147,536	0 - 1,908,473	1,826	D	123			
Arts, entertainment, and recreation	71000	NA	14,265	12,920	12,727	15,248	13,180	12,903	16,137	17,510	18,945	26,563	31,860	14,474	16,076	29,365			
Accommodation and food services	72000	NA	D	37,218	27,476	54,266	i	57,908	31,664	44,505	32,404	21,272	33,736	56,338	35,128	42,054	56,323		
Other services (not listed elsewhere)	81000	NA	9,638	35,994	118,268	44,823	120,458	60,949	51,253	173,078	0 - 413,972	0 - 1,147,536	0 - 1,908,473	0 - 839,065	D	205,741			
Less: intersegment eliminations	–	219,384	110,499	132,754	117,417	136,579	136,540	160,374	126,960	129,858	131,717	152,902	117,364	152,867	128,267	142,712			
Undistributed ^g	–	756,553	1,137,705	412,892	450,613	i	108,244	i	D	1,945	D	0	0	8	i	0	0	0	0

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%; NA = not available.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System (NAICS) industry definitions.

^c Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 32543, Biotechnology-based pharmaceutical and biological products (except diagnostic substances).

^d Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2014 and beyond: 33333, Digital cameras manufacturing.

^e Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 51801, Cloud computing applications and Internet-based software services.

^f Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2020 and beyond: 54175, Research and development services in nanotechnology.

^g Includes data reported that were not allocated to a business activity.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey year 2008, industry classification was based on the 2002 NAICS. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All business activities	21100–81000	3,180,177	2,773,429	3,373,035	3,814,885	3,715,718	3,615,226	3,624,553	3,116,806	3,095,167	3,294,934	3,812,880	3,647,303	3,557,296	4,319,886	4,681,024
Oil and gas extraction	21100	143,705	92,357	126,671	152,394	147,415	130,389	116,693	70,302	59,489	57,150	86,746	58,356	39,035	70,696	111,278
Mining	21200	NA	D	5,230	19,552	19,020	16,261	D	D	10,528	5,473	19,044	2,191	1,391	48,060	462
Support activities for mining, including oil and gas	21300	NA	22,162	26,223	25,878	28,461	27,621	32,686	26,711	18,880	24,865	29,837	36,898	24,913	15,275	86,945
Utilities	22100	NA	D	9,155	10,892	9,320	8,068	8,229	10,468	4,473	6,948	4,779	4,874	1,573	3,705	4,311
Construction	23000	NA	15,107	11,664	18,660	43,283	33,541	24,672	14,571	6,703	4,932	7,639	8,303	10,410	4,322	4,569
Food manufacturing	31100	81,184	127,453	193,432	196,015	184,889	247,871	235,909	202,761	184,474	172,554	190,856	214,757	229,247	242,709	267,834
Beverage manufacturing	31210	59,317	50,655	56,495	84,916	83,229	57,690	57,147	D	44,029	49,885	46,313	41,260	46,736	58,836	75,293
Tobacco manufacturing	31220	290	102,541	102,636	111,353	103,052	33,327	D	D	30,782	36,346	31,938	32,447	31,001	37,174	34,216
Textile, apparel, and leather products manufacturing	31990	NA	10,239	11,625	13,883	20,542	15,193	15,014	13,065	20,278	22,083	25,521	24,173	23,862	21,091	19,926
Wood products manufacturing	32100	6,381	1,613	3,101	1,821	4,144	5,769	7,172	4,715	0 - 163,991	4,290	6,131	6,111	3,130	5,297	5,105
Paper manufacturing	32200	39,895	30,504	36,481	40,196	41,303	40,349	42,619	D	33,888	36,393	39,708	0 - 585,012	33,357	32,569	33,400
Printing and related support activities	32300	3,748	4,212	5,234	6,013	5,885	3,296	5,049	7,829	4,501	8,418	4,995	10,337	3,615	4,963	6,348
Petroleum refineries	32401	NA	NA	297,333	372,811	333,710	328,477	266,321	175,953	170,110	0 - 408,784	254,128	203,583	143,144	220,963	302,595
Asphalt paving, roofing, and saturated materials manufacturing	32402	NA	NA	17	91	74	1,244	2,278	630	3,234	3,312	6,373	5,800	2,928	4,171	1,092
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	NA	NA	10,623	23,005	D	9,703	9,496	8,643	5,100	4,968	2,770	981	471	3,091	4,841
Basic chemicals manufacturing	32510	115,189	75,544	92,953	92,754	129,151	79,818	75,221	58,600	59,714	67,172	80,961	0 - 228,985	0 - 563,442	102,289	106,058
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	29,537	33,110	44,009	30,499	29,307	27,404	35,325	30,979	33,055	36,203	51,259	40,023	39,322	57,112	60,314

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	12,327	23,686	10,412	14,001	16,929	22,163	i 13,617	D	16,513	18,587	30,225	12,170	10,865	9,438	14,695
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing ^c	32541	136,925	128,937	147,497	163,323	165,908	162,730	155,814	153,415	144,820	149,280	159,641	170,480	168,105	222,522	225,673
In vitro diagnostic substances manufacturing ^c	32542	6,964	7,135	7,802	11,270	12,376	5,730	11,359	7,940	0 - 163,991	6,700	8,931	i 0 - 585,012	6,846	8,916	10,371
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	NA	NA	NA	NA	NA	3,553	8,035	13,232	0 - 163,991	0 - 90,420	13,346	15,602	11,239	37,959	34,325
Soap, cleaning compound, and toilet preparations manufacturing	32591	72,271	80,113	86,107	99,565	84,423	98,232	95,193	86,186	81,727	85,732	84,362	79,648	81,725	78,327	90,983
Paint, adhesive, and other chemical manufacturing	32592	49,968	41,584	42,946	55,746	49,627	45,604	54,754	39,126	45,439	45,358	45,691	42,428	43,283	46,113	58,049
Plastics and rubber products manufacturing	32600	43,878	46,866	55,694	70,156	71,055	65,315	76,697	45,131	56,942	66,455	55,679	60,034	61,140	69,608	72,329
Clay and glass products manufacturing	32710	12,023	8,789	12,710	12,430	16,796	16,378	13,287	15,938	16,850	14,053	18,837	15,547	i 14,387	14,973	20,876
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	5,307	3,931	7,648	8,629	6,833	9,164	9,381	7,494	6,333	4,163	5,504	5,799	6,143	7,153	5,676
Primary metal manufacturing	33100	NA	26,985	35,756	30,648	22,619	24,443	24,114	12,138	15,437	17,605	33,370	37,994	24,103	21,288	24,843
Fabricated metal products manufacturing	33200	45,571	29,870	42,347	49,138	52,129	39,319	67,646	43,238	35,404	47,454	53,830	50,382	49,793	76,212	65,275
Agricultural machinery and equipment manufacturing	33311	20,642	21,025	24,042	i 14,152	23,984	23,076	26,760	21,505	21,684	21,146	30,017	0 - 585,012	21,007	24,924	29,813

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Construction machinery manufacturing	33312	13,881	10,015	11,205	17,120	11,502	20,431	24,092	20,423	14,283	21,099	29,451	30,626	25,473	29,585	31,186
Mining, oil, and gas field machinery and equipment manufacturing	33319	NA	35,907	36,300	48,499	49,800	37,434	32,935	36,375	26,418	34,098	40,208	27,371	32,383	23,093	25,434
Semiconductor machinery manufacturing	33321	10,928	5,740	9,670	10,941	3,134	13,613	16,266	16,438	15,074	18,206	25,323	0 - 585,012	22,989	38,109	45,709
Industrial machinery manufacturing (except semiconductor machinery)	33322	7,532	5,996	8,961	14,930	11,492	10,092	16,537	6,590	12,341	11,149	12,740	9,699	11,163	12,857	10,697
Photographic and photocopying equipment manufacturing	33331	NA	2,080	D	D	D	618	1,915	1,477	0 - 163,991	857	0 - 242,771	127	0 - 563,442	195	194
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	NA	16,053	28,404	30,270	36,451	33,652	40,045	27,712	37,396	32,672	38,473	35,358	26,891	34,928	38,538
Digital cameras manufacturing	33333	NA	NA	NA	NA	NA	NA	0	D	0 - 5,580	i 4,524	0 - 242,771	1,610	0 - 563,442	92	111
Engine, turbine, and power transmission equipment manufacturing	33360	28,100	16,787	37,994	44,319	45,968	56,604	D	35,258	36,775	48,658	i 45,700	0 - 585,012	50,998	62,627	59,488
Metalworking and other general purpose machinery manufacturing	33390	36,061	22,352	36,485	41,866	39,237	23,995	51,377	41,166	38,528	39,516	38,439	26,329	25,014	38,490	35,920
Computers and peripheral equipment manufacturing and magnetic and optical media ^d	33412	NA	136,763	162,729	167,518	160,818	127,377	131,576	129,679	203,226	255,629	264,980	242,284	239,607	305,149	323,312
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	22,369	30,531	46,528	32,477	29,869	36,859	32,417	109,988	i 32,209	32,943	36,643	0 - 585,012	29,345	32,518	31,701

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Radio, television, and wireless communication equipment manufacturing	33422	29,526	18,039	18,034	37,667	54,443	54,074	i 72,211	i 15,183	0 - 163,991	5,839	0 - 242,771	6,439	i 6,721	7,226	8,179
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	6,791	4,680	4,015	8,552	2,041	6,695	i 1,747	1,326	0 - 163,991	2,019	0 - 242,771	1,476	2,225	2,838	2,971
Audio and video equipment manufacturing	33430	2,243	4,112	3,100	4,180	3,294	4,764	5,171	D	9,734	3,725	5,308	8,187	3,261	3,145	2,817
Semiconductor and other electronic components manufacturing	33440	100,661	79,098	157,934	185,199	186,007	197,516	188,661	D	163,360	191,123	232,485	0 - 585,012	180,433	D	248,474
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	12,419	8,728	9,394	13,503	11,985	11,882	14,588	15,589	14,752	20,106	i 22,814	i 18,118	i 17,058	14,056	14,095
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	5,126	9,629	11,268	7,329	10,300	13,337	12,013	9,882	i 11,779	12,359	i 9,889	10,658	16,076	2,921	14,242
Measuring and control instruments manufacturing (not listed elsewhere)	33459	20,381	35,476	37,663	34,616	40,865	44,169	46,955	39,940	39,568	30,855	28,163	28,865	31,658	39,682	38,893
Electrical equipment, appliances, and components manufacturing	33500	47,654	43,416	54,549	58,580	54,904	49,253	56,905	51,633	73,973	65,117	74,039	74,152	69,495	71,293	56,234
Motor vehicles manufacturing	33610	174,950	124,140	146,852	166,401	166,616	155,415	153,493	119,588	132,355	0 - 408,784	120,673	122,714	105,124	134,404	156,263
Motor vehicle body and trailer manufacturing	33620	D	504	937	903	2,302	187	573	145	384	763	603	3,589	4,591	4,676	4,370
Motor vehicle parts manufacturing	33630	66,559	49,109	95,944	98,857	98,046	113,842	134,544	101,485	89,740	84,753	82,209	95,607	i 85,627	115,060	117,378

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Aircraft manufacturing	33641	S	6,959	7,569	9,732 i	5,939	8,600 i	7,452	9,077	5,821	6,995	8,989	5,758	6,175	D	5,087
Aircraft engine and engine parts manufacturing	33642	7,773	12,349	9,361	15,023	13,670	7,406	7,083 i	D	1,316	1,784	24,974	21,585	13,163	30,464	17,494
Other aircraft parts and auxiliary equipment manufacturing	33643	9,178	9,959	10,547	12,611	10,015	12,933	16,421	19,962	17,048	20,212	11,827	10,607	0 - 68,810	8,589	10,386
Guided missiles, space vehicles, and related parts manufacturing	33644	D	D	D	D	1,899	2,431	2,366	2,434 i	339	1,480 i	4,265	2,774	5,309	2,767	2,322
Railroad rolling stock manufacturing	33651	894	875	1,980	1,666	2,455	1,764	3,557 i	3,253	3,760	5,164	5,507	5,415 i	7,433	3,630 i	4,694
Ship and boat building	33660	1,581	D	D	D	1,188 i	1,919 i	6,971 i	1,858	0 - 100,602 i	1,677	1,979	2,069	1,866	2,150	2,027
Motorcycle, bicycle, and parts manufacturing	33691	345	395	565	1,526	762	926	1,365	1,381	3,231 i	3,684	4,254	4,031	4,158	6,664	6,158
Military armored vehicle, tank, and tank components manufacturing	33692	249	462	D	484	224	164	2,608	D	78	1,644 i	2,678	1,557	1,367	1,793 i	804
All other transportation equipment manufacturing	33699	2,382	895	1,929	2,349	2,212	13,125	D	3,093	2,495	3,104	3,294	1,539	1,880	2,124	2,459
Furniture and related products manufacturing	33700	7,183	4,342	4,610	6,151	6,272	5,960	6,085	5,506	5,625	3,866	4,438	5,317	7,203	7,431	4,763
Medical equipment and supplies manufacturing	33910	58,419	57,025	73,646	79,038	80,885	77,466	78,288	81,056	78,407	85,432	0 - 242,771	101,069	112,337	120,823	124,300
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	41,981	29,242	30,526	D	37,781	47,716	43,898	D	45,531 i	38,962	65,941 i	29,707	0 - 563,442	48,001	31,974
Merchant wholesalers, durable goods	42300	174,168	116,754	127,763	42,957	25,213	25,149 i	18,514	27,926	26,876	22,686	22,567	16,769	25,347	26,378	18,261
Merchant wholesalers, nondurable goods	42400	66,765	33,733	33,672	229,921	237,186	208,777	240,437	160,432	152,996	156,369	178,950	155,095	131,942	196,408	221,342
Wholesale electronic markets and agents and brokers (business to business)	42500	119	D	16	1,714 i	50,376 i	20,233	20,653	20,376	544	312	436	251	732	285	282

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Retail trade (except electronic shopping and electronic auctions)	44000	NA	D	27,253	34,498	42,738	28,360	42,336	13,516	17,264	16,756	55,879	80,367	77,183	46,998	45,849
Electronic shopping and electronic auctions	45411	NA	NA	D	D	34,500	37,403	D	D	0 - 163,991	0 - 198,757	0 - 242,771	0 - 585,012	0 - 563,442	D	88,353
Transportation	48000	NA	D	86,945	25,930	32,403	8,708	5,691	D	0 - 163,991	54,889	58,580	88,742	41,227	56,182	80,937
Couriers, messengers, and express delivery services	49200	D	D	11,199	D	0	30,192	47,478	D	45,916	33,435	22,049	20	0 - 563,442	D	47,388
Warehousing and storage	49300	2,512	240	474	975	826	1,295	614	D	1,294	5,837	0 - 242,771	7,536	5,701	D	2,385
Newspaper, periodical, book, and directory publishers (except Internet)	51110	4,670	8,159	7,754	8,343	7,008	2,953	2,040	1,265	1,441	1,628	0 - 242,771	1,562	1,491	1,689	1,397
Software publishers (except Internet) ^e	51120	89,158	77,832	84,710	97,929	100,697	112,350	115,101	113,255	101,226	97,898	96,171	94,590	89,112	100,167	102,254
Motion picture and sound recording (except Internet)	51200	6,721	6,341	6,635	5,141	2,185	7,140	D	1,939	2,490	2,583	4,452	3,265	2,081	1,129	1,365
Broadcasting (except Internet)	51500	NA	5,624	7,533	4,466	7,504	8,215	D	10,083	14,710	16,825	25,106	39,683	36,550	35,744	25,442
Wired telecommunications carriers	51710	D	D	1,214	6,862	7,093	865	2,852	2,667	2,665	2,349	2,328	2,226	3,923	3,920	3,301
Wireless telecommunications carriers (except satellite)	51720	1,085	745	6	171	154	D	45	D	59	84	3	5	1,645	688	5,074
Satellite telecommunications	51740	5,325	5,919	176	353	234	D	63	587	305	296	90	70	192	1,208	574
Other telecommunications (not listed elsewhere)	51790	1,230	1,015	515	2,875	3,193	2,179	534	893	840	1,898	0 - 242,771	0 - 585,012	0 - 563,442	767	551
Data processing, hosting, and related services ^e	51800	NA	6,292	7,107	9,443	12,874	9,301	13,891	14,101	16,853	20,676	26,815	28,779	33,130	47,461	31,228

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cloud computing applications and Internet-based software services	51801	NA	NA	NA	NA	NA	7,987	i D	7,138	13,012	20,668	35,853	49,309	96,722	112,222	114,459
Other information services, including Internet publishing, broadcasting, and Web search portals ^e	51910	NA	13,753	P	11,126	16,969	28,521	44,849	i 40,718	37,792	60,390	77,032	93,598	0 - 563,442	152,479	173,318
Finance: banking and credit intermediation	52200	NA	45,027	76,052	i 29,501	41,335	41,144	47,077	64,668	58,050	72,381	56,472	52,099	63,767	D	74,087
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	NA	D	34,345	35,268	16,671	23,114	19,687	15,087	i 17,046	18,774	20,890	30,062	35,216	32,486	34,837
Insurance carriers and related activities	52400	NA	11,594	16,234	14,985	8,907	34,172	i 32,407	i 21,780	i 19,060	i 18,456	i 242,771	i 37,830	i 30,746	i 17,753	i 21,446
Real estate	53100	D	D	D	D	D	D	D	88	57	0 - 10,116	583	223	1	1	*
Rental and leasing services	53200	NA	D	8,580	i 5,232	i 7,232	8,873	6,656	5,390	0 - 14,237	8,019	3,608	4,473	3,186	9,682	9,712
Lessors of nonfinancial intangible assets, including patent licensing	53300	D	352	225	359	764	640	517	168	82	729	0 - 80,926	i 56	0 - 563,442	1,838	1,150
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	NA	864	i 1,623	D	2,222	2,614	3,816	i 3,720	2,818	2,755	2,902	3,148	2,323	2,697	2,190
Architectural, engineering, and related services	54130	4,931	14,969	33,706	36,917	19,373	45,064	49,007	49,180	26,789	19,248	18,151	16,522	14,317	15,897	16,694
Specialized design services	54140	D	D	454	228	345	900	678	D	68	2,229	i 18,371	8,921	0 - 563,442	55	D
Computer systems design and related services ^e	54150	86,084	76,243	80,239	153,776	i 104,306	90,742	104,143	78,373	73,013	70,600	96,552	86,379	0 - 225,490	79,708	91,929

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Management, scientific, and technical consulting services	54160	18,909	23,315	14,838	24,421	27,236	22,327	8,247	16,452	7,535	6,959	19,754	7,997 i	5,267	6,184	17,980
Research and development services in the social sciences and humanities	54172	NA	2	2	7	D	4	22	D	7	5	7	89	13	1	6
Research and development services in biotechnology ^{c,f}	54173	NA	3,663 i	1,299	1,269	1,547	1,701	1,671	1,581	2,478 i	2,864	3,773	4,160	4,095	6,144	5,034
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	NA	3,817	2,994	4,352	5,625	4,814	5,253	5,194	7,260	9,736	10,193 i	10,902 i	13,029 i	15,402 i	14,883 i
Research and development services in nanotechnology	54175	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	2	2
Advertising and related services	54180	D	D	1,656	D	25,263	D	D	D	0 - 163,991	54,756	67,297	0 - 585,012	0 - 563,442	D	D
Professional, scientific, and technical services (not listed elsewhere)	54190	3,456	2,025	2,186	4,901	9,285	8,417	8,004	2,749	0 - 163,991	2,049	4,823	3,988 i	2,695	3,112	4,242
Management of companies and enterprises	55100	76	23	266	5,428	1,304	887	716	D	622	1,592	1,726	40	206 i	104 i	21
Administrative and support services	56100	NA	6,821	19,476	10,588	11,810	17,023	29,314	26,456	28,098	22,603	28,430	27,044	8,212	9,268	13,161
Waste management and remediation services	56200	NA	D	201	959	484	595	614	1,827	1,910	1,402	4,360	281	0 - 563,442	608	3
Offices of physicians	62110	0	* i	0	0	0	0	0	0	0	1	0	0	0	0	22
Medical and diagnostic laboratories	62150	1,037	857	1,662	1,269	1,383	887	895	1,488 i	1,925 i	1,275	4,320 i	4,132 i	4,245 i	5,676 i	7,948 i
Other ambulatory health care services (ambulance, dental, home health care)	62199	NA	D	154	D	27	0	0	0	0	455	177	193	3,636	D	542
Hospitals and nursing care facilities	62200	NA	0	D	D	D	D	0	131	287	0	1 i	0	0	0	0

TABLE 64

Foreign sales for companies located in the United States that performed or funded R&D, by business activity: 2008–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Social assistance services	62400	D	D	0	0	0	29	2	0	0	0	0	0	0	0	0
Arts, entertainment, and recreation	71000	NA	3,074	3,169	3,297	3,096	D	D	2,540	0 - 163,991	5,595	8,134	5,730	0 - 563,442	1,879	3,830
Accommodation and food services	72000	NA	9,891	32,256	11,945	34,612	49,347	14,564	32,394	34,445	4,924	20,830	28,004	17,863	22,216	5,220
Other services (not listed elsewhere)	81000	NA	5,946	7,784	10,816	12,789	21,571	17,416	19,528	64,593	0 - 408,784	0 - 242,771	18,846	i 20,963	D	80,689
Less: intersegment eliminations	–	161,647	127,244	101,536	164,044	172,709	165,075	156,556	113,257	97,136	64,324	102,225	65,462	62,651	95,382	85,344
Undistributed ^g	–	335,723	452,404	103,862	147,756	i 58,997	D	2,657	D	0	0	0	0	0	0	0

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; NA = not available.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System (NAICS) industry definitions.

^c Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 32543, Biotechnology-based pharmaceutical and biological products (except diagnostic substances).

^d Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2014 and beyond: 33333, Digital cameras manufacturing.

^e Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 51801, Cloud computing applications and Internet-based software services.

^f Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2020 and beyond: 54175, Research and development services in nanotechnology.

^g Includes data reported that were not allocated to a business activity.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey year 2008, industry classification was based on the 2002 NAICS. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 65

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2011–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
All business activities	21100–81000	290,240	302,759	323,107	340,539	355,671	378,590	396,979	443,633	491,434	538,870	608,429	691,547
Oil and gas extraction	21100	D	D	D	1,108	D	867	0 - 11,355 i	0 - 16,964	712	681	544	D
Mining	21200	83	88	80	54	68	58	121	92	121	104	89 i	138 i
Support activities for mining, including oil and gas	21300	D	1,860	1,871	2,349	2,076	1,544	1,599 i	836 i	1,364	722	651 i	786 i
Utilities	22100	298	434	343	343	485	349	323 i	272	274	275	D	D
Construction	23000	752	756	244 i	204 i	521	258 i	507	686	868	1,071	749	790
Food manufacturing	31100	3,769	3,565	5,156	4,934 i	4,388 i	4,966	4,809	4,678	4,756	5,098	5,120	6,525 i
Beverage manufacturing	31210	D	D	628	D	664	0 - 28,354 i	734	702	654	663	740	794
Tobacco manufacturing	31220	D	140	163	D	153	153	175	196	189	217	233	213
Textile, apparel, and leather products manufacturing	31990	623	688	687	662 i	794	1,244 i	904	934	831	768	577	D
Wood products manufacturing	32100	202	278	234	322 i	227	238	236	261	232	234	476	301
Paper manufacturing	32200	755	982	1,166	1,028	D	1,165	1,411	1,302	1,472	1,244	1,534	1,337
Printing and related support activities	32300	244	305 i	389	363	287	304	265	321	439	352	298	337
Petroleum refineries	32401	D	596	438	D	443	441	396	491	0 - 17,119	25,158	392	432
Asphalt paving, roofing, and saturated materials manufacturing	32402	38	41	117 i	66	52 i	75	124	107	110	197	138	92
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	285	218	312 i	279 i	268	202	223	133	106 - 2,076	120	91	129
Basic chemicals manufacturing	32510	3,099	3,228	2,925	3,144	3,071	2,946	2,897	2,897	2,638	3,039	3,048	3,136
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	815	1,093	999	1,054	1,213	930	825	1,262	1,293	1,338	1,375	1,370
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	D	1,951	2,114 i	2,057 i	D	1,900 i	1,977	2,384 i	2,094	1,512	1,482	D
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing ^c	32541	42,381	43,672	42,456	43,748	40,540	43,964	45,846	48,489	55,243	56,811	60,803	61,071
In vitro diagnostic substances manufacturing ^c	32542	1,110	1,044 i	831	729	801	987	1,308	1,151	1,380	1,596	1,621	1,777
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	NA	NA	7,118	10,337	14,071	16,440	18,629	23,591	29,477	32,452	39,327	51,697
Soap, cleaning compound, and toilet preparations manufacturing	32591	2,344	2,261	2,286	2,365	2,451	2,550	2,492	2,534	0 - 17,119	2,404	2,477	2,586
Paint, adhesive, and other chemical manufacturing	32592	1,552	1,630	1,489	1,562 i	D	0 - 28,354	1,636	1,361	1,423	1,472	1,356	1,384
Plastics and rubber products manufacturing	32600	2,669	3,277	3,010	3,072 i	2,910	3,396	3,264	3,128	2,997	2,921	3,225	3,515
Clay and glass products manufacturing	32710	801 i	987 i	973 i	1,003 i	948	987	1,199	1,333	1,326 i	1,376 i	1,375	1,382
Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	303	367	458 i	564 i	393 i	374	378	331	437	374	417	446

TABLE 65

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2011–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Primary metal manufacturing	33100	552	750	644	703	596	0 - 28,354	608	708	742	915	1,036	1,231
Fabricated metal products manufacturing	33200	D	2,236	2,535	2,280	2,541	2,321	2,650	2,764	3,278	3,895	4,614	4,020
Agricultural machinery and equipment manufacturing	33311	989	1,175	1,193	1,230	1,172	1,194	1,224	1,529	1,549	0 - 25,158	1,531	D
Construction machinery manufacturing	33312	655	675	1,340	1,309	1,210	1,209	1,203	1,316	1,276	1,254	1,384	1,249
Mining, oil, and gas field machinery and equipment manufacturing	33319	1,735	1,999	1,436	1,142	1,431	1,107	1,272	1,324	1,104	1,028	1,222	1,262
Semiconductor machinery manufacturing	33321	2,207	1,308	3,146	2,979	3,218	3,374	3,707	4,131	4,396	4,752	5,308	5,466
Industrial machinery manufacturing (except semiconductor machinery)	33322	945	850	878	1,158	1,143	900	1,049	971	1,386	1,042	1,432	1,503
Photographic and photocopying equipment manufacturing	33331	656	23	458	79	133	92	61	59	162	0 - 25,158	70	D
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	D	1,182	1,367	1,446	1,380	0 - 28,354	1,780	1,667	1,712	1,440	1,907	2,300
Digital cameras manufacturing	33333	NA	NA	NA	25	491	421	475	230	409	313	273	194
Engine, turbine, and power transmission equipment manufacturing	33360	3,257	3,603	2,373	1,847	2,304	2,365	2,543	2,273	2,550	2,466	2,051	2,568
Metalworking and other general purpose machinery manufacturing	33390	1,832	1,607	1,780	2,089	2,292	2,139	2,039	2,468	2,394	2,881	2,530	2,767
Computers and peripheral equipment manufacturing and magnetic and optical media ^d	33412	10,311	10,893	11,162	9,651	10,997	18,321	20,751	21,765	19,060	22,842	24,769	27,905
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	7,006	5,101	5,534	7,734	9,529	8,182	7,789	8,550	8,495	7,562	7,912	D
Radio, television, and wireless communication equipment manufacturing	33422	4,182	5,851	7,664	6,325	3,387	4,108	3,942	0 - 16,964	2,589	2,286	3,299	3,453
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	871	1,937	1,729	1,687	1,695	1,798	1,536	0 - 16,964	1,686	1,641	681	595
Audio and video equipment manufacturing	33430	798	865	876	1,018	1,071	972	1,058	1,084	1,270	1,285	1,517	1,713
Semiconductor and other electronic components manufacturing	33440	24,580	28,983	30,792	31,986	30,805	31,428	30,858	31,240	35,725	44,110	47,620	50,441
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	2,787	2,868	3,178	3,670	3,409	3,417	3,094	4,079	3,973	3,902	4,386	5,106
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	5,666	6,403	6,550	6,234	6,503	8,275	6,538	7,819	7,870	8,840	3,918	5,584
Measuring and control instruments manufacturing (not listed elsewhere)	33459	3,191	3,465	3,901	4,045	4,201	4,222	3,885	3,888	3,911	4,376	4,273	4,182
Electrical equipment, appliances, and components manufacturing	33500	3,007	3,391	4,208	4,461	4,378	4,805	4,512	4,362	5,230	5,295	5,389	6,700
Motor vehicles manufacturing	33610	9,320	11,314	11,696	12,134	12,502	15,095	16,308	17,447	15,241	15,574	22,120	24,738
Motor vehicle body and trailer manufacturing	33620	69	91	98	96	156	113	44	93	155	82	137	162
Motor vehicle parts manufacturing	33630	3,010	D	4,554	6,022	6,158	6,401	6,946	7,800	8,146	7,780	7,727	7,687
Aircraft manufacturing	33641	5,853	15,380	16,607	15,632	14,757	0 - 28,354	9,704	14,488	10,720	15,641	9,842	17,879
Aircraft engine and engine parts manufacturing	33642	1,636	1,296	1,758	2,294	1,580	1,738	1,850	2,226	2,104	2,038	8,245	4,396

TABLE 65

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2011–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other aircraft parts and auxiliary equipment manufacturing	33643	1,896	2,655	3,446	4,443	4,919	3,817	4,453	1,887	1,434	1,740	1,490	2,873
Guided missiles, space vehicles, and related parts manufacturing	33644	3,526	2,850	2,703	2,826	3,011	3,063	3,269	3,405	3,496	3,357	2,426	6,684
Railroad rolling stock manufacturing	33651	136	177	183	295	240	187	11,355	148	0 - 17,119	239	212	289
Ship and boat building	33660	D	D	1,106	1,568	D	28,354	1,289	16,964	0 - 17,119	964	859	960
Motorcycle, bicycle, and parts manufacturing	33691	212	176	214	251	282	286	11,355	372	368	417	447	454
Military armored vehicle, tank, and tank components manufacturing	33692	D	122	215	358	335	392	653	664	541	468	731	660
All other transportation equipment manufacturing	33699	415	D	362	428	D	368	564	465	465	552	563	397
Furniture and related products manufacturing	33700	300	382	383	389	458	364	438	428	458	462	458	432
Medical equipment and supplies manufacturing	33910	10,141	10,703	11,797	10,987	11,336	12,024	13,299	13,211	14,801	14,638	16,886	18,572
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	2,593	D	2,544	2,387	2,455	2,597	2,575	2,861	2,499	3,032	3,133	3,261
Merchant wholesalers, durable goods	42300	505	1,461	449	414	1,507	551	364	730	750	855	1,303	1,145
Merchant wholesalers, nondurable goods	42400	429	651	272	D	546	153	207	273	0 - 17,119	384	656	662
Wholesale electronic markets and agents and brokers (business to business)	42500	54	182	D	139	D	23	41	94	37	36	50	168
Retail trade (except electronic shopping and electronic auctions)	44000	52	101	96	58	87	149	69	190	280	216	353	354
Electronic shopping and electronic auctions	45411	940	1,239	993	1,051	1,543	28,354	11,355	16,964	0 - 17,119	25,158	11,930	12,205
Transportation	48000	123	D	D	388	205	100	691	2,045	9,398	25,158	5,929	6,816
Couriers, messengers, and express delivery services	49200	D	D	D	344	D	394	421	446	290	923	1,115	1,671
Warehousing and storage	49300	15	15	15	3	3	0	90	76	128	33	17	D
Newspaper, periodical, book, and directory publishers (except Internet)	51110	345	229	316	89	99	80	83	151	84	25,158	123	94
Software publishers (except Internet) ^e	51120	22,635	23,803	26,661	31,392	29,887	26,685	24,362	25,742	24,798	23,520	27,768	34,695
Motion picture and sound recording (except Internet)	51200	61	73	86	71	10	16	27	148	72	81	22	D
Broadcasting (except Internet)	51500	94	36	53	70	101	28,354	11,355	186	0 - 2,469	25,158	D	D
Wired telecommunications carriers	51710	867	1,482	951	945	1,229	1,067	924	469	424	505	599	624
Wireless telecommunications carriers (except satellite)	51720	391	739	1,768	2,481	1,176	1,477	1,920	2,147	2,306	2,022	2,492	2,582
Satellite telecommunications	51740	D	195	106	107	681	699	593	451	475	25,158	510	600
Other telecommunications (not listed elsewhere)	51790	495	383	322	255	459	448	413	691	0 - 17,119	427	304	315
Data processing, hosting, and related services ^e	51800	4,922	3,997	4,009	4,754	5,839	6,295	6,217	6,809	8,885	11,223	13,119	11,506
Cloud computing applications and Internet-based software services	51801	NA	NA	3,727	5,718	5,783	9,981	16,812	20,600	28,631	39,147	43,704	51,438

TABLE 65

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2011–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Other information services, including Internet publishing, broadcasting, and Web search portals ^e	51910	D	11,397	13,485	15,306	21,534	23,962	28,445	37,435	46,171	53,228	63,300	D
Finance: banking and credit intermediation	52200	1,365	1,601	1,834	2,451	2,708	4,474	4,819	4,309	4,924	7,917	12,268	10,424
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	1,148	893	1,153	937	1,352	1,516	1,587	1,248	1,445	1,815	4,409	4,674
Insurance carriers and related activities	52400	D	1,141	1,573	887	1,364	1,216	1,127	1,673	2,190	2,542	3,655	1,948
Real estate	53100	13	26	i 100	193	280	438	251	377	0 - 17,119	368	674	785
Rental and leasing services	53200	27	D	69	59	D	97	i 536	639	945	2,766	1,423	1,644
Lessors of nonfinancial intangible assets, including patent licensing	53300	319	369	74	78	79	40	58	23	59	0 - 25,158	14	D
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	578	i 417	i 514	i 826	i 1,283	892	875	1,148	1,901	2,492	2,674	3,238
Architectural, engineering, and related services	54130	2,028	4,206	i 3,398	3,392	4,143	i 3,259	2,664	4,293	4,421	4,347	D	5,748
Specialized design services	54140	271	207	i 101	97	83	77	198	i 16,964	163	212	170	122
Computer systems design and related services ^e	54150	11,129	12,390	i 11,472	i 13,216	i 13,647	14,159	12,607	16,346	19,604	16,755	18,727	20,455
Management, scientific, and technical consulting services	54160	1,745	2,280	2,030	1,958	1,761	2,137	i 1,903	2,796	2,561	2,671	3,758	4,158
Research and development services in the social sciences and humanities	54172	D	601	792	745	756	0 - 28,354	1,124	674	764	0 - 25,158	563	699
Research and development services in biotechnology ^{c,f}	54173	6,030	7,146	4,145	3,083	i 5,178	i 3,911	i 3,610	5,398	5,564	5,482	8,119	9,309
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	7,196	9,427	9,139	9,068	10,907	10,621	11,842	14,904	15,130	i 19,362	i 24,453	i 27,923
Research and development services in nanotechnology	54175	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 - 25,158	i 232	293
Advertising and related services	54180	80	377	i 450	i 435	424	344	381	1,032	i 1,107	i 1,284	i 2,095	i 2,003
Professional, scientific, and technical services (not listed elsewhere)	54190	1,316	2,463	i 1,786	1,020	1,228	874	1,113	1,246	1,649	1,883	1,714	2,442
Management of companies and enterprises	55100	20	40	68	25	i D	28	70	0 - 16,964	0 - 17,119	0 - 25,158	D	D
Administrative and support services	56100	338	436	556	i 401	i 202	i 418	1,405	2,302	3,285	3,521	3,264	4,195
Waste management and remediation services	56200	19	i D	39	i 31	24	i 25	20	20	20	0 - 25,158	530	r D
Offices of physicians	62110	24	73	i 74	i 88	i 79	i 106	i 190	155	508	235	192	D
Medical and diagnostic laboratories	62150	764	1,027	959	965	1,204	0 - 28,354	i 1,210	2,049	2,467	2,065	2,849	3,828
Other ambulatory health care services (ambulance, dental, home health care)	62199	11	41	i 51	i 35	i 42	i 24	i 65	46	148	93	297	317
Hospitals and nursing care facilities	62200	2	2	i 2	7	i 7	9	0 - 11,355	0 - 10,879	0 - 11,355	0 - 25,158	7	9

TABLE 65

Domestic R&D paid for by the company and others and performed by the company, by business activity: 2011–22

(Millions of U.S. dollars)

Business activity ^a	Business code ^b	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022		
Social assistance services	62400	7	36	38	16	2	2	0 - 11,355	0 - 16,964	0 - 17,119	0 - 25,158	D	7		
Arts, entertainment, and recreation	71000	105	108	31	91	D	44	48	44	415	0 - 25,158	64	D		
Accommodation and food services	72000	74	131	i	123	i	57	87	61	49	120	80	122	163	104
Other services (not listed elsewhere)	81000	366	553	366	576	682	28,354	0 - 11,355	0 - 16,964	0 - 654	0 - 25,158	D	6,960	i	
Undistributed ^g	-	28,583	i	1,689	i	336	i	63	0	0	0	0	0	0	0

D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%; NA = not available.

^a Data are tabulated independent of the industry classification of the company. Companies were asked to report their sales and R&D activity in one or more business activity codes.

^b Business codes and descriptions are based on 2017 North American Industry Classification System (NAICS) industry definitions.

^c Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 32543, Biotechnology-based pharmaceutical and biological products (except diagnostic substances).

^d Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2014 and beyond: 33333, Digital cameras manufacturing.

^e Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2013 and beyond: 51801, Cloud computing applications and Internet-based software services.

^f Estimates for this business code may not be comparable to those from prior years due to the introduction of a related business code for survey year 2020 and beyond: 54175, Research and development services in nanotechnology.

^g Includes data reported that were not allocated to a business activity.

Note(s):

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Most statistics for years prior to 2022 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE 66

Domestic R&D paid for by the company and others and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for by the company and others	Depreciation	Capital expenditures related to R&D	Adjusted domestic R&D paid for by the company and others	Change	
						Amount	Percent
All industries	21-23, 31-33, 42-81	691,547	22,557	36,069	705,060	13,513	r 2.0
Manufacturing industries	31-33	372,459	14,074	23,717	382,102	9,642	r 2.6
Food	311	7,143	270	544	7,417	274	i 3.8
Beverage and tobacco products	312	767	34	76	808	41	i 5.4
Textile, apparel, and leather products	313-16	635	16	44	664	28	i 4.4
Wood products	321	259	3	40	297	37	i 14.5
Paper	322	1,005	7	266	1,264	259	i 25.8
Printing and related support activities	323	165	10	12	167	2	i 1.2
Petroleum and coal products	324	860	36	142	966	106	i 12.3
Chemicals	325	125,728	4,278	6,121	127,571	1,843	i 1.5
Basic chemicals	3251	2,860	174	392	3,078	218	i 7.6
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,493	92	171	1,572	79	i 5.3
Pesticide, fertilizer, and other agricultural chemicals	3253	1,193	74	55	1,173	-20	i -1.6
Pharmaceuticals and medicines	3254	116,073	3,788	5,234	117,520	1,446	i 1.2
Soap, cleaning compound, and toilet preparations	3256	2,886	100	195	2,982	96	i 3.3
Paint, coating, adhesive, and other chemicals	3255, 3259	1,223	50	73	1,247	24	i 1.9
Plastics and rubber products	326	3,470	109	320	3,681	211	i 6.1
Nonmetallic mineral products	327	1,464	75	70	1,459	-5	i -0.3
Primary metals	331	1,120	31	225	1,313	193	i 17.3
Fabricated metal products	332	3,526	98	300	3,728	202	i 5.7
Machinery	333	19,464	790	1,788	20,462	998	i 5.1
Agricultural implement	33311	2,287	89	141	2,339	52	i 2.3
Semiconductor machinery	333242	5,438	400	581	5,620	181	i 3.3
Engine, turbine, and power transmission equipment	3336	3,026	79	144	3,091	65	i 2.1
Other machinery	other 333	8,713	223	922	9,412	699	i 8.0
Computer and electronic products	334	104,718	5,692	8,444	107,469	2,752	i 2.6
Communications equipment	3342	11,665	387	482	11,760	95	i 0.8
Semiconductor and other electronic components	3344	49,330	2,753	4,981	51,558	2,228	i 4.5
Navigational, measuring, electromedical, and control instruments	3345	12,777	306	479	12,949	172	i 1.3
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	4,578	113	149	4,614	36	i 0.8
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	4,146	64	134	4,216	70	i 1.7
Other measuring and controlling devices	other 3345	4,053	129	195	4,119	66	i 1.6
Other computer and electronic products	other 334	30,946	2,246	2,503	31,202	257	i 0.8
Electrical equipment, appliances, and components	335	7,086	179	675	7,582	496	i 7.0
Transportation equipment	336	71,259	1,549	3,128	72,837	1,579	i 2.2
Motor vehicles, bodies, trailers, and parts	3361-63	32,881	1,049	2,159	33,991	1,110	i 3.4
Aerospace products and parts	3364	35,356	433	819	35,742	386	i 1.1

TABLE 66

Domestic R&D paid for by the company and others and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for by the company and others	Depreciation	Capital expenditures related to R&D	Adjusted domestic R&D paid for by the company and others	Change	
						Amount	Percent
Aircraft, aircraft engine, and aircraft parts	336411-13	24,571 i	154	408	24,825 i	254 i	1.0
Guided missile, space vehicle, and related parts	336414-15, 336419	10,785	279	411	10,918	133	1.2
Military armored vehicle, tank, and tank components	336992	30	*	*	30	*	-0.1
Other transportation	other 336	2,992	67	150	3,074 i	83	2.8
Furniture and related products	337	410	9	19	420	10	2.5
Miscellaneous	339	23,382	889	1,503	23,997	614	2.6
Medical equipment and supplies	3391	20,394	798	1,259	20,855	461	2.3
Other miscellaneous manufacturing	3399	2,989	91	244	3,142 i	153	5.1
Nonmanufacturing industries	21-23, 42-81	319,088	8,482	12,353	322,958 i	3,870 r	1.2
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D	1,230 i	D	D
Utilities	22	D	D	D	D	245 i	D
Wholesale trade	42	D	D	49	1,818 i	D	D
Electronic shopping and electronic auctions	454111-12	D	D	D	D	D	D
Transportation and warehousing	48-49	9,395	325	303	9,374 i	-22 i	-0.2
Information	51	182,340	4,054	7,889	186,175	3,835	2.1
Publishing	511	50,367	656	2,916	52,627	2,260	4.5
Newspaper, periodical, book, and directory publishers	5111	72	0	1	73	1 i	1.6
Software publishers	5112	50,295	656	2,915	52,554	2,259	4.5
Telecommunications	517	3,690	30 i	487 i	4,147 i	457 i	12.4
Data processing, hosting, and related services	518	49,407	562	1,053	49,898	491	1.0
Other information	other 51	78,876	2,806	3,433 i	79,502 i	627 i	0.8
Finance and insurance	52	17,222	738	59 i	16,543 i	-679 i	-3.9
Real estate and rental and leasing	53	2,398 i	48	145 i	2,495 i	97 i	4.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5 i	0	*	5 i	*	7.2
Other real estate and rental and leasing	other 53	2,393 i	48	145 i	2,490 i	97 i	4.0
Professional, scientific, and technical services	54	74,773	2,182	2,370	74,961 i	188 i	0.3
Architectural, engineering, and related services	5413	3,883	26	91 i	3,948 i	65 i	1.7
Computer systems design and related services	5415	22,534	618	528	22,444	-90	-0.4
Scientific research and development services	5417	39,625 i	1,429 i	1,423	39,619 i	-7 i	*
Research and development in nanotechnology	541713	282	9	21	293	11	4.1
Research and development in biotechnology (except nanobiotechnology)	541714	10,226	236	345	10,335 i	109	1.1
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	28,420 i	1,184 i	1,055	28,291 i	-129 i	-0.5
Research and development in the social sciences and humanities	541720	698	*	2	700	2	0.3
Other professional, scientific, and technical services	other 54	8,730	109	329 i	8,950 i	220 i	2.5
Health care services	621-23	2,855	141	38	2,752 i	-103 i	-3.6

TABLE 66

Domestic R&D paid for by the company and others and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for by the company and others	Depreciation	Capital expenditures related to R&D	Adjusted domestic R&D paid for by the company and others	Change		
						Amount	Percent	
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,394	D	D	3,501	108	i	3.2
All companies (number of domestic employees)	–	691,547	22,557	36,069	705,060	13,513	r	2.0
Small companies								
10–19 ^a	–	5,277	72	204	5,408	131	i	2.5
20–49	–	14,695	279	847	15,264	569	r	3.9
Medium companies								
50–99	–	15,265	263	887	15,888	624	r	4.1
100–249	–	27,847	641	1,540	28,746	899	r	3.2
Large companies								
250–499	–	29,549	768	1,322	30,103	554		1.9
500–999	–	31,802	999	1,729	32,532	730		2.3
1,000–4,999	–	104,505	2,808	4,944	106,642	2,136	i	2.0
5,000–9,999	–	58,709	2,303	3,152	59,559	850	i	1.4
10,000–24,999	–	121,142	5,002	7,313	123,453	2,311	i	1.9
25,000 or more	–	282,756	9,423	14,131	287,464	4,709	i	1.7

* = -\$500,000 < amount < \$500,000 (or -0.05% < amount < 0.05%); D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development (BERD) Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D. To enable comparisons between U.S. statistics from the BERD Survey and statistics from other nations, in this table an internationally comparable adjusted domestic R&D estimate is calculated by subtracting depreciation relating to R&D operations, which is included in U.S. R&D from the BERD Survey, and adding capital expenditures relating to R&D operations, which is excluded from U.S. R&D from the BERD Survey.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 67

Domestic R&D paid for and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for and performed by the company	Depreciation	Capital expenditures related to R&D	Adjusted domestic R&D paid for by the company and others	Change	
						Amount	Percent
All industries	21-23, 31-33, 42-81	608,058	20,232	36,069	623,895	15,837	r 2.6
Manufacturing industries	31-33	326,998	12,995	23,717	337,720	10,722	r 3.3
Food	311	D	D	544	7,081	D	D
Beverage and tobacco products	312	660	27	76	708	48	i 7.3
Textile, apparel, and leather products	313-16	D	D	44	651	D	D
Wood products	321	254	3	40	291	38	i 14.8
Paper	322	1,004	7	266	1,263	259	i 25.8
Printing and related support activities	323	164	10	12	166	2	i 1.2
Petroleum and coal products	324	856	36	142	962	106	12.4
Chemicals	325	113,518	3,765	6,121	115,874	2,356	2.1
Basic chemicals	3251	D	D	392	2,888	D	D
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,413	D	171	D	D	D
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D	55	D	D	D
Pharmaceuticals and medicines	3254	104,720	3,332	5,234	106,623	1,903	1.8
Soap, cleaning compound, and toilet preparations	3256	D	D	195	2,761	D	D
Paint, coating, adhesive, and other chemicals	3255, 3259	1,195	49	73	1,219	24	i 2.0
Plastics and rubber products	326	3,251	102	320	3,468	218	i 6.7
Nonmetallic mineral products	327	1,435	74	70	1,431	-4	i -0.3
Primary metals	331	1,099	31	225	1,293	193	17.6
Fabricated metal products	332	3,304	88	300	3,516	212	6.4
Machinery	333	18,246	720	1,788	19,315	1,068	5.9
Agricultural implement	33311	D	D	141	2,211	D	D
Semiconductor machinery	333242	5,390	397	581	5,574	184	3.4
Engine, turbine, and power transmission equipment	3336	D	D	144	2,792	D	D
Other machinery	other 333	7,987	172	922	8,738	751	9.4
Computer and electronic products	334	99,234	5,530	8,444	102,148	2,914	i 2.9
Communications equipment	3342	10,870	376	482	10,976	106	i 1.0
Semiconductor and other electronic components	3344	47,380	2,668	4,981	49,692	2,312	i 4.9
Navigational, measuring, electromedical, and control instruments	3345	10,105	244	479	10,339	234	i 2.3
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	3,959	105	149	4,003	43	i 1.1
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	2,170	11	134	2,293	123	i 5.7
Other measuring and controlling devices	other 3345	3,976	128	195	4,043	67	i 1.7

TABLE 67

Domestic R&D paid for and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for and performed by the company	Depreciation	Capital expenditures related to R&D	Adjusted domestic R&D paid for by the company and others	Change	
						Amount	Percent
Other computer and electronic products	other 334	30,879	2,241	2,503	31,140	261	0.8
Electrical equipment, appliances, and components	335	6,657	166	675	7,165	i 509	7.6
Transportation equipment	336	46,468	1,273	3,128	48,323	1,855	4.0
Motor vehicles, bodies, trailers, and parts	3361-63	30,722	990	2,159	31,891	1,169	3.8
Aerospace products and parts	3364	13,786	241	819	14,365	579	4.2
Aircraft, aircraft engine, and aircraft parts	336411-13	9,303	107	408	9,604	i 301	i 3.2
Guided missile, space vehicle, and related parts	336414-15, 336419	4,483	134	411	4,761	277	6.2
Military armored vehicle, tank, and tank components	336992	26	*	* i	26	* i	-0.1
Other transportation	other 336	1,935	43	150	2,041	i 107	5.5
Furniture and related products	337	405	9	19	415	10	2.5
Miscellaneous	339	23,032	886	1,503	23,649	617	2.7
Medical equipment and supplies	3391	20,112	796	1,259	20,575	463	2.3
Other miscellaneous manufacturing	3399	2,921	90	244	3,074	i 154	5.3
Nonmanufacturing industries	21-23, 42-81	281,060	7,237	12,353	286,175	5,116	r 1.8
Mining, quarrying, oil and gas extraction, and support activities	21	D	D	D	D	D	D
Utilities	22	D	D	D	D	245	i D
Wholesale trade	42	D	D	49	1,778	i D	D
Electronic shopping and electronic auctions	454111-12	D	D	D	D	D	D
Transportation and warehousing	48-49	D	325	303	D	-21	i D
Information	51	181,392	4,011	7,889	185,270	3,878	2.1
Publishing	511	49,674	620	2,916	51,970	2,296	4.6
Newspaper, periodical, book, and directory publishers	5111	72	0	1 i	73	1 i	1.6
Software publishers	5112	49,602	620	2,915	51,897	2,295	4.6
Telecommunications	517	3,614	30	i 487	i 4,072	i 458	i 12.7
Data processing, hosting, and related services	518	49,270	557	1,053	49,767	496	1.0
Other information	other 51	78,834	2,805	3,433	i 79,462	i 628	i 0.8
Finance and insurance	52	17,173	738	59	i 16,494	i -679	i -4.0
Real estate and rental and leasing	53	2,398	i 48	145	i 2,495	i 97	i 4.0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	5	i 0	* i	5	* i	7.2
Other real estate and rental and leasing	other 53	2,393	i 48	145	i 2,490	i 97	i 4.0
Professional, scientific, and technical services	54	38,633	985	2,370	40,019	1,386	3.6
Architectural, engineering, and related services	5413	2,912	19	91	i 2,983	i 72	i 2.5

TABLE 67

Domestic R&D paid for and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for and performed by the company	Depreciation	Capital expenditures related to R&D	Adjusted domestic R&D paid for by the company and others	Change	
						Amount	Percent
Computer systems design and related services	5415	18,878	566	528	18,839	-38	-0.2
Scientific research and development services	5417	9,297	295	1,423	10,425	1,128	12.1
Research and development in nanotechnology	541713	179	8	21	192	13	7.1
Research and development in biotechnology (except nanobiotechnology)	541714	2,916	101	345	3,159	243	8.3
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	6,176	185	1,055	7,046	870	14.1
Research and development in the social sciences and humanities	541720	27	*	2	29	2	7.0
Other professional, scientific, and technical services	other 54	7,547	104	329	7,771	225	3.0
Health care services	621-23	D	D	38	2,683	D	D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	3,300	D	D	D	D	D
All companies (number of domestic employees)	-	608,058	20,232	36,069	623,895	15,837	2.6
Small companies							
10-19 ^a	-	4,009	59	204	4,154	145	3.6
20-49	-	12,788	240	847	13,396	607	4.7
Medium companies							
50-99	-	13,274	227	887	13,934	660	5.0
100-249	-	24,844	544	1,540	25,840	996	4.0
Large companies							
250-499	-	26,469	693	1,322	27,098	629	2.4
500-999	-	29,007	928	1,729	29,807	800	2.8
1,000-4,999	-	94,615	2,347	4,944	97,212	2,597	2.7
5,000-9,999	-	54,018	2,265	3,152	54,905	887	1.6
10,000-24,999	-	96,071	4,017	7,313	99,366	3,295	3.4
25,000 or more	-	252,964	8,912	14,131	258,183	5,219	2.1

* = -\$500,000 < amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development (BERD) Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D. To enable comparisons between U.S. statistics from the BERD Survey and statistics from other nations, in this table an internationally comparable adjusted domestic R&D estimate is calculated by subtracting depreciation relating to R&D operations, which is included in U.S. R&D from the BERD Survey, and adding capital expenditures relating to R&D operations, which is excluded from U.S. R&D from the BERD Survey.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 68

Domestic R&D paid for by others and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for by others and performed by the company	Depreciation			Capital expenditures related to R&D ^a	Adjusted domestic R&D paid for by the company and others	Change	
								Amount	Percent
All industries	21-23, 31-33, 42-81	83,489	2,325		0	81,164	-2,325	-2.8	
Manufacturing industries	31-33	45,461	1,079		0	44,382	-1,079	-2.4	
Food	311	D	D		0	336	D	D	
Beverage and tobacco products	312	107	7		0	100	-7	-6.2	
Textile, apparel, and leather products	313-16	D	D		0	13	D	D	
Wood products	321	5	*		0	5	*	-0.8	
Paper	322	*	0		0	*	0	0.0	
Printing and related support activities	323	1	* r		0	1	*	-4.8	
Petroleum and coal products	324	4	0		0	4	0	0.0	
Chemicals	325	12,210	513		0	11,697	-513	-4.2	
Basic chemicals	3251	D	D		0	190	D	D	
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	80 i	D		0	D	D	D	
Pesticide, fertilizer, and other agricultural chemicals	3253	D	D		0	D	D	D	
Pharmaceuticals and medicines	3254	11,353	456		0	10,897	-456	-4.0	
Soap, cleaning compound, and toilet preparations	3256	D	D		0	221	D	D	
Paint, coating, adhesive, and other chemicals	3255, 3259	29	*		0	28	*	-1.5	
Plastics and rubber products	326	219	6		0	213	-6	-2.9	
Nonmetallic mineral products	327	29	1		0	28	-1	-3.8	
Primary metals	331	20 r	*		0	20 r	*	-0.1	
Fabricated metal products	332	222 i	10 i		0	212 i	-10 i	-4.3	
Machinery	333	1,218	70 r		0	1,147	-70	-5.8	
Agricultural implement	33311	D	D		0	128	D	D	
Semiconductor machinery	333242	48	2		0	46	-2	-4.9	
Engine, turbine, and power transmission equipment	3336	D	D		0	299	D	D	
Other machinery	other 333	725	51 r		0	674	-51	-7.0	
Computer and electronic products	334	5,483	162		0	5,321	-162	-2.9	
Communications equipment	3342	795 i	11 i		0	784 i	-11 i	-1.4	
Semiconductor and other electronic components	3344	1,950	84		0	1,865	-84	-4.3	
Navigational, measuring, electromedical, and control instruments	3345	2,671	62		0	2,609	-62	-2.3	
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	619 i	8 i		0	611 i	-8 i	-1.2	
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	1,976	53		0	1,923	-53	-2.7	

TABLE 68

Domestic R&D paid for by others and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for by others and performed by the company	Depreciation		Capital expenditures related to R&D ^a	Adjusted domestic R&D paid for by the company and others	Change	
			Amount	Percent			Amount	Percent
Other measuring and controlling devices	other 3345	77	1		0	76	-1	-1.7
Other computer and electronic products	other 334	67	5		0	62	-5	-7.0
Electrical equipment, appliances, and components	335	429	i 13	i	0	417	i -13	i -3.0
Transportation equipment	336	24,790	276		0	24,514	-276	-1.1
Motor vehicles, bodies, trailers, and parts	3361-63	2,159	60		0	2,100	-60	-2.8
Aerospace products and parts	3364	21,570	192		0	21,378	-192	-0.9
Aircraft, aircraft engine, and aircraft parts	336411-13	15,268	i 48		0	15,221	i -48	-0.3
Guided missile, space vehicle, and related parts	336414-15, 336419	6,302	145		0	6,157	-145	-2.3
Military armored vehicle, tank, and tank components	336992	4	0		0	4	0	0.0
Other transportation	other 336	1,057	24	i	0	1,033	i -24	i -2.3
Furniture and related products	337	5	*		0	5	*	-1.5
Miscellaneous	339	350	3		0	347	-3	-0.7
Medical equipment and supplies	3391	282	2		0	280	-2	-0.7
Other miscellaneous manufacturing	3399	68	1		0	67	-1	-0.8
Nonmanufacturing industries	21-23, 42-81	38,028	i 1,245	i	0	36,783	i -1,245	i -3.3
Mining, quarrying, oil and gas extraction, and support activities	21	D	D		0	D	D	D
Utilities	22	D	0		0	D	0	0.0
Wholesale trade	42	41	1		0	40	i -1	-1.4
Electronic shopping and electronic auctions	454111-12	0	0		0	0	0	NA
Transportation and warehousing	48-49	D	*		0	D	*	D
Information	51	947	43		0	905	-43	-4.5
Publishing	511	693	36		0	657	-36	-5.2
Newspaper, periodical, book, and directory publishers	5111	1	0		0	1	0	0.0
Software publishers	5112	693	36		0	657	-36	-5.2
Telecommunications	517	76	1		0	75	-1	-1.1
Data processing, hosting, and related services	518	137	5	r	0	132	-5	-3.6
Other information	other 51	42	1	i	0	40	i -1	-2.8
Finance and insurance	52	49	0		0	49	0	0.0
Real estate and rental and leasing	53	0	0		0	0	0	NA
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0		0	0	0	NA
Other real estate and rental and leasing	other 53	0	0		0	0	0	NA

TABLE 68

Domestic R&D paid for by others and performed by the company, depreciation, capital expenditures, and adjusted domestic R&D, by industry and company size: 2022

(Millions of U.S. dollars and percent change)

Industry and company size	NAICS code	Domestic R&D paid for by others and performed by the company	Depreciation		Capital expenditures related to R&D ^a	Adjusted domestic R&D paid for by the company and others	Change				
			Amount	Percent			Amount	Percent			
Professional, scientific, and technical services	54	36,139	i	1,198	i	0	34,942	i	-1,198	i	-3.3
Architectural, engineering, and related services	5413	971		7		0	965		-7		-0.7
Computer systems design and related services	5415	3,656		51		0	3,605		-51		-1.4
Scientific research and development services	5417	30,328	i	1,135	i	0	29,193	i	-1,135	i	-3.7
Research and development in nanotechnology	541713	102		1		0	101		-1		-1.3
Research and development in biotechnology (except nanobiotechnology)	541714	7,310		134		0	7,176		-134		-1.8
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	22,244	i	999	i	0	21,245	i	-999	i	-4.5
Research and development in the social sciences and humanities	541720	672		*		0	671		*		*
Other professional, scientific, and technical services	other 54	1,184		5		0	1,179		-5		-0.4
Health care services	621-23	D		D		0	68		D		D
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	94		D		0	D		D		D
All companies (number of domestic employees)	-	83,489		2,325		0	81,164		-2,325		-2.8
Small companies											
10-19 ^b	-	1,269		14		0	1,255		-14		-1.1
20-49	-	1,907		39		0	1,868		-39		-2.0
Medium companies											
50-99	-	1,990		36		0	1,954		-36		-1.8
100-249	-	3,003		97		0	2,906		-97		-3.2
Large companies											
250-499	-	3,080		75		0	3,005		-75		-2.4
500-999	-	2,795		70		0	2,725		-70		-2.5
1,000-4,999	-	9,890		461		0	9,430		-461		-4.7
5,000-9,999	-	4,692		38		0	4,654		-38		-0.8
10,000-24,999	-	25,072	i	985	i	0	24,087	i	-985	i	-3.9
25,000 or more	-	29,792		511		0	29,281	i	-511	i	-1.7

* = -\$500,000 < amount < \$500,000 (or -0.05% < amount < 0.05%); D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%; NA = not available.

NAICS = 2017 North American Industry Classification System.

^a Capital expenditures related to R&D are assumed to be \$0 for domestic R&D paid for by others and performed by the company.

^b The Business Enterprise Research and Development (BERD) Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D. To enable comparisons between U.S. statistics from the BERD Survey and statistics from other nations, in this table an internationally comparable adjusted domestic R&D estimate is calculated by subtracting depreciation relating to R&D operations, which is included in U.S. R&D from the BERD Survey, and adding capital expenditures relating to R&D operations, which is excluded from U.S. R&D from the BERD Survey.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 69

U.S. patent applications and patents issued to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Number)

Industry and company size	NAICS code	Applications				Patents issued ^c
		Total	Nonprovisional utility patents			
			Total	To foreign jurisdictions ^a	From within organized R&D activity ^b	
All industries	21-23, 31-33, 42-81	160,810	110,955	57,853	90,432	103,232
Manufacturing industries	31-33	116,218	76,771	45,612	64,169	70,731
Food	311	2,035	1,131	516	633	925
Beverage and tobacco products	312	799	685	617	649	457
Textile, apparel, and leather products	313-16	441	226	122	171	158
Wood products	321	61	12	5	8	54
Paper	322	260	219	89	213	335
Printing and related support activities	323	153	74	55	71	93
Petroleum and coal products	324	599	316	103	115	460
Chemicals	325	18,135	9,383	7,585	8,613	7,913
Basic chemicals	3251	1,023	644	559	592	480
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	820	354	231	331	480
Pesticide, fertilizer, and other agricultural chemicals	3253	377	190	128	174	131
Pharmaceuticals and medicines	3254	13,486	6,547	5,574	6,166	5,230
Soap, cleaning compound, and toilet preparations	3256	1,500	1,111	707	819	948
Paint, coating, adhesive, and other chemicals	3255, 3259	929	536	387	530	644
Plastics and rubber products	326	1,277	712	399	615	569
Nonmetallic mineral products	327	1,462	1,338	930	1,209	673
Primary metals	331	129	68	54	68	53
Fabricated metal products	332	1,953	979	579	809	643
Machinery	333	12,256	7,219	4,160	6,146	7,781
Agricultural implement	33311	1,525	999	606	947	1,019
Semiconductor machinery	333242	2,949	783	584	634	1,324
Engine, turbine, and power transmission equipment	3336	1,133	855	561	757	738
Other machinery	other 333	6,649	4,581	2,408	3,808	4,700
Computer and electronic products	334	44,269	33,803	15,490	27,670	30,450
Communications equipment	3342	8,062	7,209	5,712	6,025	7,081
Semiconductor and other electronic components	3344	21,781	16,104	6,582	12,108	12,057
Navigational, measuring, electromedical, and control instruments	3345	2,655	1,963	1,148	1,391	1,655
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	661	459	174	437	367
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	161	147	122	126	137
Other measuring and controlling devices	other 3345	1,833	1,357	852	829	1,151

TABLE 69

U.S. patent applications and patents issued to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Number)

Industry and company size	NAICS code	Applications					Patents issued ^c
		Total	Nonprovisional utility patents				
			Total	To foreign jurisdictions ^a	From within organized R&D activity ^b		
Other computer and electronic products	other 334	11,771	8,527	2,047	8,146	9,657	
Electrical equipment, appliances, and components	335	4,254	2,860	1,826	2,152	2,695	
Transportation equipment	336	11,562	9,322	6,770	7,078	9,516	
Motor vehicles, bodies, trailers, and parts	3361-63	5,974	4,695	3,827	3,415	3,962	
Aerospace products and parts	3364	4,845	4,110	2,816	3,473	5,345	
Aircraft, aircraft engine, and aircraft parts	336411-13	1,872	1,505	556	874	1,868	
Guided missile, space vehicle, and related parts	336414-15, 336419	2,973	2,605	2,260	2,599	3,477	
Military armored vehicle, tank, and tank components	336992	13	4	0	4	9	
Other transportation	other 336	730	513	128	186	200	
Furniture and related products	337	184	94	27	57	76	
Miscellaneous	339	16,391	8,327	6,285	7,893	7,881	
Medical equipment and supplies	3391	13,703	7,160	5,593	6,812	6,936	
Other miscellaneous manufacturing	3399	2,688	1,167	692	1,081	944	
Nonmanufacturing industries	21-23, 42-81	44,592	34,185	12,241	26,262	32,501	
Mining, quarrying, oil and gas extraction, and support activities	21	871	562	476	528	432	
Utilities	22	79	70	19	67	51	
Wholesale trade	42	1,971	894	239	846	924	
Electronic shopping and electronic auctions	454111-12	2,123	1,957	137	1,956	2,094	
Transportation and warehousing	48-49	281	235	30	224	321	
Information	51	21,322	16,669	6,196	14,363	14,556	
Publishing	511	4,425	3,521	1,946	3,240	4,027	
Newspaper, periodical, book, and directory publishers	5111	147	147	0	0	0	
Software publishers	5112	4,278	3,374	1,946	3,240	4,027	
Telecommunications	517	2,994	2,787	239	1,582	2,449	
Data processing, hosting, and related services	518	6,126	4,671	671	4,192	4,223	
Other information	other 51	7,777	5,689	3,339	5,349	3,856	
Finance and insurance	52	3,147	2,646	347	1,289	2,218	
Real estate and rental and leasing	53	72	36	3	30	64	
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	0	0	0	
Other real estate and rental and leasing	other 53	72	36	3	30	64	
Professional, scientific, and technical services	54	14,082	10,771	4,695	6,671	11,701	
Architectural, engineering, and related services	5413	483	317	174	178	171	

TABLE 69

U.S. patent applications and patents issued to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Number)

Industry and company size	NAICS code	Applications					Patents issued ^c
		Total	Nonprovisional utility patents				
			Total	To foreign jurisdictions ^a	From within organized R&D activity ^b		
Computer systems design and related services	5415	6,586	5,467	1,570	3,479	7,095	
Scientific research and development services	5417	6,351	4,681	2,765	2,727	3,896	
Research and development in nanotechnology	541713	326	250	53	243	143	
Research and development in biotechnology (except nanobiotechnology)	541714	617	341	235	289	160	
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	5,394	4,078	2,478	2,196	3,587	
Research and development in the social sciences and humanities	541720	13	12	0	0	6	
Other professional, scientific, and technical services	other 54	662	306	187	287	539	
Health care services	621–23	233	92	51	74	62	
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	411	253	48	215	77	
All companies (number of domestic employees)	–	160,810	110,955	57,853	90,432	103,232	
Small companies							
10–19 ^d	–	1,948	1,147	469	865	885	
20–49	–	5,106	3,055	1,483	2,446	1,927	
Medium companies							
50–99	–	4,761	2,585	1,300	2,393	1,992	
100–249	–	11,499	8,513	6,441	8,010	7,140	
Large companies							
250–499	–	7,770	4,431	2,253	3,529	3,016	
500–999	–	5,811	3,454	2,246	3,122	2,947	
1,000–4,999	–	21,439	15,228	8,479	11,825	13,518	
5,000–9,999	–	14,930	10,363	5,344	9,723	9,226	
10,000–24,999	–	31,705	20,571	12,350	17,727	20,184	
25,000 or more	–	55,840	41,608	17,487	30,792	42,397	

i = more than 50% of the estimate is imputation to account for nonresponse.

NAICS = 2017 North American Industry Classification System.

^a Also includes patent applications for which company planned to apply for in foreign jurisdictions.^b Includes patent applications in which the named inventors were R&D employees.^c Includes patent applications from 2022 and prior years. For a small number of companies issued more than 100 patents by the Patent and Trademark Office (USPTO), counts from USPTO.gov were used to supplement survey data.^d The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. These statistics include an adjustment to the weight to account for unit nonresponse.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 70

Total patent licensing revenue of companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Revenue ^a
All industries	21-23, 31-33, 42-81	24,625
Manufacturing industries	31-33	23,309
Food	311	2
Beverage and tobacco products	312	*
Textile, apparel, and leather products	313-16	20
Wood products	321	0
Paper	322	0
Printing and related support activities	323	0
Petroleum and coal products	324	148 i
Chemicals	325	11,960
Basic chemicals	3251	62
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	D
Pesticide, fertilizer, and other agricultural chemicals	3253	1
Pharmaceuticals and medicines	3254	11,515
Soap, cleaning compound, and toilet preparations	3256	12
Paint, coating, adhesive, and other chemicals	3255, 3259	D
Plastics and rubber products	326	208 r
Nonmetallic mineral products	327	*
Primary metals	331	2
Fabricated metal products	332	43
Machinery	333	434
Agricultural implement	33311	*
Semiconductor machinery	333242	54
Engine, turbine, and power transmission equipment	3336	7
Other machinery	other 333	372
Computer and electronic products	334	9,444
Communications equipment	3342	D
Semiconductor and other electronic components	3344	7,762
Navigational, measuring, electromedical, and control instruments	3345	D
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	1
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	*
Other measuring and controlling devices	other 3345	D
Other computer and electronic products	other 334	D
Electrical equipment, appliances, and components	335	26
Transportation equipment	336	823 i
Motor vehicles, bodies, trailers, and parts	3361-63	671 i
Aerospace products and parts	3364	151 i
Aircraft, aircraft engine, and aircraft parts	336411-13	D
Guided missile, space vehicle, and related parts	336414-15, 336419	D
Military armored vehicle, tank, and tank components	336992	0
Other transportation	other 336	1
Furniture and related products	337	1
Miscellaneous	339	199
Medical equipment and supplies	3391	131
Other miscellaneous manufacturing	3399	68
Nonmanufacturing industries	21-23, 42-81	1,317
Mining, quarrying, oil and gas extraction, and support activities	21	0
Utilities	22	0
Wholesale trade	42	1
Electronic shopping and electronic auctions	454111-12	0

TABLE 70

Total patent licensing revenue of companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Revenue ^a
Transportation and warehousing	48-49	0
Information	51	753
Publishing	511	10
Newspaper, periodical, book, and directory publishers	5111	0
Software publishers	5112	10
Telecommunications	517	D
Data processing, hosting, and related services	518	718
Other information	other 51	D
Finance and insurance	52	2
Real estate and rental and leasing	53	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0
Other real estate and rental and leasing	other 53	0
Professional, scientific, and technical services	54	527
Architectural, engineering, and related services	5413	30 r
Computer systems design and related services	5415	207
Scientific research and development services	5417	251
Research and development in nanotechnology	541713	2
Research and development in biotechnology (except nanobiotechnology)	541714	18
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	231
Research and development in the social sciences and humanities	541720	0
Other professional, scientific, and technical services	other 54	39 r
Health care services	621-23	15
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	18
All companies (number of domestic employees)	-	24,625
Small companies		
10-19 ^b	-	107
20-49	-	324 r
Medium companies		
50-99	-	177
100-249	-	831
Large companies		
250-499	-	685
500-999	-	429
1,000-4,999	-	2,762
5,000-9,999	-	302
10,000-24,999	-	16,206
25,000 or more	-	2,802 i

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a Amounts received from all patent licensing activities during 2022.

^b The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 71

Importance of types of intellectual property protections to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Percent)

Industry and company size	NAICS code	Utility patents			Design patents			Trademarks			Copyrights			Trade secrets			Mask works		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
All industries	21-23, 31-33, 42-81	28.1	16.4	55.5	17.2	19.8	63.0	36.0	27.3	36.7	26.1	27.0	46.9	45.5	24.1	30.4	4.9	9.5	85.6
Manufacturing industries	31-33	32.0	18.0	50.0	22.3	22.2	55.5	38.2	27.0	34.8	23.4	27.3	49.3	47.6	24.1	28.3	5.6	11.1	83.3
Food	311	14.0	12.8	73.3	10.5	15.1	74.4	44.2	25.6	30.2	18.6	25.6	55.8	42.5	31.0	26.4	3.5	7.0	89.5
Beverage and tobacco products	312	14.3	7.1	78.6	14.3	14.3	71.4	50.0	21.4	28.6	20.0	20.0	60.0	42.9	14.3	42.9	6.7	6.7	86.7
Textile, apparel, and leather products	313-316	24.0	16.0	60.0	20.0	24.0	56.0	34.6	26.9	38.5	19.2	26.9	53.8	32.0	24.0	44.0	4.0	12.0	84.0
Wood products	321	20.0	30.0	50.0	10.0	30.0	60.0	30.0	20.0	50.0	20.0	30.0	50.0	40.0	30.0	30.0	10.0	10.0	80.0
Paper	322	22.2	22.2	55.6	22.2	22.2	55.6	33.3	33.3	33.3	20.0	30.0	50.0	44.4	33.3	22.2	0.0	11.1	88.9
Printing and related support activities	323	13.3	20.0	66.7	14.3	14.3	71.4	21.4	21.4	57.1	14.3	21.4	64.3	26.7	26.7	46.7	7.1	7.1	85.7
Petroleum and coal products	324	37.5	12.5	50.0	25.0	25.0	50.0	66.7	11.1	22.2	37.5	25.0	37.5	62.5	12.5	25.0	12.5	12.5	75.0
Chemicals	325	47.3	17.1	35.6	18.7	20.2	61.1	40.8	35.4	23.8	20.3	36.1	43.6	62.3	19.1	18.6	6.4	10.8	82.8
Basic chemicals	3251	53.3	20.0	26.7	20.7	13.8	65.5	40.0	43.3	16.7	17.9	53.6	28.6	69.0	17.2	13.8	7.1	7.1	85.7
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	33.3	27.8	38.9	21.1	31.6	47.4	33.3	44.4	22.2	16.7	38.9	44.4	57.9	21.1	21.1	5.3	31.6	63.2
Pesticide, fertilizer, and other agricultural chemicals	3253	33.3	22.2	44.4	22.2	22.2	55.6	50.0	25.0	25.0	37.5	25.0	37.5	55.6	22.2	22.2	12.5	12.5	75.0
Pharmaceuticals and medicines	3254	59.2	15.5	25.2	20.6	19.6	59.8	41.2	32.4	26.5	21.6	33.3	45.1	64.7	17.6	17.6	6.9	8.8	84.3
Soap, cleaning compound, and toilet preparations	3256	23.8	19.0	57.1	16.7	22.2	61.1	55.0	15.0	30.0	26.3	26.3	47.4	50.0	25.0	25.0	5.6	5.6	88.9
Paint, coating, adhesive, and other chemicals	3255, 3259	27.3	15.2	57.6	15.2	21.2	63.6	29.4	47.1	23.5	15.2	36.4	48.5	50.0	26.5	23.5	8.8	14.7	76.5
Plastics and rubber products	326	24.7	22.2	53.1	18.5	25.9	55.6	32.9	20.7	46.3	18.5	23.5	58.0	41.3	26.3	32.5	3.8	9.0	87.2
Nonmetallic mineral products	327	15.4	19.2	65.4	8.3	16.7	75.0	23.1	30.8	46.2	11.5	26.9	61.5	38.5	26.9	34.6	4.0	8.0	88.0
Primary metals	331	19.2	11.5	69.2	11.5	15.4	73.1	18.5	22.2	59.3	11.5	19.2	69.2	60.0	16.0	24.0	4.0	8.0	88.0
Fabricated metal products	332	15.7	13.4	70.9	13.8	20.7	65.5	16.7	20.1	63.2	9.3	18.6	72.1	31.2	23.1	45.7	1.7	6.4	91.9
Machinery	333	37.9	22.1	40.0	28.4	28.9	42.6	34.2	32.1	33.7	23.9	28.2	47.9	43.4	29.1	27.5	4.2	11.1	84.7
Agricultural implement	33311	50.0	18.8	31.3	37.5	31.3	31.3	58.8	23.5	17.6	25.0	43.8	31.3	31.3	43.8	25.0	5.9	11.8	82.4
Semiconductor machinery	333242	60.0	20.0	20.0	33.3	33.3	33.3	40.0	40.0	20.0	40.0	40.0	20.0	60.0	40.0	0.0	40.0	20.0	40.0

TABLE 71

Importance of types of intellectual property protections to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Percent)

Industry and company size	NAICS code	Utility patents			Design patents			Trademarks			Copyrights			Trade secrets			Mask works		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
Engine, turbine, and power transmission equipment	3336	36.4	18.2	45.5	20.0	30.0	50.0	45.5	18.2	36.4	20.0	40.0	40.0	54.5	18.2	27.3	10.0	10.0	80.0
Other machinery	other 333	36.2	22.7	41.1	28.2	28.2	43.6	30.9	33.3	35.8	24.1	25.9	50.0	42.6	28.4	29.0	3.7	11.2	85.1
Computer and electronic products	334	37.0	16.7	46.4	24.3	18.5	57.1	50.7	24.2	25.1	37.2	25.6	37.2	56.3	21.4	22.4	13.8	19.0	67.2
Communications equipment	3342	40.6	15.6	43.8	29.0	19.4	51.6	46.9	40.6	12.5	35.5	38.7	25.8	60.6	21.2	18.2	12.9	25.8	61.3
Semiconductor and other electronic components	3344	31.1	22.2	46.7	23.9	15.2	60.9	37.0	23.9	39.1	24.4	31.1	44.4	48.9	23.4	27.7	24.4	20.0	55.6
Navigational, measuring, electromedical, and control instruments	3345	36.2	16.0	47.9	23.4	21.3	55.3	45.3	25.3	29.5	28.4	28.4	43.2	57.4	20.2	22.3	8.5	19.1	72.3
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	70.6	17.6	11.8	52.9	17.6	29.4	58.8	29.4	11.8	47.1	23.5	29.4	70.6	17.6	11.8	23.5	23.5	52.9
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	27.3	18.2	54.5	27.3	18.2	54.5	27.3	36.4	36.4	18.2	27.3	54.5	45.5	27.3	27.3	9.1	18.2	72.7
Other measuring and controlling devices	other 3345	29.0	15.9	55.1	17.1	22.9	60.0	44.9	21.7	33.3	25.7	30.0	44.3	55.7	18.6	25.7	5.8	18.8	75.4
Other computer and electronic products	other 334	43.5	13.0	43.5	26.1	13.0	60.9	75.5	12.2	12.2	67.3	8.2	24.5	54.5	22.7	22.7	18.2	13.6	68.2
Electrical equipment, appliances, and components	335	41.7	22.9	35.4	31.3	29.2	39.6	43.8	37.5	18.8	35.4	29.2	35.4	55.3	19.1	25.5	6.4	21.3	72.3
Transportation equipment	336	33.3	18.6	48.0	31.1	20.4	48.5	38.6	28.7	32.7	31.1	27.2	41.7	45.5	27.7	26.7	7.0	14.0	79.0
Motor vehicles, bodies, trailers, and parts	3361, 3362, 3363	33.9	16.1	50.0	33.3	15.8	50.9	31.6	36.8	31.6	25.0	32.1	42.9	35.1	38.6	26.3	9.1	16.4	74.5
Aerospace products and parts	3364	32.0	20.0	48.0	24.0	24.0	52.0	44.0	16.0	40.0	36.0	24.0	40.0	60.9	13.0	26.1	8.0	12.0	80.0
Aircraft, aircraft engine, and aircraft parts	336411-13	33.3	14.3	52.4	26.1	21.7	52.2	45.5	13.6	40.9	36.4	22.7	40.9	57.1	14.3	28.6	9.1	9.1	81.8
Guided missile, space vehicle, and related parts	336414-15, 336419	25.0	50.0	25.0	25.0	50.0	25.0	20.0	40.0	40.0	25.0	25.0	50.0	50.0	25.0	25.0	0.0	25.0	75.0

TABLE 71

Importance of types of intellectual property protections to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Percent)

Industry and company size	NAICS code	Utility patents			Design patents			Trademarks			Copyrights			Trade secrets			Mask works		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
Military armored vehicle, tank, and tank components	336992	50.0	0.0	50.0	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	50.0	0.0	50.0
Other transportation	other 336	30.4	26.1	43.5	34.8	26.1	39.1	52.2	21.7	26.1	40.9	18.2	40.9	52.2	17.4	30.4	4.3	17.4	78.3
Furniture and related products	337	18.2	27.3	54.5	23.8	28.6	47.6	38.1	23.8	38.1	18.2	27.3	54.5	23.8	33.3	42.9	4.8	4.8	90.5
Miscellaneous	339	41.5	24.4	34.1	36.6	28.5	35.0	50.8	24.6	24.6	29.5	34.4	36.1	54.1	23.0	23.0	7.5	10.8	81.7
Medical equipment and supplies	3391	44.7	22.4	32.9	35.5	27.6	36.8	50.0	22.4	27.6	28.9	31.6	39.5	57.9	18.4	23.7	9.3	9.3	81.3
Other miscellaneous manufacturing	3399	35.4	27.1	37.5	37.5	29.2	33.3	51.1	27.7	21.3	31.3	37.5	31.3	46.8	31.9	21.3	6.4	14.9	78.7
Nonmanufacturing industries	21-23, 42-81	24.3	15.0	60.7	12.5	17.5	70.1	34.0	27.5	38.6	28.8	26.7	44.5	43.6	24.1	32.4	4.2	7.9	87.9
Mining, quarrying, oil and gas extraction, and support activities	21	30.8	38.5	30.8	16.7	41.7	41.7	30.8	38.5	30.8	16.7	41.7	41.7	28.6	50.0	21.4	0.0	38.5	61.5
Utilities	22	28.6	28.6	42.9	16.7	16.7	66.7	28.6	28.6	42.9	16.7	33.3	50.0	33.3	33.3	33.3	16.7	16.7	66.7
Wholesale trade	42	27.8	16.6	55.6	28.5	20.5	51.0	43.4	26.3	30.3	20.8	38.3	40.9	41.7	29.8	28.5	3.3	12.7	84.0
Electronic shopping and electronic auctions	454111-12	30.8	7.7	61.5	15.4	38.5	46.2	42.9	42.9	14.3	38.5	38.5	23.1	38.5	46.2	15.4	0.0	7.7	92.3
Transportation and warehousing	48-49	28.6	28.6	42.9	16.7	33.3	50.0	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	16.7	0.0	83.3
Information	51	20.2	22.1	57.6	10.1	23.6	66.4	44.1	31.7	24.2	36.0	32.9	31.1	46.7	27.7	25.5	4.5	9.9	85.6
Publishing	511	16.3	21.5	62.2	6.7	23.1	70.1	50.4	28.1	21.5	43.4	29.4	27.2	44.0	26.1	29.9	5.4	8.5	86.2
Newspaper, periodical, book, and directory publishers	5111	14.3	14.3	71.4	16.7	16.7	66.7	33.3	33.3	33.3	28.6	14.3	57.1	16.7	33.3	50.0	0.0	16.7	83.3
Software publishers	5112	16.2	22.3	61.5	7.0	23.3	69.8	51.5	27.7	20.8	43.8	30.0	26.2	45.0	25.6	29.5	5.6	8.8	85.6
Telecommunications	517	22.2	25.9	51.9	19.2	23.1	57.7	26.9	38.5	34.6	23.1	26.9	50.0	61.5	26.9	11.5	15.4	7.7	76.9
Data processing, hosting, and related services	518	25.0	23.5	51.5	12.4	25.5	62.0	40.6	34.1	25.4	30.7	38.0	31.4	47.8	28.3	23.9	2.9	12.5	84.6
Other information	other 51	15.4	15.4	69.2	7.7	19.2	73.1	44.4	29.6	25.9	40.7	29.6	29.6	40.7	33.3	25.9	4.0	8.0	88.0
Finance and insurance	52	5.9	5.9	88.2	3.9	7.8	88.2	11.8	7.8	80.4	7.8	9.8	82.4	80.4	7.8	11.8	0.0	2.0	98.0
Real estate and rental and leasing	53	16.7	16.7	66.7	14.3	14.3	71.4	42.9	28.6	28.6	33.3	16.7	50.0	42.9	28.6	28.6	14.3	14.3	71.4

TABLE 71

Importance of types of intellectual property protections to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Percent)

Industry and company size	NAICS code	Utility patents			Design patents			Trademarks			Copyrights			Trade secrets			Mask works		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
Lessors of nonfinancial intangible assets (except copyrighted works)	533	50.0	0.0	50.0	50.0	0.0	50.0	66.7	0.0	33.3	50.0	0.0	50.0	50.0	25.0	25.0	33.3	0.0	66.7
Other real estate and rental and leasing	other 53	20.0	20.0	60.0	16.7	16.7	66.7	40.0	40.0	20.0	40.0	20.0	40.0	20.0	40.0	40.0	0.0	20.0	80.0
Professional, scientific, and technical services	54	23.5	13.7	62.7	12.3	16.2	71.5	26.4	31.1	42.5	26.6	26.5	46.9	39.9	25.3	34.8	4.8	7.5	87.6
Architectural, engineering, and related services	5413	23.4	12.5	64.1	14.1	14.1	71.9	22.5	22.5	55.0	19.7	19.7	60.6	36.7	23.4	39.8	7.1	7.1	85.8
Computer systems design and related services	5415	17.7	13.2	69.1	10.9	16.3	72.8	27.9	34.9	37.1	23.9	29.0	47.1	40.4	27.2	32.4	4.8	7.4	87.8
Scientific research and development services	5417	46.6	17.3	36.1	18.9	20.5	60.6	27.8	34.6	37.6	18.9	29.5	51.5	55.6	19.5	24.8	5.3	10.7	84.0
Research and development in nanotechnology	541713	40.0	20.0	40.0	20.0	20.0	60.0	20.0	40.0	40.0	10.0	30.0	60.0	60.0	20.0	20.0	10.0	20.0	70.0
Research and development in biotechnology (except nanobiotechnology)	541714	56.3	15.6	28.1	16.1	22.6	61.3	32.3	35.5	32.3	18.8	31.3	50.0	53.1	18.8	28.1	6.5	12.9	80.6
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	43.6	18.1	38.3	19.6	20.7	59.8	27.2	33.7	39.1	19.4	29.0	51.6	55.3	19.1	25.5	5.4	10.9	83.7
Research and development in the social sciences and humanities	541720	0.0	33.3	66.7	0.0	33.3	66.7	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	0.0	33.3	66.7
Other professional, scientific, and technical services	other 54	12.1	13.1	74.7	7.1	14.1	78.8	24.7	25.8	49.5	54.1	23.5	22.4	21.4	29.6	49.0	3.1	5.2	91.8
Health care services	621-23	21.4	7.1	71.4	10.7	21.4	67.9	20.7	27.6	51.7	14.3	14.3	71.4	25.0	14.3	60.7	7.1	7.1	85.7

TABLE 71

Importance of types of intellectual property protections to companies located in the United States that performed or funded R&D, by industry and company size: 2022

(Percent)

Industry and company size	NAICS code	Utility patents			Design patents			Trademarks			Copyrights			Trade secrets			Mask works		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	39.7	7.3	53.0	6.6	6.0	87.4	45.3	8.7	46.0	42.0	8.0	50.0	47.4	9.2	43.4	4.0	3.3	92.7
All companies (number of domestic employees)	-	28.1	16.4	55.5	17.2	19.8	63.0	36.0	27.3	36.7	26.1	27.0	46.9	45.5	24.1	30.4	4.9	9.5	85.6
Small companies																			
10-19 ^a	-	27.3	11.3	61.4	12.7	10.1	77.3	39.2	23.9	36.9	37.2	21.5	41.3	48.5	21.0	30.5	5.1	4.5	90.4
20-49	-	27.2	16.4	56.3	16.7	18.9	64.4	32.1	25.8	42.0	24.4	25.3	50.3	49.8	22.4	27.8	5.0	10.2	84.8
Medium companies																			
50-99	-	27.1	17.7	55.2	19.7	23.1	57.3	31.9	33.2	34.9	19.7	29.7	50.6	39.4	28.8	31.8	4.1	10.8	85.2
100-249	-	23.3	16.8	60.0	16.6	20.2	63.2	31.5	28.0	40.5	20.2	27.5	52.3	37.3	24.1	38.6	4.9	9.8	85.3
Large companies																			
250-499	-	30.8	19.2	50.0	19.3	26.4	54.3	40.4	27.3	32.3	25.3	29.3	45.5	45.2	25.4	29.4	5.1	12.2	82.7
500-999	-	30.6	24.0	45.5	19.8	29.8	50.4	42.6	32.0	25.4	24.6	36.9	38.5	43.4	30.3	26.2	5.8	14.2	80.0
1,000-4,999	-	40.2	23.1	36.8	22.9	28.0	49.2	51.7	26.3	22.0	31.6	34.2	34.2	53.4	24.1	22.4	6.0	12.1	81.9
5,000-9,999	-	54.2	20.8	25.0	30.4	30.4	39.1	65.2	21.7	13.0	36.4	40.9	22.7	60.9	26.1	13.0	9.1	13.6	77.3
10,000-24,999	-	61.1	16.7	22.2	44.4	27.8	27.8	72.2	11.1	16.7	44.4	33.3	22.2	66.7	16.7	16.7	11.1	11.1	77.8
25,000 or more	-	58.3	16.7	25.0	36.4	36.4	27.3	72.7	18.2	9.1	45.5	36.4	18.2	66.7	16.7	16.7	9.1	18.2	72.7

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.**Note(s):**

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2020, the company counts used in the calculation of the percentage estimates reflect a change in rounding methodology. These statistics are also not comparable to estimates prior to 2012 because those estimates are representative of all companies in the United States.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 72

Companies located in the United States that performed or funded R&D and engaged in intellectual property transfer activities, by type of activity and industrial sector: 2022

(Number)

Type of IP transfer activity	Industrial sector		
	All	Manufacturing	Nonmanufacturing
Transferred IP to others not owned by your company through participation in technical assistance or know how agreements	710	410	300
Received IP from others not owned by your company through participation in technical assistance or know how agreements	870	520	360
Transferred IP to a spin-off or spin-out of your company	240	90	160
Received IP from a parent company as part of a spin-off or spin-out	80	60	30
Acquired more than 50% ownership in another company for the primary purpose of acquiring its IP	320	150	180
Acquired any financial interest in another company in order to gain access to its IP	240	140	100
Participated in cross-licensing agreements—the agreements in which two or more parties grant a license to each other for the use of the subject matter claimed in one or more of the patents owned by each party	570	370	210
Allowed free use of patents or other IP owned by your company (e.g., allowing free use of software patents by the open-source community)	560	200	370
Made use of open-source patents or other freely available IP not owned by your company	3,030	660	2,370

IP = intellectual property.

Note(s):

Detail may not add to total because of rounding. Industrial sector is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. Statistics are based on companies in the United States that reported to the survey. No systematic item imputation was applied. Beginning in survey year 2018, these statistics include an adjustment to the weight to account for unit nonresponse; beginning in survey year 2020, the company counts reflect a change in rounding methodology.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE 73

Worldwide capital assets, by type of asset, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide assets				Accumulated depreciation and amortization			Reduction in value due to impairment charges, disposals, or retirement				Book value of assets acquired through mergers and acquisitions			
		Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets
All industries	21-23, 31-33, 42-81	14,106,170	6,714,274	4,494,155	2,897,741	6,496,309	5,161,964	1,334,345	359,245	165,981	129,126	64,138	583,517	71,503	303,550	208,465
Manufacturing industries	31-33	6,612,277	2,857,773	2,222,777	1,531,727	3,579,727	2,694,716	885,011	181,183	97,180	38,902	45,101	287,896	59,032	123,558	105,306
Food	311	674,539	276,919	232,757	164,863	264,628	238,123	26,505	7,840	4,942	1,319	1,580	14,174	3,776	5,681	4,717
Beverage and tobacco products	312	271,532	66,444	101,580	103,508	54,711	49,943	4,767	1,523	696	9	817	20,317	961	14,307	5,049
Textile, apparel, and leather products	313-16	46,783	26,115	10,632	10,035	26,061	23,639	2,422	573	365	47	161	958	289	473	196
Wood products	321	23,628	18,125	2,199	3,304	17,375	16,574	801	593	577	6	10	749	387	141	222
Paper	322	80,181	56,679	16,567	6,934	60,124	56,664	3,460	4,855	3,884	611	360	2,036	461	790	785
Printing and related support activities	323	20,089	11,439	4,348	4,302	18,739	14,895	3,843	851	165	554	132	482	113	359	10
Petroleum and coal products	324	344,322	324,446	10,491	9,386	376,728	367,115	9,613	D	D	0	D	D	D	634	D
Chemicals	325	1,874,645	707,004	578,188	589,452	990,960	570,431	420,529	54,784	26,315	10,226	18,242	89,260	15,198	20,980	53,083
Basic chemicals	3251	446,123	333,052	73,148	39,923	221,821	201,321	20,500	6,863	2,540	3,966	357	1,696	820	507	370
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	88,324	61,499	17,028	9,797	89,894	81,814	8,080	1,122	226	856	40	2,431	2,092	55	284
Pesticide, fertilizer, and other agricultural chemicals	3253	48,971	20,591	17,137	11,243	29,395	24,065	5,330	3,108	1,956	761	391	740	108	395	237
Pharmaceuticals and medicines	3254	1,053,913	218,609	367,756	467,548	535,133	173,139	361,994	40,725	20,722	4,586	15,417	80,146	11,855	17,819	50,472
Soap, cleaning compound, and toilet preparations	3256	173,171	50,673	75,314	47,183	80,600	64,357	16,243	828	484	1	342	2,121	78	1,127	916
Paint, coating, adhesive, and other chemicals	3255, 3259	64,143	22,580	27,804	13,759	34,116	25,736	8,381	2,137	387	57	1,694	2,125	245	1,077	804
Plastics and rubber products	326	214,791	132,364	54,759	27,668	130,116	115,697	14,419	7,717	4,234	3,001	481	10,732	3,802	3,814	3,116
Nonmetallic mineral products	327	89,079	63,803	15,374	9,902	49,492	46,626	2,866	2,225	2,103	44	77	4,039	1,127	1,490	1,422
Primary metals	331	82,680	61,651	11,149	9,880	60,051	55,670	4,382	5,683	3,450	962	1,271	2,866	1,280	1,512	74
Fabricated metal products	332	103,230	59,372	30,557	13,302	61,725	55,832	5,894	2,012	1,771	191	50	7,396	2,997	2,728	1,672
Machinery	333	416,904	170,532	170,783	75,589	216,932	166,038	50,894	8,389	4,095	3,014	1,280	13,137	1,217	7,452	4,469
Agricultural implement	33311	35,807	22,859	8,177	4,771	26,878	24,880	1,998	481	429	0	52	2,116	259	1,350	507
Semiconductor machinery	333242	29,905	17,166	9,835	2,905	21,072	14,516	6,556	1,081	151	0	930	1,313	46	648	619
Engine, turbine, and power transmission equipment	3336	49,553	29,700	14,880	4,973	40,750	33,043	7,707	1,504	259	1,236	10	373	78	96	199

TABLE 73

Worldwide capital assets, by type of asset, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide assets				Accumulated depreciation and amortization			Reduction in value due to impairment charges, disposals, or retirement				Book value of assets acquired through mergers and acquisitions			
		Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets
Other machinery	other 333	301,639	100,807	137,892	62,940	128,231	93,599	34,633	5,323	3,256	1,778	288	9,335	834	5,357	3,144
Computer and electronic products	334	845,766	303,390	389,699	152,678	499,780	377,474	122,306	15,484	5,675	8,844	964	58,964	3,324	44,520	11,120
Communications equipment	3342	93,572	17,534	61,583	14,455	38,975	24,441	14,535	4,073	1,883	2,122	68	1,573	140	883	550
Semiconductor and other electronic components	3344	431,735	191,749	162,827	77,159	247,382	207,336	40,046	1,823	1,099	450	273	33,777	1,964	29,758	2,055
Navigational, measuring, electromedical, and control instruments	3345	170,608	28,625	97,810	44,173	55,768	31,056	24,712	6,717	1,633	4,705	379	17,556	654	10,588	6,314
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	61,360	6,520	36,515	18,325	12,999	6,465	6,534	4,874	292	4,520	62	1,087	20	636	430
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	11,444	3,455	6,281	1,708	6,951	4,779	2,171	71	70	1	*	277	30	130	117
Other measuring and controlling devices	other 3345	97,805	18,651	55,014	24,140	35,819	19,812	16,006	1,772	1,271	185	317	16,193	604	9,822	5,767
Other computer and electronic products	other 334	149,851	65,482	67,478	16,891	157,654	114,641	43,013	2,871	1,060	1,567	244	6,058	566	3,291	2,202
Electrical equipment, appliances, and components	335	155,103	46,325	72,756	36,022	69,934	50,269	19,664	5,039	1,888	527	2,624	6,253	489	2,974	2,789
Transportation equipment	336	823,233	406,378	253,025	163,829	440,617	359,218	81,399	21,515	18,111	2,815	589	10,770	2,421	4,248	4,101
Motor vehicles, bodies, trailers, and parts	3361-63	384,770	281,613	42,620	60,538	271,787	235,074	36,713	13,954	12,752	922	280	8,484	2,196	2,920	3,367
Aerospace products and parts	3364	364,301	95,411	176,292	92,599	144,801	105,019	39,782	4,964	4,265	442	258	2,096	211	1,219	665
Aircraft, aircraft engine, and aircraft parts	336411-13	197,182	59,002	92,167	46,014	92,943	72,228	20,715	4,402	3,952	398	52	1,436	169	752	515
Guided missile, space vehicle, and related parts	336414-15, 336419	167,119	36,409	84,125	46,585	51,858	32,791	19,068	563	313	44	205	660	43	467	151
Military armored vehicle, tank, and tank components	336992	1,589	D	D	598	181	89	92	*	*	0	0	0	0	0	0
Other transportation	other 336	72,571	D	D	10,094	23,848	19,036	4,812	2,596	1,094	1,450	52	190	14	109	68
Furniture and related products	337	20,727	8,787	5,877	6,063	9,095	7,179	1,916	1,152	742	204	205	1,139	120	944	75
Miscellaneous	339	525,045	118,002	262,035	145,008	232,660	123,330	109,330	D	D	6,528	D	D	D	10,510	D

TABLE 73

Worldwide capital assets, by type of asset, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide assets				Accumulated depreciation and amortization			Reduction in value due to impairment charges, disposals, or retirement				Book value of assets acquired through mergers and acquisitions																	
		Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets														
Medical equipment and supplies	3391	449,728	92,573	231,457	125,699	195,946	97,255	98,691	25,716	i	6,873	5,115	13,728	10,092	804	5,656	3,632													
Other miscellaneous manufacturing	3399	75,317	25,429	30,578	19,310	36,715	26,075	10,640	D		D	1,413	D	D	D	4,854	D													
Nonmanufacturing industries	21–23, 42–81	7,493,893	3,856,501	2,271,378	1,366,014	2,916,583	2,467,249	449,334	178,062		68,801	90,224	19,037	295,621	12,471	179,992	103,158													
Mining, quarrying, oil and gas extraction, and support activities	21	515,315	503,149	7,742	4,423	368,434	365,929	2,505	4,024	i	3,924	i	77	i	24	i	2,409	2,068	D	D										
Utilities	22	1,474,048	1,373,964	86,878	13,206	477,041	471,570	5,471	11,811		10,372	430	1,009	3,678	2,101	284	1,292													
Wholesale trade	42	136,600	i	67,285	i	50,938	i	18,377	i	81,062	i	73,031	i	8,031	i	2,999	i	2,627	i	236	i	135	i	7,071	i	1,940	3,382	i	1,750	i
Electronic shopping and electronic auctions	454111–12	249,083	D	D	D	118,498	112,593	5,905	3,081		1,813	1,264	4	D	D	D	D													
Transportation and warehousing	48–49	300,770	238,271	48,916	13,583	147,882	138,068	9,814	5,946		4,871	875	201	5,293	182	3,500	1,612													
Information	51	3,127,735	977,414	1,154,958	995,363	1,183,015	931,807	251,208	84,822		21,471	57,256	6,094	219,373	3,508	132,761	83,103													
Publishing	511	631,104	174,216	333,066	123,822	202,063	122,312	79,751	7,297		3,980	D	D	105,181	1,325	68,048	35,807													
Newspaper, periodical, book, and directory publishers	5111	1,208	164	981	62	653	221	432	11		6	0	5	r	0	0	0	0												
Software publishers	5112	629,896	174,051	332,086	123,759	201,410	122,091	79,319	7,286		3,974	D	D	105,181	1,325	68,048	35,807													
Telecommunications	517	1,107,759	391,905	166,228	549,626	611,034	559,847	51,187	36,740		11,280	25,273	187	18,255	D	D	15,910													
Data processing, hosting, and related services	518	753,062	86,088	499,959	167,016	180,381	95,099	85,281	11,696		1,681	6,928	3,088	38,800	446	20,047	18,306													
Other information	other 51	635,810	325,205	155,705	154,900	189,537	154,549	34,988	29,088		4,530	D	D	57,138	D	D	13,081													
Finance and insurance	52	604,127	99,058	405,027	100,041	142,762	98,368	44,394	32,890		9,017	22,056	1,816	i	16,440	1,363	12,135	2,943												
Real estate and rental and leasing	53	46,510	39,442	5,235	1,833	21,307	20,729	577	2,105	i	1,623	i	185	i	298	i	164	D	102	D										
Lessors of nonfinancial intangible assets (except copyrighted works)	533	628	i	162	i	18	i	448	i	157	i	118	i	39	i	3	i	2	i	*	i	*	i	0	0	0	0			
Other real estate and rental and leasing	other 53	45,881	39,280	5,216	1,385	21,149	20,611	538	2,103	i	1,620	i	185	i	297	i	164	D	102	D										
Professional, scientific, and technical services	54	641,580	118,872	377,052	145,656	238,560	140,512	98,049	15,183		4,966	5,929	4,289	30,553	595	19,232	10,727													

TABLE 73

Worldwide capital assets, by type of asset, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide assets				Accumulated depreciation and amortization			Reduction in value due to impairment charges, disposals, or retirement				Book value of assets acquired through mergers and acquisitions											
		Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets								
Architectural, engineering, and related services	5413	37,004	18,837	11,813	6,355	22,837	19,976	2,862	1,511	1,218	59	234	i	599	165	350	85							
Computer systems design and related services	5415	293,782	46,594	190,160	57,029	100,232	73,115	27,117	6,657	2,182	2,374	2,101		15,563	78	10,284	5,200							
Scientific research and development services	5417	201,470	38,433	113,069	49,968	62,219	29,533	32,686	4,660	864	i	2,384	1,412	10,009	248	5,727	4,034							
Research and development in nanotechnology	541713	428	334	6	88	162	156	7	10	9		1	*	*	*	0	0							
Research and development in biotechnology (except nanobiotechnology)	541714	48,016	11,070	23,260	13,686	9,014	5,578	3,437	2,028	231		413	1,383	6,555	34	3,736	2,784							
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	152,748	26,877	89,694	36,177	52,834	23,637	29,197	2,208	210		1,970	28	3,428	212	1,970	1,247							
Research and development in the social sciences and humanities	541720	278	153	108	17	209	162	46	414	i	414	i	0	0	25	i	2	i	21	i	2	i		
Other professional, scientific, and technical services	other 54	109,324	15,009	62,011	32,304	53,272	i	17,888	35,384	i	2,355	701	1,112	542	4,383	103	2,871	1,409						
Health care services	621-23	55,247	14,806	31,732	8,710	20,611		14,764	5,847		1,250	432	744	73	1,595	182	1,208	205						
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	342,878	D	D	D	117,410		99,877	17,533		13,951	7,685	i	1,172	5,095	D	468	D	D					
All companies (number of domestic employees)	-	14,106,170	6,714,274	4,494,155	2,897,741	6,496,309		5,161,964	1,334,345		359,245	165,981	129,126	64,138	583,517	71,503	303,550	208,465						
Small companies																								
10-19 ^a	-	34,938	17,169	12,206	r	5,563		24,871	22,934		1,936	518	i	320	113	i	85	i	106	73	17	16		
20-49	-	77,578	43,671	15,732		18,175		60,346	53,949		6,397	2,333		935	i	444	i	954	r	2,639	1,064	1,052	r	523
Medium companies																								
50-99	-	93,554	50,229	22,698		20,627		73,891	62,063		11,828	2,882	i	1,835	448	i	600		6,641	3,446	2,120	1,075		
100-249	-	229,651	115,079	62,295		52,278		120,050	99,277		20,773	23,445	r	19,789	r	2,127		1,528	i	17,901	1,438	13,971	2,491	

TABLE 73

Worldwide capital assets, by type of asset, industry, and company size: 2022

(Millions of U.S. dollars)

Industry and company size	NAICS code	Worldwide assets				Accumulated depreciation and amortization			Reduction in value due to impairment charges, disposals, or retirement				Book value of assets acquired through mergers and acquisitions				
		Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	Total	Property, plant, and equipment	Goodwill	Identifiable intangible assets	
Large companies																	
250–499	–	266,768	122,816	89,006	54,945	120,737	94,146	26,592	8,170	4,124	2,683	1,363	34,543	2,798	21,935	9,809	
500–999	–	451,930	169,043	176,823	106,064	162,480	122,276	40,204	13,007	4,990	2,682	5,336	23,790	3,874	13,178	6,738	
1,000–4,999	–	2,156,999	917,326	758,105	481,568	831,071	579,550	251,522	85,506	29,674	43,551	12,281	196,757	10,759	109,800	76,198	
5,000–9,999	–	1,645,590	914,174	457,559	273,858	742,661	628,210	114,452	38,950	22,649	13,698	2,603	53,881	4,686	39,571	9,623	
10,000–24,999	–	3,580,719	1,932,275	999,333	649,112	1,795,906	1,429,274	366,632	78,041	27,827	31,442	18,772	107,858	36,728	35,436	35,695	
25,000 or more	–	5,568,442	2,432,492	1,900,399	1,235,551	2,564,296	2,070,285	494,010	106,392	53,838	31,936	20,617	139,402	6,637	66,468	66,297	

* = amount < \$500,000; D = data withheld to avoid disclosing operations of individual companies; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; r = relative standard error is more than 50%.

NAICS = 2017 North American Industry Classification System.

^a The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Detail may not add to total because of rounding. Industry classification is based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

Technical Notes

Survey Overview (2022 Survey Cycle)

Purpose. The Business Enterprise Research and Development (BERD) Survey, successor to the Business Research and Development Survey (BRDS) (2017–18), the Business R&D and Innovation Survey (BRDIS) (2008–16), and the Survey of Industrial Research and Development (SIRD) (1953–2007), is the primary source of information on research and development (R&D) expenditures and R&D employees of for-profit, publicly or privately held, nonfarm businesses with 10 or more employees in the United States that performed or funded R&D either domestically (in the 50 states and the District of Columbia) or abroad.

Data collection authority. The information collected by the BERD Survey is solicited under the authority of the National Science Foundation (NSF) Act of 1950, as amended, and the America COMPETES Reauthorization Act of 2010. Response to this annual survey is mandatory and confidential; the Census Bureau collects the data under the authority of Title 13, Section 8, of the U.S. Code. The Office of Management and Budget (OMB) control number is 0607-0912. The disclosure review number is NCSSES-DRN24-042.

Survey sponsors. The BERD Survey is cosponsored by the National Center for Science and Engineering Statistics (NCSES) within NSF and the Census Bureau.

Survey collection and tabulation agent. The survey is conducted annually by the Census Bureau in accordance with an interagency agreement with NCSES.

Key Survey Information

Frequency. Annual.

Initial survey year. BERD Survey data collection began in 2019. BRDS collected data for 2017–18, BRDIS collected data for 2008–16, and SIRD collected data for 1953–2007.

Reference period. Calendar year 2022.

Response unit. Company.

Sample or census. Sample.

Population size. 1,104,000 companies.

Sample size. 45,500 companies; the actual number of companies that remained within the scope of the survey between sample selection and tabulation was 42,500.

Survey Design

The survey is administered both to companies known to have performed R&D and to companies with no known history of R&D activity. The BERD Survey has been designed to provide detailed statistics on global and domestic R&D expenditures of companies located in the United States and on these companies' R&D employees.

The survey is sent to a single coordinator within each company, but it is organized into sections that help the coordinator collect specific types of information from different experts in the company (human resources, accounting, R&D managers, etc.). Foreign-owned companies are instructed to report only for company operations owned by the U.S. subsidiary and, for purposes of the survey, to treat the U.S. subsidiary's foreign owners as if they were unrelated third parties.

Target Population

The target population for the BERD Survey consists of all for-profit companies that have 10 or more paid employees in the United States, that have at least one establishment located in the United States that is in business during the survey year, and that are classified in certain industries based on the 2017 North American Industry Classification System (NAICS), with a particular focus on those companies that perform R&D in the United States.

The Business Register, a Census Bureau compilation that contains information on more than 8.5 million establishments with paid employees, serves as the primary input to the sampling frame from which the BERD Survey sample is selected. For a given company with more than one establishment, the prior year's annual payroll and employment data for its active establishments are summed to the company level.

Sampling Frame

The scope of the 2022 BERD Survey is limited to companies that (1) are in business primarily to make a profit; (2) are classified within a specific set of NAICS industries; (3) have 10 or more paid employees in the United States, based on employment on 12 March 2021; (4) have at least one establishment that is physically located in the United States and is in business at the end of calendar year 2022 (the time at which the Census Bureau finished the 2021 Business Register Processing); and (5) are not federally funded R&D centers.

Single-unit company records were extracted from the 2021 Business Register if the company had at least 10 paid employees in 2021 or, when employment information was unavailable, if the company's 2021 payroll was greater than or equal to \$500,000. Companies were removed from the sampling frame if their NAICS codes were designated as agriculture, forestry, fishing, and hunting (NAICS 11); postal service (NAICS 491); educational services (NAICS 61); private households (NAICS 814); or public administration (NAICS 92); or if they were no longer in business or were nonprofits. Companies were also removed from the sampling frame if they were not located in the 50 U.S. states or the District of Columbia.

Records for active establishments from multiunit companies were extracted from the 2021 Business Register if the given establishment's 2021 payroll was greater than zero or if the establishment employed at least one person in 2021. Prior to creating records for multiunit companies from these establishments, establishments classified as postal service (NAICS 491), private households (NAICS 814), or public administration (NAICS 92) were removed, as were those that were not physically located in the 50 U.S. states or the District of Columbia. Unlike single-unit companies, establishments classified as agriculture, forestry, fishing, and hunting (NAICS 11) or educational services (NAICS 61) were not initially removed during the construction of multiunit company records. Establishments classified in NAICS 11 or NAICS 61 contributed to the classification of the multiunit companies, and their payroll could have been included in determining the company's measure of size. From the resulting set of multiunit companies, companies were removed from the sampling frame if they had fewer than 10 paid employees or if the payroll associated with their nonprofit establishments was greater than the payroll of their for-profit establishments.

For each company on the sampling frame, a measure of size was assigned. The measure of size for a given company was based on R&D, if R&D data from the past 5 years were available from (1) the BERD Survey, (2) online financial databases, (3) the Report of Organization conducted as part of the Company Organization Survey (in years not ending in "2" or "7") or as a supplement to the Economic Census (in years ending in "2" or "7"), or (4) qualified R&D expenses from the Internal Revenue Service (IRS). For all other companies, the measure of size was based on total annual payroll for 2021 from the Business Register.

Industry Classification for Sampling

Each company was assigned to 1 of 60 industry sampling strata based on the reported business segment in which the company performed the largest amount of total domestic R&D, as reported within the previous 5 years (2017–18 BRDS and 2019–21 BERD Survey), if available. If these business segment data were not reported for a given company, assignment was based on the NAICS codes of its establishments in the Business Register using the following method, with some adjustments made to account for vertical integration of related business activities within the company. The company was first assigned to the economic sector, defined by a two-digit NAICS code that accounted for the highest percentage of its aggregated annual payroll. Then the company was assigned to a subsector, defined by a three-digit NAICS code that accounted for the highest percentage of its annual payroll within the economic sector. Next, the company was assigned a four-digit NAICS code within the subsector, again based on the highest percentage of its aggregated annual payroll within the subsector. Finally, the company was assigned a six-digit NAICS code within the four-digit NAICS code, based on the highest percentage of its aggregated annual payroll within the four-digit NAICS code. Companies with an assigned six-digit NAICS code beginning with 11 or 61 were removed from the sampling frame at this point, and their R&D and associated data are not included in the tabulations. The industry used for sampling purposes was not necessarily the same code used for publication; see section “[Postsampling Industry Classification](#).”

Stratification of the Sampling Frame

Each company in an industry sampling stratum was further assigned to one of two R&D groups based on information about its prior domestic R&D activity: (1) companies with a positive value for the measure of size based on R&D (*known positive R&D group*), or (2) companies with unknown R&D activity (*unknown R&D group*). For the 2022 BERD Survey, there were 32,500 companies in the first group and 1,072,000 companies in the second group, for a total of 1,104,000 companies ([table A-1](#)).

Sample Selection

In the known positive R&D group, Pareto probability-proportional-to-size (PPS) sampling was used within each noncertainty industry stratum, where the probability of selection was proportional to the company’s measure of size. In the unknown R&D group, Pareto PPS sampling was used within most industry strata; simple random sampling (SRS) was used instead of Pareto PPS for industries in which the number of companies in the sampling frame was high and the likelihood of R&D was low. For both the known positive and unknown groups, a separate stratum was created for companies with fewer than 25 employees, regardless of industry. Pareto PPS sampling was used within these strata. Each sampling stratum had a certainty and noncertainty portion ([table A-2](#)). Across both groups (known positive and unknown), companies in select industries and companies that exhibited characteristics of having large R&D amounts, including those with the largest annual payroll, were selected for the sample with certainty (i.e., the probability of selection was equal to 1). The probability of selection for other companies in the known positive R&D and unknown R&D groups depended on their size, the number of companies selected, and the total size or number of companies in their strata. The number of companies selected was based on a coefficient of variation constraint on the estimated sample total for the stratum and was adjusted, if necessary, to ensure that the minimum probability of selection is 0.05 for the known positive R&D group and one of six values for the unknown R&D group: 0.004, 0.01, or 0.02 for nonmanufacturing industries (NAICS other than 31–33) and incomplete manufacturers (incomplete NAICS beginning with 3), depending on the population size and likelihood of R&D; 0.04 for printing and related support activities manufacturing (NAICS 323), furniture and related product manufacturing (NAICS 337), and computer systems design and related services (NAICS 5415); 0.02 for the remaining manufacturing (NAICS 31–33) industries; and 0.05 for the companies with fewer than 25 employees. Within the unknown R&D group, a total of 33,000 companies had a known zero value for the measure of size based on R&D from prior survey response. The probability of selection for those companies was set to zero.

Once selected, each company was assigned a sampling weight equal to the reciprocal of its probability of selection for the sample. Companies that were selected for the sample with certainty were assigned sampling weights equal to 1, and companies that were selected using SRS or Pareto PPS sampling were assigned weights ranging from 1 to 250. A complete and detailed description of the sample design and estimation methodology is given in the annual BERD Survey methodology report available from the NCSSES Survey Manager.

Sample Size

Using the sample design parameters detailed above, a total of 45,500 companies were selected, of which 21,000 companies were in the known positive R&D group, and 24,500 companies were in the unknown R&D group ([table A-3](#) and [table A-4](#)).

During the survey's annual contact update procedures, 150 large R&D performers from the 2021 sample were found that were not included on the 2022 sampling frame. The primary reasons for this were mergers, acquisitions, or other company structure changes that cause a difference between a company's current Business Register ID and its prior year survey ID—in this case, its ID in the 2021 BERD Survey file. To follow up with these companies, they were added to the 2022 sample with certainty, and 150 companies were mailed the same survey invitation as the other companies in the sample. Because it was expected that many of these records would not contribute to 2022 BERD Survey tabulations due to changes in company structure, these companies are not included in sampling frame counts or sample sizes ([table A-5](#)). A complete and detailed description of the selection of additional sampling units is given in the annual BERD Survey methodology report available from the NCSSES Survey Manager.

Data Collection and Processing

Starting in the 2017 cycle, an initial letter was mailed to all companies instructing them to report via the Census Bureau's Centurion data collection instrument. Beginning in survey year 2020, in addition to the initial physical mailing, an initial electronic message was sent to a subset of sampled companies. Beginning in survey year 2022, the BERD Survey stopped mailing paper questionnaires by request of the company and also stopped mailing a paper questionnaire during a later nonresponse follow-up for companies that had not yet responded. All responses for the 2022 survey were submitted electronically.

Questionnaires

Beginning with the 2017 cycle, all companies received the same questionnaire, BRD-1, which combines the standard form BRDI-1 and the abbreviated form BRDI-1(S) used in prior cycles ([table A-6](#)). Companies that reported less than \$1 million in R&D paid for by the company or less than \$1 million in R&D funded by others completed abbreviated worksheets in lieu of more detailed questions asked of companies with \$1 million or more in R&D. As was the case in previous cycles, some companies with decentralized records requested a special reporting arrangement with the Census Bureau. Under this arrangement, the survey form was sent to multiple operating units within the same company, and each Alternate Reporting Unit (ARU) completed the survey individually. The data for these ARUs were also tabulated separately in published estimates and were not consolidated at the company level ([table A-7](#)).

Because of the potential compartmentalization of organizational knowledge within companies (particularly in larger companies), the BERD Survey questionnaire is organized into sections based on the subject matter of the questions. These sections include the following:

Section 1. Company information. Includes basic questions about company ownership, lines of business, sales, and employee data.

Section 2. R&D paid for by your company. Includes geographic location and accounting questions about the company's R&D expenses.

Section 3. Costs paid for by others. Includes accounting questions about R&D paid for by others, such as the company's customers or grant-giving organizations.

Section 4. Assets. Includes questions on total assets, total capital expenditures, and capital expenditures for R&D operations.

Section 5. Management and strategy of R&D. Includes questions related to the characteristics and focus of the company's R&D. This section was targeted toward company employees responsible for managing R&D departments or programs.

Section 6. Human resources. Includes questions related to the human resources involved in the company's R&D activities.

Section 7. Intellectual property and technology transfer. Includes questions on the company's production, use, acquisition, and disposition of intellectual property related to science and technology with a focus on patents.

Section 8. Tax topics. Includes questions on filing federal and state tax credits for research activities.

For specific differences among the BERD Survey questionnaires, see section "[Data Comparability \(Changes\)](#)."

Response Rates

Unit Response Rates

Of the companies surveyed for the 2022 survey, 31% did not submit any response, and an additional 2% did not provide enough information to be treated as responses. Nonresponse studies are conducted periodically to assess reasons for nonresponse and possible nonresponse bias. Three metrics used by NCSSES and the Census Bureau to measure unit response to the BERD Survey were check-in rates, unit response rates (URRs), and coverage rates.

Check-in rate. The check-in rate is defined as the unweighted number of surveys that were either submitted online or mailed in by in-scope companies, divided by the unweighted total number of all in-scope companies in the sample. Response to individual questions did not factor into this metric.

Coverage rate. BERD Survey Managers track a coverage rate that is a weighted measure of survey response based on the measure of size at the time of sample selection. The coverage rate measures how much of the weighted measure of size for in-scope companies in the sample is accounted for by respondents to the survey.

Unit response rate (URR). The URR is the unweighted number of responding companies with positive data for at least one of the survey's key items (i.e., worldwide R&D expenses or R&D costs funded by others, worldwide or domestic sales, or worldwide or domestic employees), divided by the unweighted total number of in-scope companies in the sample.

For the 2022 BERD Survey, the check-in rate was 69% and the URR was 67%. The coverage rate for the 2022 BERD Survey was 94% for the known positive R&D group and 67% for the unknown R&D group ([table A-8](#) and [table A-9](#)).

Item Response Rates

The BERD Survey collects data for over 500 variables, and the distribution of values reported by sample companies is highly skewed. Thus, rather than report unweighted item response rates, total quantity response rates are calculated, which are based on weighted data.

Total quantity response rate (TQRR). For a given published estimate other than count or ratio estimates, TQRR is the percentage of the weighted estimate based on data that were reported by units in the sample or on data that were obtained from other sources and were determined to be equivalent in quality to reported data. The TQRR for total R&D performed in the United States in 2022 was 70%.

Total quantity nonresponse rate (TQNR). For a given published estimate, TQNR, defined as 100% minus TQRR, is calculated for each tabulation cell from the BERD Survey, except for cells that contain count or ratio estimates. TQNR measures the combined effect of the procedures used to handle unit and item nonresponse on the weighted BERD Survey estimate. TQNR tables giving imputation rates corresponding to each data table are available from the NCSSES Survey Manager. Also see section “[Item Nonresponse](#).”

Data Editing

Given the size and complexity of the BERD Survey, many survey responses included errors that required correction or had unusual patterns that required validation. Several hundred automated edit checks were programmed to improve the efficiency of analyst data review and correction ([table A-10](#)).

Approximately two-thirds of these edit checks were designed to catch arithmetic errors and logically inconsistent responses (*balance edits*). The remaining edit checks were designed to flag outliers for further analyst review (*analytical edits*). Descriptions of the data edits and edit failure rates are in annual methodology reports that are available from the NCSSES Survey Manager.

During the editing and review process, several cases were identified where companies reported zero R&D or a relatively small amount of R&D, even though subject-matter experts expected large amounts of R&D to be reported. Some of these companies were contract research organizations or federal contractors that did not account for the costs they incurred while conducting customer-sponsored research as R&D; instead, they accounted for these as the cost of sales. The largest of these companies were contacted by analysts and asked to resubmit their surveys. In rare cases, if no response could be elicited from a company and public information was available related to costs for customer-sponsored R&D, those data were used to impute an R&D estimate for that company.

Techniques for Handling Unit and Item Nonresponse

For various reasons, many firms chose to return the survey questionnaire with one or more blank items. For some firms, internal accounting systems and procedures may not have allowed quantification of specific expenditures. Others may have refused to answer any questions as a matter of company policy. Weighted estimates produced from the BERD Survey include adjustments to account for companies that did not respond to the survey (*unit nonresponse*) and for companies that did respond but left some questions blank (*item nonresponse*).

Unit Nonresponse

The BERD Survey accounts for unit nonresponse by multiplying each company’s sampling weight by a nonresponse adjustment factor. To calculate the adjustment factors, each company in the sample that is eligible for tabulation is assigned to one (and only one) adjustment cell. The adjustment cells are based on the two R&D groups, which are subdivided according to R&D size and certainty status and also on the industry sampling strata described in the section “[Stratification of the Sampling Frame](#)” that are updated using information on industry classification reported in the BERD Survey. For a given adjustment cell, the nonresponse adjustment factor is the ratio of the sum of the weighted measure of size for all companies in the cell to the sum of the weighted measure of size for all companies in the cell with reported or imputed data. The measure of size used to select the sample for the 2021 BERD Survey (see section “[Sampling Frame](#)”) was also used to adjust for unit nonresponse. For companies in the known positive R&D stratum, the measure of size was based on R&D in the United States. For companies in the unknown R&D stratum, the measure of size was based on total annual payroll in the United States. Beginning in survey year 2018, this unit nonresponse adjustment was also applied to counts, patents, patent licensing agreements, and intellectual property protection. In previous survey years, no such adjustment was applied to those items.

R&D estimates for geographic areas outside the largest countries, states, and core-based statistical areas (CBSAs) that are dominated by a relatively small number of companies are particularly sensitive to changes in survey response because these areas may not be similarly represented by companies in the same adjustment cell.

Item Nonresponse

Item nonresponse for a given company is handled by item imputation. For account manager companies, large companies, and special cases, analysts impute these data using direct substitution of available company data (e.g., data from the company's website, annual Form 10-K report, or administrative sources) or other methods determined appropriate by NCSSES's and the Census Bureau's subject-matter experts. For other cases, including cases where analysts were unable to provide a superior estimate, data are imputed by programmed item imputation procedures. Depending on the particular item being imputed for a company, these procedures are based on a combination of (1) direct substitution of available company data, (2) ratio imputation using the company's survey data for both the current and prior year, and (3) ratio imputation using survey data from both the company and other similar companies, which reported both the survey item being imputed for the company and the other survey item used in the ratio. Tables of imputation rates corresponding to each data table are available from the NCSSES Survey Manager.

Estimation

The general methodology used to produce estimates from the BERD Survey involves sums of weighted data (reported or imputed) in which the weights are the product of the sampling weight and the nonresponse adjustment factor. However, there are some exceptions, which are described below.

Weighting

Estimates published for the BERD Survey are computed as sums of weighted data for sample companies that reported to the survey or for sample companies for which data could be reliably imputed based on prior reports or other information. Two types of weights are used for estimates of R&D: sampling weights and nonresponse adjustment factors. The *sampling weight* for a given company is calculated as the reciprocal of the company's probability of inclusion in the sample. *Nonresponse adjustment factors* are used to represent companies in the sample that did not provide sufficient response data to be directly tabulated and whose data could not be imputed. For information on the calculation of the nonresponse adjustment factors, see section "[Unit Nonresponse](#)."

Each value that contributes to a given BERD Survey estimate is multiplied by both its sampling weight and its nonresponse adjustment factor, and these weighted values are then summed to create the estimate. Beginning in survey year 2018, the nonresponse adjustment factor was also applied to estimates of counts, patents, and patent licensing agreements. In prior survey years, the adjustment was not applied to those items.

Postsampling Industry Classification

As mentioned in the section "[Industry Classification for Sampling](#)," the industry classification assigned to companies for sampling was based on either reported BERD Survey business segment data from prior years or annual payroll. To produce more accurate estimates for the current survey year, a company's reported business code, if available for the current survey year, was used to assign an updated industry code for tabulations. The company's response to the domestic R&D performance questions from the current survey year was used to classify each company into the business code that accounted for the largest amount of total domestic R&D performance. The business codes reported by companies with large amounts of R&D were validated, and in some cases corrected, by survey staff. If no business code data were available for a company's domestic R&D performance, the industry code used for sampling was also used for tabulations.

R&D, by Core-Based Statistical Area (CBSA) or State

CBSA-level estimates of business R&D are modeled using BERD Survey data reported by companies on the address of each of their largest R&D locations and administrative data from the Census Business Register on the payroll for each business establishment in the United States. The weighted amount of company R&D is apportioned to CBSAs within states using the same hybrid estimator method used for state estimates (below). Current BERD Survey methodology

cannot attribute all R&D to a specific location. For example, R&D reported by companies that did not respond to geographic questions and for whom no method was available to impute locations is not assigned to a location. This R&D was performed in one of the 50 U.S. states or the District of Columbia, but the specific location is not estimated and is reported as “undistributed” in BERD Survey tables.

The estimation methodology for state estimates takes the form of a hybrid estimator, combining the unweighted reported amount, by state, with a weighted amount apportioned (or raked) across states with relevant industrial activity. The hybrid estimator smooths the estimate over states with R&D activity, by industry, and accounts for real observed change within a state.

R&D estimates for CBSAs and states that are dominated by a relatively small number of companies are particularly sensitive to changes in both unit and item response. Because companies rarely publish detailed information about the geographic location of their R&D operations, it is difficult to identify and correct erroneous responses to these questions. And, as noted earlier, the method used to correct for unit nonresponse relies on data from companies in the same industry or size category. These peer companies may report relatively less (or no) R&D in the geographic areas where a nonresponsive company performs R&D.

R&D, by Business Segment Code

To provide increased granularity on R&D activities, the BERD Survey includes questions asking companies to report data for business units below the company level. To support subcompany reporting, a list of business codes based on NAICS was provided in the BERD Survey for companies to use to categorize their business operations. The list of business codes for the 2022 cycle of the BERD Survey was based on the 2017 NAICS. To assist companies in selecting appropriate business codes, likely business codes were provided to respondents by prepopulating them on the online version of the survey. For companies that reported to the 2020 or 2021 BERD Survey, the most recent business codes reported by the company were used to provide the business codes for the 2022 survey. For companies that did not report to the 2020 or 2021 BERD Survey, establishment payroll data from the Business Register were used to provide the business codes for the 2022 survey.

Company Counts

The BERD Survey is designed primarily to produce valid, useful estimates of *money amounts* related to the performance and funding of R&D. Because this is the survey’s focus, estimation of meaningful *company counts* is difficult. Consequently, throughout the history of the survey there have been various efforts to calculate frequencies more precisely. Following is a summary of the results of recent efforts.

Beginning in survey year 2019, company count estimates reflect a change in rounding methodology. Beginning in survey year 2018, a weight adjustment to account for unit nonresponse was implemented for company counts; as a result, company count estimates are not comparable with survey years prior to 2018.

The company count estimates for 2017 are not comparable with those for 2016 for two reasons. First, the target population for 2017 was restricted to companies with 10 or more domestic employees, whereas the 2016 survey population included companies with 5 or more employees. Second, no adjustment is applied to count estimates to correct for unit nonresponse, and overall response to the survey declined from 2016 to 2017.

The company count estimates for 2014 and onward are not comparable with estimates published for previous years. BRDIS review and correction procedures were amended beginning in survey year 2014 to include a more systematic analysis of companies reporting small amounts of R&D (less than \$10,000) and no R&D employees. Many of these responses were determined to be reporting errors (false-positive R&D), and their R&D was set to zero. These corrections had a negligible impact on BRDIS R&D estimates compared to earlier years. But because these companies tended to have high sample weights, these corrections had a large impact on the estimate of R&D-active companies compared to prior years (when many fewer such corrections were made).

Revision of Capital Expenditure Estimates

Review of BERD Survey capital expenditures data in calendar year 2021 uncovered cases where reported or imputed R&D capital expenditures (CAPEX) were unrealistically high, resulting in inflated overall survey estimates. In addition to an overall escalation in the priority placed on the review of these data by survey staff, the following specific procedures were implemented to improve the quality of BERD Survey estimates of CAPEX and total capital expenditures (TCPEX):

1. Use of total domestic capital expenditures data from the Census Bureau's Annual Capital Expenditures Survey (ACES) when companies report TCPEX amounts significantly smaller than estimated in ACES.
2. Imputing values of CAPEX for respondents that report the same value for CAPEX as they do for either domestic R&D expenditures (DOEXP) or domestic R&D performance.
3. Flagging cases where reported CAPEX exceeds DOEXP for additional subject-matter expert review. Erroneous CAPEX values were replaced with imputed values.
4. Excluding influential outliers from the imputation bases for CAPEX. Imputation for CAPEX relies on industry ratios of reported CAPEX to reported TCPEX. These ratios can be highly influenced by outliers.

Tabulation Eligibility

Beginning in survey year 2018, companies that performed or funded less than \$50,000 of R&D were excluded from tabulation. In prior years, companies that performed or funded any amount of R&D were tabulated. This change has affected the comparability of these estimates to those published for years prior to 2018. These companies in aggregate represented a very small share of total R&D expenditures in prior years, but they accounted for a larger share of count estimates. Had the companies under this threshold been included in the 2022 estimates, they would have contributed approximately \$80 million to overall R&D expenditures and would have added approximately 6,300 companies to the estimated count of U.S. companies with R&D expenditures.

Survey Quality Measures

Sampling and Nonsampling Errors

The estimates produced from the BERD Survey are subject to both sampling and nonsampling errors. Sampling error is the difference between estimates obtained from the sample and results theoretically obtainable from a comparable complete enumeration of the sampling frame. This error results because only a subset of the sampling frame is measured in a sample survey. For published estimates from the BERD Survey, standard errors are produced for estimated percentages, while relative standard errors (RSEs) are produced for all other estimates. Tables of the estimated measures of sampling variability corresponding to each data table are available from the NCSSES Survey Manager.

Beginning in survey year 2021, a data flag denoted by "r" was added to the data tables to denote any data estimates that had RSEs greater than 50%. If estimates required both an "r" and "i" flag (where an "i" flag indicates that more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse), the estimate "r" flag was assigned. This is because the "r" flag indicates the data is of lower quality than the "i" flag.

Standard errors may be used to define confidence intervals about the corresponding estimates with a desired level of confidence. If a confidence interval was constructed for each possible sample that could be selected using the same sample design, then it would be expected that the percentage of confidence intervals containing the result of a complete enumeration of the sampling frame would equal the percentage of the level of confidence. For example, the interval defined by a margin of error of 2 standard errors yields a confidence interval of approximately 95%.

Because relatively few companies perform R&D in the United States, and because the amount of R&D they perform is quite variable, it is difficult to achieve control over the sampling error of survey estimates produced from the BERD Survey. This depends on the correlation between the measure of size on the sampling frame that was used to assign the selection probabilities and the actual data that are collected in the BERD Survey, which cannot be predicted accurately for all companies when the sample is designed. However, the companies known to perform the greatest amounts of R&D are included in the sample with certainty so that these companies will not contribute to the sampling error of the resulting estimates produced from the BERD Survey.

The sample size is sufficiently large so that estimates based on the total sample are subject to low sampling error. However, because priority in designing the sample was given to industries that were identified in previous surveys as conducting large amounts of R&D expenditures, the sampling error may be larger for estimates for the lower-priority industries. The RSE for the estimate of total domestic R&D performed by the company was 0.36% in 2022.

Potential nonsampling errors include coverage error and various response and operational errors, such as errors during data collection, reporting errors, transcription errors, and bias due to nonresponse. These are errors that could also occur if a complete enumeration of the sampling frame had been conducted under the same conditions as the sample survey. Most of the important operational errors were detected and corrected during the course of reviewing the data for reasonableness and consistency. Although nonsampling error is not measured directly, quality control procedures were employed throughout the survey process to minimize this type of error.

Measurement Error

Variations in respondent interpretations of the definitions of R&D activities and variations in accounting procedures are of particular concern—specifically, the characterization and reporting of R&D activities by large defense contractors funded by the U.S. federal government, the reporting of R&D activities by companies classified in the scientific R&D services industry (NAICS 5417), and the method used by companies, in general, to count and report numbers of employees in various categories, such as the number of employees who work full time versus part time on R&D. The sophistication and comprehensiveness of a company's accounting and personnel tracking systems often depend on its size and activities and on its willingness to accommodate government-sponsored surveys. Although no metric of measurement error is produced, ongoing efforts to minimize measurement error include questionnaire pretesting, improvement of questionnaire wording and format, inclusion of more cues and examples in the questionnaire instructions, in-person and telephone interviews and consultations with respondents, and post-survey evaluations.

Data Comparability (Changes)

The statistics resulting from this survey are intended primarily as *indicators* of 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. Although estimating the business portion of the nation's R&D enterprise accurately has always been the goal, such strict 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 coverage and definitions, the industry classification system, estimation methods, and the procedure used to assign industry codes to multi-establishment companies, which are documented in the annual reports, may have affected the comparability of the statistics. Among the most demonstrable changes are those made to the questionnaires, and those changes are summarized below.

Differences between the 2021 and 2022 BERD Survey Questionnaires

The following changes were made to the 2022 BERD Survey from the 2021 BERD Survey:

- Question on details of R&D performed by others was cycled off.
- Question on activities with academia was cycled off.
- Question on federal R&D by government agency was cycled off.
- Question on federal R&D by types of agreements was cycled off.
- Questions on R&D application areas were cycled off.
- Questions on patents, intellectual property, and technology transfer were rotated back on. The questions were last asked in survey year 2020 and there were no changes to the questions in survey year 2022.

Differences between the 2020 and 2021 BERD Survey Questionnaires

The following changes were made to the 2021 BERD Survey from the 2020 BERD Survey:

- Question on details of R&D performed by others was rotated back on.
- Question on activities with academia was rotated back on.
- Question on business code or codes in which the company performed R&D and was paid for by others was rotated back on.
- Question on federal R&D by government agency was rotated back on.
- Question on federal R&D by types of agreements was rotated back on.
- Questions on assets were added to section 4. The capital expenditures questions were expanded, and the section was also renamed from “Capital Expenditures” to “Assets.”
- Questions on R&D application areas were rotated back on.
- Questions on patents, intellectual property, and technology transfer were cycled off.

Differences between the 2019 and 2020 BERD Survey Questionnaires

The following changes were made to the 2020 BERD Survey from the 2019 BERD Survey:

- Questions on the contact information of the person primarily responsible for completing each section were added to the end of each section.
- A follow-up question was added to the ownership question asking whether the new owner of the sampled company is a holding company or a private equity firm.
- Question on details of R&D performed by others was cycled off.
- Question on activities with academia was cycled off.
- Question on business code or codes in which the company performed R&D and was paid for by others was cycled off.
- Question on federal R&D by government agency was cycled off.
- Question on federal R&D by types of agreements was cycled off.
- Question on source of funds for domestic R&D funded by others was added to the section 3 worksheet.
- Questions on R&D application areas were cycled off.

- Questions on patents, intellectual property, and technology transfer were rotated back on.

Differences between the 2018 BRDS and 2019 BERD Survey Questionnaires

The following changes were made to the 2019 BERD Survey from the 2018 BRDS:

- Questions on patents, intellectual property, and technology transfer were cycled off.
- A question on filing for state tax credit for research activities in 2019 was added.

Differences between the 2017 and 2018 BRDS Questionnaires

The following changes were made to the 2018 BRDS from the 2017 BRDS:

- A question on land acquisition capital expenditures for R&D operations was added.
- Questions related to R&D on artificial intelligence (AI) were added.
- Questions asking for country and state location of employees and R&D employees were added.
- A question asking for counts of temporary and leased employees working on R&D was added.

Differences between the 2016 BRDIS and 2017 BRDS Questionnaires

The following changes were made to the 2017 BRDS from the 2016 BRDIS:

- Questions on product and process innovation were removed.
- A question on whether R&D paid for by the company included customer-sponsored R&D was added.
- Questions on R&D funded by foreign governments or agencies and R&D funded by universities and colleges located outside the United States were added.
- A question on whether any capital expenditures for R&D were funded, paid for, or reimbursed by others not owned by your company was added.

Differences between the 2015 and 2016 BRDIS Questionnaires

The following changes were made to the 2016 BRDIS from the 2015 BRDIS:

- Questions on royalties and licensing fees were added to both the R&D paid for by the company and the R&D paid for by others type-of-cost sections.
- Questions on the type of worldwide R&D paid for by the company were added to Form BRDI-1(S).
- Questions on the type of worldwide R&D paid for by others were added to Form BRDI-1(S).
- A question on all other contract R&D services paid for by customers was added to Form BRDI-1(S).
- A question on R&D performed by universities, colleges, and academic researchers located inside the United States was added, while a question on R&D performed by foreign governments was removed.
- A question on R&D funded by universities, colleges, and academic researchers located inside the United States was added, while a question on R&D funded by foreign governments was removed.
- A question on whether utility patent sales and licensing revenues were received from companies or organizations outside the United States was added to Form BRDI-1.

- A question on whether utility patent purchases and licensing payments were made to companies or organizations outside the United States was added to Form BRDI-1.
- A question on whether the company filed for the tax credit for increasing research activities (IRS Form 6765) in tax year 2016 was added to Form BRDI-1.
- Questions on the importance of intellectual property protections were removed.

Differences between the 2014 and 2015 BRDIS Questionnaires

The following changes were made to the 2015 BRDIS from the 2014 BRDIS:

- A question on phase IV clinical trials was added to Form BRDI-1.
- A question on R&D performed by others that was paid for by U.S. federal government agencies or laboratories was added to Form BRDI-1.
- Questions on the type of foreign R&D paid for and performed by the company were added to Form BRDI-1.
- Questions on the type of foreign R&D performed by the company but paid for by others were added to Form BRDI-1.
- A question on nonprovisional utility patents was added to Form BRDI-1.
- Questions related to R&D in photonics and optics application areas were removed from Form BRDI-1.

Differences between the 2013 and 2014 BRDIS Questionnaires

The following changes were made to the 2014 BRDIS from the 2013 BRDIS:

- A question on monetary gifts to universities or colleges restricted to supporting R&D was added to Form BRDI-1.
- A question on revenue received from patent licensing was added to Form BRDI-1.
- A question on purchasing patents from others was added to Form BRDI-1.
- A question on licensing patents from others was added to Form BRDI-1.
- One business code was added to the list of business codes collected on the survey: 33333, digital cameras manufacturing. In prior years, this line of business was included in the business code 33412, computers and peripheral equipment manufacturing and magnetic and optical media.
- Questions related to patenting were removed from Form BRDI-1(S).
- Questions related to innovation were added to Form BRDI-1(S).

Differences between the 2012 and 2013 BRDIS Questionnaires

The following changes were made to the 2013 BRDIS from the 2012 BRDIS:

- The list of countries for which foreign R&D performance data were collected was expanded by three: Hungary, Luxembourg, and Norway.
- A question was restored asking the amount of R&D that the company plans to recoup through indirect charges on U.S. federal government contracts (independent R&D). This question was last asked on the 2010 BRDIS.
- Questions on R&D for software products and R&D for embedded software were combined.
- A question on R&D for software products and embedded software paid for by the federal government was added.

- A question related to the educational attainment of scientists and engineers was restored. This question was last asked on the 2010 BRDIS.
- Two business codes were added to the list of business codes collected on the survey: 32542, biotechnology-based pharmaceutical and biological products (except diagnostics), and 51801, cloud computing applications and Internet-based software services.
- Delinquent companies in the known positive R&D stratum for the past two survey cycles were sent Form BRD-1(S) to see if they would report at least the high-level numbers.

Differences between the 2011 and 2012 BRDIS Questionnaires

For 2012, a much shorter (8-page) version of the short form, BRD-1(S), was implemented. The form included 19 high-level-detail items on worldwide sales; domestic sales; R&D expenses funded both by the company and by others; employment both worldwide and domestic, including R&D employment; and patents applied for and issued. Companies that reported \$1 million or more of domestic R&D performance were then sent the long form (BRDI-1) for additional details. The BRD-1(S) form was sent to companies in the unknown and known zero R&D strata. In section 2, the questionnaire collected the additional detail categories for capital expenditures. In section 3, four agencies were added to the type of agency question so as to reduce the amount reported in the “all other” category. In section 4, the percentage of R&D that was directed toward business areas or product lines new to the respondent’s company and also the percentages that pertain to defense applications, health or medical applications, or agricultural applications were added for R&D funded by the company and R&D funded by others.

Differences between the 2010 and 2011 BRDIS Questionnaires

For the 2011 data collection, the innovation questions and instructions in section 1 were changed based on the results of the 2010 experiment. Cycling continued for data items that were not needed every year. The survey was expanded in several ways to address data gaps: the list of countries in which companies could report foreign R&D performance was expanded, a question was added to collect intracompany R&D transactions, and questions were added about companies’ second-largest R&D location. In addition, questions pertaining to full-time equivalent (FTE) R&D scientists and engineers were revised to improve respondent understanding of survey concepts.

Differences between the 2009 and 2010 BRDIS Questionnaires

For the 2010 data collection, the most notable changes made to the questionnaire were the inclusion of a one-time section (section 7) on R&D time frame and R&D product life, the inclusion of an experiment testing the impact of different innovation questions and instructions, and the addition of a survey supplement to collect detailed information from companies reporting R&D paid for by others. In addition, questions and instructions about company ownership were expanded to clarify, especially for foreign-owned companies, the information that should be reported on the survey. Cycling began for data items that were not needed every year from every company. These items will be returned to the questionnaire cyclically, depending on the demand for and quality of the collected data. Finally, data items that were poorly reported during the first two cycles of BRDIS were deleted.

The section titled “R&D Time Frame and R&D Product Life” was added for the 2010 cycle to aid in estimating the depreciation of R&D when it is treated as an investment in the U.S. System of National Accounts.

An experiment testing the impact of different innovation questions and instructions used two versions of the BRDIS short form. The innovation questions on the 2010 Form BRDI-1A were identical to questions used on the 2009 Form BRDI-1A, and the 2010 Form BRDI-1B altered the questions and instructions to replicate innovation questions on the European Union’s Community Innovation Survey. The experiment did not produce statistically significant differences in measured rates of innovation.

Differences between the 2008 and 2009 BRDIS Questionnaires

Several changes were made to the 2009 BRDIS questionnaire—in part, to address reporting errors observed during the 2008 survey cycle. These changes included the following:

- A screening question at the beginning of the form asking companies whether they had R&D activity during the reporting period was removed.
- Exclusion instructions in the main R&D expense question were replaced with a series of targeted questions. This approach was based on the premise that the economic concepts requested by BRDIS do not always conform to the R&D measures tracked by companies. Rather than directly asking for concepts that may diverge from respondent preconceptions about R&D, the approach in 2009 guided respondents to derive amounts that conformed to the BRDIS definition of R&D.
- Instructions in the question about R&D paid for by others were replaced with a series of targeted questions.
- Data for R&D performed by others were derived rather than collected directly. For the 2009 cycle of BRDIS, R&D performed by others was the sum of two R&D costs known to be tracked by companies: payments to business partners for collaborative R&D and purchased R&D services.
- The order of the “Management and Strategy of R&D” and the “Financial Schedule B” (R&D paid for by others) sections was switched.

Definitions

Capital expenditure. Capital expenditures are payments by a business for assets that usually have a useful life of more than 1 year, like buildings, equipment, or software. The value of assets acquired or improved through capital expenditures is recorded on a company’s balance sheet. Expenditures for long-lived assets used in a company’s R&D operations are not included in its R&D expense, but any depreciation recorded for those assets would be included in its R&D expense. Data are collected in the BERD Survey for capital expenditures for R&D operations for land acquisition, structures, equipment, capitalized software, and other items.

Core-based statistical area (CBSA). A CBSA is a U.S. geographic area that consists of one or more counties (or equivalents) anchored by an urban center of at least 10,000 people plus adjacent counties that are socioeconomically tied to the urban center by commuting. CBSAs are defined by OMB in the Executive Office of the President.

Employment, total and R&D. Involves the number of people employed by R&D-performing or R&D-funding companies in all locations, both foreign and domestic, during the pay period that included 12 March of the survey year. (The date 12 March is what most employers use when paying first-quarter employment taxes to IRS.) R&D employees are those who provide direct support to R&D, such as researchers, R&D managers, technicians, clerical staff, and others assigned to R&D groups. Those not included are employees who provide indirect support to R&D, such as corporate personnel, security guards, and cafeteria workers. In addition to providing head counts of total and R&D employees, the BERD Survey also produces estimates of FTE domestic R&D employment. This is the number of persons employed who were assigned full time to R&D, plus a prorated number of employees who worked on R&D only part of the time.

Employment, leased and temporary. The number of people who work for R&D-performing or R&D-funding companies but who are not considered employees of the reporting company. These workers perform tasks similar to the reporting companies’ own employees but are technically employed by another company (such as a temp or staffing agency or a consulting firm) or are independent on-site consultants.

Expense and R&D expense. Involves money spent or costs incurred in an organization’s efforts to generate revenue, representing the cost of doing business. Expenses may be in the form of actual cash payments (such as wages and salaries), a computed expired portion of an asset (depreciation), or an amount taken out of earnings (such as bad debts). Expenses are summarized and charged in the income statement as deductions from the income before assessing income tax. Whereas all expenses are costs, not all costs are expenses (e.g., costs incurred in acquisition of income-generating assets—see the definition of *capital expenditure* above). R&D expense is the cost of R&D funded by the company itself and performed within the respondent company’s facilities, both foreign and domestic, or performed by others outside of the company under contract, subcontract, grant, or other funding arrangement.

R&D and business R&D. R&D is planned, creative work aimed at discovering new knowledge or devising new applications of available knowledge. This includes (1) activities aimed at acquiring new knowledge or understanding without specific immediate commercial applications or uses (*basic research*), (2) activities aimed at solving a specific problem or meeting a specific commercial objective (*applied research*), and (3) systematic use of research and practical experience and resulting in additional knowledge, which is directed to producing new or improved goods, services, or processes (*development*). R&D includes both *direct costs*, such as salaries of researchers, and *administrative and overhead costs* clearly associated with the company’s R&D. However, R&D does not include expenditures for routine product testing, quality control, and technical services unless they are an integral part of an R&D project. R&D also does not include market research; efficiency surveys or management studies; literary, artistic, or historical projects, such as films, music, or books and other publications; and prospecting or exploration for natural resources.

R&D, artificial intelligence (AI). AI is a branch of computer science and engineering devoted to making machines intelligent. Intelligence is that quality that enables an entity to perceive, analyze, determine response, and act appropriately in its environment.

Systems with AI perform functions including, but not limited to, speech recognition, machine vision, or machine learning:

- Speech recognition transforms human speech into a format useful for computer applications (e.g., a digital assistant).
- Machine vision uses sensors and software that allow images to be used as an input for computer applications (e.g., systems that sort or inspect objects or support navigation in mobile equipment).
- Machine learning uses statistical software and data to “learn” and make better predictions without reprogramming (e.g., recommender systems for websites, or sales and demand forecasting).

AI technologies also include virtual agents, deep learning platforms, decision management systems, biometrics, text analytics, and natural language generation and processing.

R&D, biotechnology. Biotechnology is the application of science and technology (S&T) to living organisms, as well as parts, products, and models thereof, to alter living or nonliving materials for the production of knowledge, goods, and services. The following list provides examples of areas of biotechnology in which R&D may be performed.

- DNA or RNA: genomics; pharmacogenomics; gene probes; genetic engineering; DNA or RNA sequencing, synthesis, or amplification; gene expression profiling; and use of antisense technology, large-scale DNA synthesis, genome editing and gene editing, and gene drive
- Proteins and other molecules: sequencing, synthesis, or engineering of proteins and peptides (including large-molecule hormones); improved delivery methods for large molecule drugs; proteomics; protein isolation and purification; signaling; and identification of cell receptors
- Cell and tissue culture and engineering: cell or tissue culture, tissue engineering (including tissue scaffolds and biomedical engineering), cellular fusion, vaccine or immune stimulants, embryo manipulation, marker-assisted breeding technologies, and metabolic engineering

- Process biotechnology techniques: fermentation using bioreactors, biorefining, bioprocessing, bioleaching, biopulping, biobleaching, biodesulfurization, bioremediation, biosensing, biofiltration and phytoremediation, and molecular aquaculture
- Gene and RNA vectors: gene therapy and viral vectors
- Bioinformatics: construction of databases on genomes, protein sequences, and modeling complex biological processes, including systems biology
- Nanobiotechnology: application of the tools and processes of nano- or microfabrication to build devices for studying biosystems and applications in, for example, drug delivery or diagnostics

R&D, domestic. R&D performed in the 50 U.S. states and the District of Columbia. *Adjusted* domestic R&D is calculated in tables designed to enable comparisons between U.S. BERD Survey statistics and those of other nations. There are three types of tables corresponding to the three principal measures of domestic R&D in the BERD Survey—that is, R&D paid for by the respondent company and others outside of the company and performed by the respondent company, R&D paid for and performed by the respondent company, and R&D paid for by others and performed by the company. In each table, an internationally comparable adjusted domestic R&D estimate is calculated by subtracting depreciation relating to R&D operations, which is *included* in U.S. BERD Survey domestic R&D, and adding capital expenditures relating to R&D operations, which is *excluded* from U.S. BERD Survey domestic R&D. Also shown in each table are the differences between the U.S. BERD Survey estimates in this report and the adjusted internationally comparable estimates for domestic R&D.

R&D intensity, or R&D-to-sales ratio. R&D intensity is a ratio, expressed as a percentage, calculated by dividing the cost of R&D by sales. The ratio serves as an indicator of the relative incidence of R&D among groups of companies, primarily among industries and company size classifications. In this report, R&D intensity ratios are calculated in various ways, depending on the measure of R&D (R&D paid for by the respondent company, paid for by others outside of the company, or both) and whether the respondent company performs and funds or only performs R&D.

R&D, nanotechnology. The understanding of processes and phenomena and the application of S&T to organisms and to organic and inorganic materials—as well as parts, products, and models thereof—at the nanometer scale (but not exclusively below 100 nanometers) in one or more dimensions, where the onset of size-dependent phenomena usually enables novel applications. These applications utilize the properties of nanoscale material that differ from the properties of individual atoms, molecules, and bulk matter for the production of knowledge, goods, and services, like improved materials, devices, and systems that exploit these new properties. The following list provides examples of areas of nanotechnology in which R&D may be performed.

- Nanomaterial: material with any external dimension in the nanoscale or having internal structure or surface structure in the nanoscale
- Nanoelectronics: field of S&T concerned with the development and production of functional electronic devices with nanoscale components
- Nanophotonics: branch of photonics concerned with interaction of photons with nanomaterials aiming to design optical or optoelectronic components
- Nanomedicine: medical application of nanotechnology (e.g., medical application of nanomaterials and biological devices, nanoelectronics biosensors, and possible future applications of molecular nanotechnology, such as biological machines)
- Nanomagnetism: the study of the magnetic response of nanomaterials to an applied magnetic field and their applications
- Nanomechanics: a branch of nanoscience studying fundamental mechanical (elastic, thermal, and kinetic) properties of physical systems at the nanometer scale

- **Nanofiltration:** a membrane filtration process used for the softening of water and the removal of organic matter; includes nanomembranes
- **Nanotools:** multicomponent tools and devices used for manipulation, nanolithography, and nanofabrication
- **Nanoinstruments or nanodevices:** multicomponent instruments or devices used for observation, analysis, or control of matter at the nanometer scale
- **Nanomanufacturing:** intentional synthesis generation of control of nanomaterials, or fabrication steps in the nanoscale, for commercial purposes

R&D paid for by others, worldwide and domestic. The cost of R&D funded by others outside of the company, including the U.S. federal government, and performed within the respondent company's facilities, both foreign and domestic.

R&D paid for by the company and others, worldwide and domestic. The cost of R&D funded by the company or by others outside of the company and performed within the respondent company's facilities, both foreign and domestic, or performed by others outside of the company under contract, subcontract, grant, or other funding arrangement.

R&D performed by the company, worldwide and domestic. The cost of R&D performed within the respondent company's facilities, both foreign and domestic, funded by the company itself or by others outside of the company.

R&D performed by the company and others, worldwide and domestic. The cost of R&D performed within the respondent company's facilities, both foreign and domestic, or performed by others outside of the company under contract, subcontract, grant, or other funding arrangement.

R&D performed by others, worldwide and domestic. The cost of R&D funded by the company or by others outside of the company and performed by others outside of the company under contract, subcontract, grant, or other funding arrangement.

R&D, software and Internet. R&D activity in software and Internet applications refers only to activities that have an element of uncertainty and that are intended to close knowledge gaps and meet scientific and technological needs. This item is reported in this survey regardless of the eventual user (internal or external). R&D activity in software includes software development or improvement activities that expand scientific or technological knowledge and construction of new theories and algorithms in the field of computer science. R&D activity in software excludes software development that does not depend on a scientific or technological advance, such as supporting or adapting existing systems, adding functionality to existing application programs, routine debugging of existing systems and software, creating new software based on known methods and applications, converting or translating existing software and software languages, and adapting a product to a specific client, unless knowledge that significantly improved the base program was added in that process.

Sales, worldwide and domestic. Dollar values for goods sold or services rendered by R&D-performing or R&D-funding companies located in the 50 U.S. states and the District of Columbia to customers outside the company, including the U.S. federal government, foreign customers, and the company's foreign subsidiaries. Included are revenues from a company's foreign operations and subsidiaries and from discontinued operations. If a respondent company is owned by a foreign parent company, sales to the parent company and to affiliates not owned by the respondent companies are included. Excluded are intracompany transfers, returns, allowances, and freight charges, as well as excise, sales, and other revenue-based taxes.

Data Availability

Publications

The data from the BERD Survey can be found online at <https://nces.nsf.gov/surveys/business-enterprise-research-development/>. Detailed historical statistics from the predecessor survey, SIRD, can be obtained from NCSES's Industrial Research and Development Information System at <https://www.nsf.gov/statistics/iris/>. Information from the BERD Survey is also included in *Science and Engineering Indicators* and in *National Patterns of R&D Resources*.

Electronic Access

The BERD Survey contains confidential data that are protected under Title 13 and Title 26 of the U.S. Code. Restricted microdata can be accessed at the secure Federal Statistical Research Data Centers (FSRDCs) administered by the Census Bureau. FSRDCs are partnerships between federal statistical agencies and leading research institutions. FSRDCs provide secure environments supporting qualified researchers using restricted-access data while protecting respondent confidentiality. Researchers interested in using the microdata can submit a proposal to the Census Bureau, which evaluates proposals based on their benefit to Census, scientific merit, feasibility, and risk of disclosure. To learn more about the FSRDCs and how to apply, please visit <https://www.census.gov/about/adrm/fsrdc.html>.

Disclosure Avoidance

Disclosure is the release of data that reveals information or permits deduction of information about a particular survey unit through the release of either tables or microdata. *Disclosure avoidance* is the process used to protect each survey unit's identity and data from disclosure. Using disclosure avoidance procedures, the Census Bureau modifies or removes the characteristics that put information at risk of disclosure. Although it may appear that a table shows information about a specific survey unit, the Census Bureau has taken steps to disguise or suppress a unit's data that may be "at risk" of disclosure while making sure the results are still useful.

The BERD Survey uses cell suppression and rounding to avoid disclosing information about a particular company. *Cell suppression* is a disclosure avoidance technique that protects the confidentiality of individual survey units by withholding cell values from release and replacing the cell value with a data code, usually a "D" or an estimate range (estimate ranges were substituted for most suppressed cells for survey years 2017–21). If the suppressed cell value were known, it would allow one to estimate an individual survey unit's value too closely.

The cells that must be protected are called *primary suppressions*. To make sure the cell values of the primary suppressions cannot be closely estimated by using other published cell values, additional cells may also be suppressed. These additional suppressed cells are called *complementary suppressions*. The process of suppression does not usually change the higher-level totals. Values for cells that are not suppressed remain unchanged. Before the Census Bureau releases data, computer programs and analysts ensure that primary and complementary suppressions have been correctly applied.

The Census Bureau has reviewed this data to ensure appropriate access, use, and disclosure avoidance protection of the confidential source data (Project No. P-7504682, Disclosure Review Board approval number: CBDRB-FY23-0164).

NCSES has reviewed this product for unauthorized disclosure of confidential information and approved its release (NCSES-DRN24-042).

Technical Tables

Table	Title
A-1	Target population counts, by frame partition: 2008–22
A-2	Companies in the target population and selected for the sample, by industry and company size: 2022
A-3	Sample size, by frame partition: 2008–22
A-4	Companies sampled, by sampling stratum: 2022
A-5	Companies included in the survey that were not in the original sampling frame: 2008–22
A-6	Survey letters mailed, by sampling stratum: 2022
A-7	Survey letters mailed for companies with subcompany reporting units, by sampling stratum: 2022
A-8	Response measures: 2008–22
A-9	Unit response rates, by industry and company size: 2022
A-10	Companies that required an analyst action, by sampling stratum: 2022

TABLE A-1

Target population counts, by frame partition: 2008–22

(Number of companies)

Year	Total ^a	Known positive R&D	Known zero R&D	Unknown R&D
2008	1,926,012	16,059	75,923	1,834,030
2009	2,090,181	22,181	79,031	1,988,969
2010	2,013,399	24,723	67,281	1,921,395
2011	1,964,757	27,049	73,930	1,863,778
2012	1,971,731	29,512	73,004	1,869,215
2013	1,971,959	34,482	70,032	1,867,445
2014	1,998,858	35,532	79,343	1,883,983
2015	2,029,436	35,839	71,386	1,922,211
2016	1,485,151	34,958	11,355	1,438,838
2017	1,097,510	32,206	27,679	1,037,625
2018	1,115,834	33,215	34,158	1,048,461
2019	1,124,000	32,000	37,500	1,055,000
2020	1,139,000	31,500	36,500	1,071,000
2021	1,137,000	31,500	na	1,106,000
2022	1,104,000	32,500	na	1,072,000

na = not applicable.

^a For each year, the estimate of the number of companies in the total target population is based on the original sampling frame that was created to select the sample. The target population estimates in this table do not include R&D performers from the previous year's sample, which were not on the original sampling frame but were found during the survey's annual contact update procedures. See [table A-5](#) for the counts of companies that were added to each year's sample.

Note(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Companies were said to be known to conduct R&D (*known positive R&D*) if they reported positive R&D in any of the previous 5 survey years. For survey years 2008–15, companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 5 survey years and no positive R&D in any of the 5 years. Beginning in survey year 2016, companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 3 survey years and no positive R&D in any of the previous 5 survey years. Companies were said to have *unknown R&D* if no R&D information was available. For survey year 2016, the target population did not include companies in the Other nonmanufacturing industry with fewer than 10 domestic employees. Starting in survey year 2017, the target population no longer includes companies with fewer than 10 domestic employees.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE A-2

Companies in the target population and selected for the sample, by industry and company size: 2022

(Number of companies)

Industry and company size	NAICS code	Companies in target population ^a	Companies selected for the sample		
			All companies	Noncertainties	Certainties
All industries	21–23, 31–33, 42–81	1,104,000	45,500	22,000	23,500
Manufacturing industries	31–33	93,000	18,000	8,600	9,200
Food	311	9,400	1,100	650	450
Beverage and tobacco products	312	3,800	350	250	150
Textile, apparel, and leather products	313–16	3,300	550	350	200
Wood products	321	4,700	550	400	150
Paper	322	1,400	350	200	150
Printing and related support activities	323	5,000	800	500	300
Petroleum and coal products ^b	324	350	150	20	150
Chemicals	325	5,300	2,200	500	1,700
Basic chemicals	3251	700	300	90	200
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	550	200	60	150
Pesticide, fertilizer, and other agricultural chemicals	3253	300	150	<i>N < 15</i>	150
Pharmaceuticals and medicines	3254	1,800	1,000	90	900
Soap, cleaning compound, and toilet preparations	3256	800	250	100	150
Paint, coating, adhesive, and other chemicals	3255, 3259	1,200	350	150	200
Plastics and rubber products	326	4,600	1,000	500	500
Nonmetallic mineral products	327	3,800	550	350	200
Primary metals	331	1,600	450	250	200
Fabricated metal products	332	19,000	2,200	1,400	850
Machinery	333	8,900	1,900	950	1,000
Agricultural implement	33311	550	200	50	150
Semiconductor machinery	333242	80	70	0	70
Engine, turbine, and power transmission equipment	3336	350	150	20	150
Other machinery	other 333	7,900	1,500	900	650
Computer and electronic products	334	4,500	1,600	450	1,200
Communications equipment	3342	550	200	30	200
Semiconductor and other electronic components	3344	1,700	450	150	300
Navigational, measuring, electromedical, and control instruments	3345	1,800	750	250	500
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	350	200	30	150
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	200	150	<i>N < 15</i>	150
Other measuring and controlling devices	other 3345	1,200	450	200	250
Other computer and electronic products	other 334	550	250	40	200
Electrical equipment, appliances, and components	335	2,100	600	300	300
Transportation equipment	336	4,700	1,200	450	750

TABLE A-2

Companies in the target population and selected for the sample, by industry and company size: 2022

(Number of companies)

Industry and company size	NAICS code	Companies in target population ^a	Companies selected for the sample		
			All companies	Noncertainties	Certainties
Motor vehicles, bodies, trailers, and parts	3361-63	3,000	700	300	400
Aerospace products and parts	3364	850	300	60	200
Aircraft, aircraft engine, and aircraft parts	336411-13	750	250	60	150
Guided missile, space vehicle, and related parts	336414, 336415, 336419	60	50	0	50
Military armored vehicle, tank, and tank components	336992	30	20	0	20
Other transportation	other 336	900	250	100	100
Furniture and related products	337	4,200	800	500	300
Miscellaneous	339	6,100	1,400	700	700
Medical equipment and supplies	3391	2,300	650	250	400
Other miscellaneous manufacturing	3399	3,800	700	400	300
Unclassified	-	100	70	<i>N < 15</i>	70
Nonmanufacturing industries	21-23, 42-81	1,008,000	25,000	13,500	11,500
Mining, quarrying, oil and gas extraction, and support activities	21	4,400	550	300	250
Utilities	22	800	200	40	150
Wholesale trade	42	62,500	5,100	3,700	1,500
Electronic shopping and electronic auctions	454111-12	5,800	450	350	100
Transportation and warehousing	48-49	37,000	550	150	400
Information	51	15,500	3,500	1,300	2,300
Publishing	511	5,200	1,300	500	750
Newspaper, periodical, book, and directory publishers	5111	2,000	350	200	150
Software publishers	5112	3,200	900	300	600
Telecommunications	517	2,500	450	250	200
Data processing, hosting, and related services	518	3,700	1,300	250	1,100
Other information	other 51	4,200	550	250	250
Finance and insurance	52	25,500	1,000	100	900
Real estate and rental and leasing	53	24,500	400	100	300
Lessors of nonfinancial intangible assets (except copyrighted works)	533	450	80	<i>N < 15</i>	70
Other real estate and rental and leasing	other 53	24,000	350	100	250
Professional, scientific, and technical services	54	100,000	7,500	4,000	3,500
Architectural, engineering, and related services	5413	17,500	2,700	1,600	1,100
Computer systems design and related services	5415	17,000	3,000	1,700	1,300
Scientific research and development services	5417	2,800	2,800	0	2,800
Research and development in nanotechnology	541713	150	150	0	150
Research and development in biotechnology (except nanobiotechnology)	541714	750	750	0	750
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,700	1,700	0	1,700

TABLE A-2

Companies in the target population and selected for the sample, by industry and company size: 2022

(Number of companies)

Industry and company size	NAICS code	Companies in target population ^a	Companies selected for the sample		
			All companies	Noncertainties	Certainties
Research and development in the social sciences and humanities	541720	200	200	0	200
Other professional, scientific, and technical services ^c	other 54	65,500	1,700	650	1,100
Health care services	621-23	116,000	1,600	550	1,100
Other nonmanufacturing	23, 44-45 (excluding 454111-12), 55-56, 624, 71-72, 81	616,000	3,900	3,100	800
Unclassified	-	450	150	40	100
Company size (number of domestic employees)					
All companies	-	1,104,000	45,500	22,000	23,500
< 10 ^d	-	10,000	500	200	300
10-19	-	560,000	10,000	7,700	2,400
20-49	-	346,000	10,000	6,700	3,400
50-99	-	102,000	6,800	3,800	3,000
100-249	-	55,000	7,400	2,800	4,500
250-499	-	16,000	3,800	800	3,000
500-999	-	7,700	3,100	70	3,000
1,000-4,999	-	6,200	2,800	70	2,700
5,000-9,999	-	850	500	20	500
10,000-24,999	-	550	350	N < 15	300
25,000 or more	-	350	200	N < 15	200

NAICS = 2017 North American Industry Classification System.

^a Estimates of the number of companies in the target population are based on the original sampling frame that was created to select the 2022 Business Enterprise Research and Development (BERD) Survey sample. These estimates do not include 150 R&D performers from the previous year's sample, which were not on the original sampling frame but were found during the survey's annual contact update procedures. These companies were added to the 2022 sample with certainty but are not reflected in the number of certainties selected for the sample.

^b Because of the widespread practice of the larger petroleum extraction and refining companies vertically integrating their activities, petroleum refineries (NAICS 32411) and oil and gas extraction (NAICS 211) were combined during sampling.

^c Contains companies classified in scientific research and development services (NAICS 5417) that, as of sampling, were not fully classified to the level of detail in research and development in nanotechnology (NAICS 541713), research and development in biotechnology (except nanobiotechnology) (NAICS 541714), research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology) (NAICS 541715), or research and development in the social sciences and humanities (NAICS 541720).

^d This category includes companies that are represented on the sampling frame as having missing data, but these companies are in scope to the BERD Survey because they have at least \$500,000 in annual payroll.

Note(s):

Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Certainties are companies whose probability of selection is 1 based on prior year R&D expenditures equal to or greater than \$3 million as well as others included in the sample for analytical purposes (analytical certainties). Noncertainties are companies whose probability of selection is less than 1. Companies that were missing or had an incomplete NAICS code at the time of sampling were assigned to an Unclassified industry category temporarily. If an unclassified company reported R&D expenditures, its primary industrial activity was investigated, and a NAICS code was assigned during statistical processing.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE A-3

Sample size, by frame partition: 2008–22

(Number of companies)

Year	Total	Known positive R&D	Known zero R&D	Unknown R&D
2008	39,553	11,103	3,156	25,294
2009	43,002	14,343	3,443	25,216
2010	42,965	14,399	3,150	25,416
2011	43,108	14,941	3,385	24,782
2012	43,655	16,188	3,527	23,940
2013	45,089	17,690	3,531	23,868
2014	44,162	16,959	3,861	23,342
2015	44,824	17,602	3,484	23,738
2016	44,861	18,184	1,058	25,619
2017	44,978	17,737	2,112	25,129
2018	45,690	20,115	2,265	23,310
2019	45,500	20,000	2,300	23,500
2020	47,500	20,500	2,200	24,500
2021	47,500	21,000	na	26,500
2022	45,500	21,000	na	24,500

na = not applicable

Note(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Companies were said to be known to conduct R&D (*known positive R&D*) if they reported positive R&D in any of the previous 5 survey years. For survey years 2008–15, companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 5 survey years and no positive R&D in any of the 5 years. Beginning in survey year 2016, companies were said to have known zero R&D if they reported zero R&D in at least 1 of the previous 3 survey years and no positive R&D in any of the previous 5 survey years. Companies were said to have *unknown R&D* if no R&D information was available.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE A-4

Companies sampled, by sampling stratum: 2022

(Number of companies)

Stratum	Total
Total	45,500
Known positive R&D	21,000
Certainties	16,500
Noncertainties	4,700
Known zero R&D	na
Certainties	na
Noncertainties	na
Unknown R&D	24,500
Certainties	7,000
Noncertainties	17,500

na = not applicable.

Note(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Companies were said to be known to conduct R&D (*known positive R&D*) if they reported positive R&D in any of the previous 5 survey years. Companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 3 survey years and no positive R&D in any of the previous 5 survey years. Companies were said to have *unknown R&D* if no R&D information was available.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE A-5

Companies included in the survey that were not in the original sampling frame: 2008–22

(Number of companies)

Year	Known positive R&D
2008	336
2009	18
2010	49
2011	42
2012	54
2013	44
2014	37
2015	52
2016	90
2017	93
2018	111
2019	150
2020	150
2021	150
2022	150

Note(s):

Beginning in survey year 2019, counts reflect a change in rounding methodology. This table shows the counts of companies that were found during the update procedures, were added to each year's sample, and were mailed a survey letter. These company counts are not in [table A-2](#).

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE A-6

Survey letters mailed, by sampling stratum: 2022

(Number)

Stratum	Total
Total	45,500
Known positive R&D	21,000
Certainties	16,000
Noncertainties	4,700
Known zero R&D	na
Certainties	na
Noncertainties	na
Unknown R&D	24,000
Certainties	6,800
Noncertainties	17,500
Cases not in the frame	150

na = not applicable.

Note(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Beginning in survey year 2017, an initial letter was mailed to all companies that instructed them to report online using the unique authentication code printed on the letter. Companies were said to be known to conduct R&D (*known positive R&D*) if they reported positive R&D in any of the previous 5 survey years. Companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 3 survey years and no positive R&D in any of the previous 5 survey years. Companies were said to have *unknown R&D* if no R&D information was available.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE A-7

Survey letters mailed for companies with subcompany reporting units, by sampling stratum: 2022

(Number of companies)

Stratum	Sent one form	Sent multiple forms ^a
Total	45,000	100
Known positive R&D	21,000	100
Certainties	16,000	100
Noncertainties	4,700	0
Known zero R&D	na	na
Certainties	na	na
Noncertainties	na	na
Unknown R&D	24,000	0
Certainties	6,800	0
Noncertainties	17,500	0
Cases not in the frame	150	0

na = not applicable.

^a Under special arrangement with the Census Bureau, and to facilitate reporting, the Business Enterprise Research and Development Survey used multiple survey forms to separately survey portions of some companies. This special arrangement extends to holding companies to facilitate reporting among the operating units. The number of companies does not include companies that made special reporting arrangements with the Census Bureau after the initial mailout.

Note(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Beginning in survey year 2017, an initial letter was mailed to all companies that instructed them to report online using the unique authentication code printed on the letter. Companies were said to be known to conduct R&D (*known positive R&D*) if they reported positive R&D in any of the previous 5 survey years. Companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 3 survey years and no positive R&D in any of the previous 5 survey years. Companies were said to have *unknown R&D* if no R&D information was available.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE A-8

Response measures: 2008–22

(Percent)

Measure	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Check-in rate ^a	79.5	74.9	75.1	73.7	78.6	74.3	73.3	80.1	80.5	75.6	74.0	72	69	70	69
Response rate (unweighted) ^b	74.2	73.1	71.4	71.1	77.1	73.6	72.5	79.6	80.2	74.5	72.8	69	67	69	67
Coverage rate for known positive sampling strata (using weighted R&D) ^c	91.4	91.5	87.7	86.0	91.4	90.4	91.0	93.0	92.6	92.4	90.5	92	92	92	94
Coverage rate for unknown sampling strata (using weighted payroll) ^c	79.9	75.0	76.2	76.7	84.2	77.7	78.1	84.3	73.4	73.6	71.6	68	65	69	67
Coverage rate for known zero sampling strata (using unweighted counts) ^c	77.2	78.7	74.5	76.0	82.7	80.7	80.4	83.4	88.0	80.0	80.3	79	78	na	na

na = not applicable.

^a The number of survey responses from in-scope companies divided by the total number of in-scope companies in the sample.^b The number of responding companies with worldwide R&D expenses or costs funded by others or the number of responding companies with worldwide or domestic sales or worldwide or domestic employees (if R&D was zero) divided by the total number of in-scope companies in the sample.^c Based on the same numerator and denominator as the response rate, but each company's measure of size at the time of sample selection is taken into account.

Notes(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, these percentages reflect a change in rounding methodology.**Source(s):**

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey.

TABLE A-9

Unit response rates, by industry and company size: 2022

(Number and percent)

Industry and company size	NAICS code	Active reporting units ^a	Reporting units that met the response criteria ^b		Reporting units that met the response criteria and reported domestic R&D paid for by the company and others and performed by the company of \$1 million or more	
			Number	Percent	Number	Percent
All industries	21–23, 31–33, 42–81	42,500	28,500	67	8,000	19
Manufacturing industries	31–33	17,000	12,000	71	4,200	25
Food	311	1,100	750	68	250	23
Beverage and tobacco products	312	350	250	71	40	11
Textile, apparel, and leather products	313–16	500	300	60	60	12
Wood products	321	550	350	64	20	4
Paper	322	350	200	57	40	11
Printing and related support activities	323	750	500	67	20	3
Petroleum and coal products	324	150	90	60	30	20
Chemicals	325	2,200	1,700	77	1,100	50
Basic chemicals	3251	250	200	80	100	40
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	200	150	75	60	30
Pesticide, fertilizer, and other agricultural chemicals	3253	150	90	60	30	20
Pharmaceuticals and medicines	3254	1,100	850	77	750	68
Soap, cleaning compound, and toilet preparations	3256	250	150	60	60	24
Paint, coating, adhesive, and other chemicals	3255, 3259	300	250	83	90	30
Plastics and rubber products	326	950	650	68	200	21
Nonmetallic mineral products	327	500	300	60	40	8
Primary metals	331	450	300	67	60	13
Fabricated metal products	332	2,100	1,500	71	300	14
Machinery	333	1,800	1,300	72	500	28
Agricultural implement	33311	200	150	75	50	25
Semiconductor machinery	333242	50	40	80	30	60
Engine, turbine, and power transmission equipment	3336	150	100	67	40	27
Other machinery	other 333	1,500	1,100	73	400	27
Computer and electronic products	334	1,600	1,100	69	650	41
Communications equipment	3342	200	150	75	100	50
Semiconductor and other electronic components	3344	450	350	78	200	44
Navigational, measuring, electromedical, and control instruments	3345	700	450	64	250	36
Electromedical, electrotherapeutic, and irradiation apparatus	334510, 334517	200	100	50	80	40

TABLE A-9

Unit response rates, by industry and company size: 2022

(Number and percent)

Industry and company size	NAICS code	Active reporting units ^a	Reporting units that met the response criteria ^b		Reporting units that met the response criteria and reported domestic R&D paid for by the company and others and performed by the company of \$1 million or more	
			Number	Percent	Number	Percent
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments	334511	150	90	60	50	33
Other measuring and controlling devices	other 3345	400	250	63	150	38
Other computer and electronic products	other 334	200	150	75	70	35
Electrical equipment, appliances, and components	335	550	400	73	200	36
Transportation equipment	336	1,200	800	67	350	29
Motor vehicles, bodies, trailers, and parts	3361-63	650	450	69	200	31
Aerospace products and parts	3364	300	200	67	100	33
Aircraft, aircraft engine, and aircraft parts	336411-13	250	150	60	80	32
Guided missile, space vehicle, and related parts	336414-15, 336419	50	40	80	20	40
Military armored vehicle, tank, and tank components	336992	<i>N < 15</i>	<i>N < 15</i>	<i>N < 15</i>	<i>N < 15</i>	<i>N < 15</i>
Other transportation	other 336	200	150	75	50	25
Furniture and related products	337	750	500	67	40	5
Miscellaneous	339	1,300	950	73	400	31
Medical equipment and supplies	3391	600	500	83	250	42
Other miscellaneous manufacturing	3399	650	450	69	150	23
Nonmanufacturing industries	21-23, 42-81	25,500	17,000	67	3,800	15
Mining, quarrying, oil and gas extraction, and support activities	21	500	300	60	30	6
Utilities	22	150	100	67	20	13
Wholesale trade	42	4,900	3,200	65	150	3
Electronic shopping and electronic auctions	454111-12	400	200	50	30	8
Transportation and warehousing	48-49	500	300	60	40	8
Information	51	3,400	2,300	68	1,300	38
Publishing	511	1,200	750	63	300	25
Newspaper, periodical, book, and directory publishers	5111	300	200	67	<i>N < 15</i>	<i>N < 15</i>
Software publishers	5112	900	550	61	300	33
Telecommunications	517	400	250	63	60	15
Data processing, hosting, and related services	518	1,300	1,000	77	800	62
Other information	other 51	500	300	60	90	18
Finance and insurance	52	950	700	74	100	11
Real estate and rental and leasing	53	400	200	50	20	5

TABLE A-9

Unit response rates, by industry and company size: 2022

(Number and percent)

Industry and company size	NAICS code	Active reporting units ^a	Reporting units that met the response criteria ^b		Reporting units that met the response criteria and reported domestic R&D paid for by the company and others and performed by the company of \$1 million or more	
			Number	Percent	Number	Percent
Lessors of nonfinancial intangible assets (except copyrighted works)	533	60	30	50	<i>N < 15</i>	<i>0</i>
Other real estate and rental and leasing	other 53	350	200	57	20	6
Professional, scientific, and technical services	54	9,000	6,200	69	1,800	20
Architectural, engineering, and related services	5413	2,600	2,000	77	350	13
Computer systems design and related services	5415	2,700	1,700	63	500	19
Scientific research and development services	5417	2,200	1,400	64	750	34
Research and development in nanotechnology	541713	150	90	60	40	27
Research and development in biotechnology (except nanobiotechnology)	541714	550	300	55	200	36
Research and development in the physical, engineering, and life sciences (except nanotechnology and biotechnology)	541715	1,400	950	68	500	36
Research and development in the social sciences and humanities	541720	150	100	67	<i>N < 15</i>	<i>N < 15</i>
Other professional, scientific, and technical services	other 54	1,500	1,100	73	250	17
Health care services	621–23	1,600	900	56	80	5
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	3,700	2,400	65	250	7
All companies (number of domestic employees)	–	42,500	28,500	67	8,000	19
Small companies						
10–19 ^c	–	7,500	5,000	67	600	8
20–49	–	10,000	6,900	69	1,300	13
Medium companies						
50–99	–	6,800	4,800	71	1,100	16
100–249	–	7,300	4,900	67	1,600	22
Large companies						
250–499	–	3,900	2,600	67	1,100	28
500–999	–	2,900	1,800	62	800	28
1,000–4,999	–	2,900	1,900	66	1,000	34
5,000–9,999	–	500	350	70	200	40
10,000–24,999	–	350	300	86	200	57
25,000 or more	–	200	150	75	100	50

NAICS = 2017 North American Industry Classification System.

^a Active reporting units are defined as reporting units of active companies that are in the scope of the survey (for-profit companies with locations in the United States, 10 or more employees, business activities in the survey year, and primary business activities in the NAICS codes listed above) after all of the data have been processed. Because of special handling requests made by company respondents, some sampled companies were mailed more than one form. A company having multiple reporting parts for data collection may contribute to the statistics for multiple industries, so detail may not add to total for number of companies.

^b Reporting units were considered to have fulfilled the response criteria if they reported that they performed or funded R&D. If not, a reporting unit fulfilled the response criteria if it reported a value for worldwide sales or domestic sales, or if it reported a positive value for paid worldwide employees or paid domestic employees.

^c The Business Enterprise Research and Development Survey does not include companies with fewer than 10 domestic employees.

Note(s):

Beginning in survey year 2019, these counts and percentages reflect a change in rounding methodology. Detail may not add to total because of rounding.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

TABLE A-10

Companies that required an analyst action, by sampling stratum: 2022

(Number)

Stratum	Total	Companies deleted ^a	Companies requiring action due to merger or acquisition ^b	Companies requiring action due to analyst review ^c
Total	2,900	2,800	100	<i>N</i> < 15
Known positive R&D	900	850	40	<i>N</i> < 15
Certainties	650	600	30	<i>N</i> < 15
Noncertainties	250	250	<i>N</i> < 15	0
Known zero R&D	na	na	na	na
Certainties	na	na	na	na
Noncertainties	na	na	na	na
Unknown R&D	2,000	1,900	60	<i>N</i> < 15
Certainties	450	450	20	<i>N</i> < 15
Noncertainties	1,500	1,500	40	<i>N</i> < 15
Cases not in the frame	30	20	<i>N</i> < 15	0

na = not applicable.

^a Companies are deleted when they are found to be out of business or out of scope for the survey during the reporting period.

^b Information regarding mergers and acquisitions comes from several sources. The information is collected on the form, and a presurvey contact requests the information from top R&D-performing companies. Information may also come from the company profiles that are maintained by survey staff.

^c These companies are added based on a review of historic R&D reported to the Business Enterprise Research and Development Survey and public information available on the companies' R&D expenses.

Note(s):

Beginning in survey year 2021, companies in the known zero R&D group were combined with the unknown R&D group. See "[Technical Notes](#)." Beginning in survey year 2019, counts reflect a change in rounding methodology. Detail may not add to total because of rounding. Companies were said to be known to conduct R&D (*known positive R&D*) if they reported positive R&D in any of the previous 5 survey years. Companies were said to have *known zero R&D* if they reported zero R&D in at least 1 of the previous 3 survey years and no positive R&D in any of the previous 5 survey years. Companies were said to have *unknown R&D* if no R&D information was available.

Source(s):

National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2022.

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