



Microbusiness R&D and Innovation: 2016

Detailed Statistical Tables | NSF 19-323 | September 05, 2019

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General Notes

The Microbusiness R&D and Innovation Survey (BRDI-M) is the primary source of information on domestic and global research and development expenditures and the R&D workforce for *microbusinesses*, or firms with less than five employees, operating in the 50 U.S. states and the District of Columbia. The survey is a pilot expansion of the Business R&D and Innovation Survey (BRDIS), which is conducted annually by the U.S. Census Bureau in accordance with an interagency agreement with the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF). Response to this survey is mandatory and confidential under Title 13 of the United States Code.

The results of the survey will be used to assess trends in the performance and funding of R&D as well as innovation in small businesses. 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 may 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. Further, the BRDI-M statistics will make it possible to evaluate more fully the status of R&D in the United States and to compare the R&D and innovation activities of the United States with those of other nations.

In conducting BRDI-M, data are collected from a probability sample of for-profit companies, which are classified in select manufacturing and nonmanufacturing industries. BRDI-M is administered both to companies known to have performed R&D and to companies with no known history of R&D activity.

The target population for BRDI-M consists of all nonfarm, for-profit companies that have between 1 and 9 paid employees in the United States. Survey statistics are published for microbusinesses, those with 1–4 employees. Businesses with 5–9 employees were also sampled to compare microbusiness survey results with estimates from BRDIS, which also surveyed businesses with 5–9 employees.

The U.S. Census Bureau's Business Register contains information on more than 3 million establishments with paid employees. It serves as the primary input to the sample 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 BRDI-M, based on their prior year aggregated annual payroll and employment data.

Terms used in business accounting and incorporated throughout the tables are defined in the section **Technical Notes**.

The BRDI-M **questionnaires**, **reports**, and **data** can be found at <https://www.nsf.gov/statistics/srvymicrobus/>.

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TABLE 1

BRDI-M aggregate estimates for companies with 1–4 employees, by questionnaire reference: 2016

(Thousands of U.S. dollars)

Question	Survey item	Aggregate amount
10	Companies' 2016 sales, revenues, and grants	22,096,504
11a	Companies' 2016 sales, revenues, and grants from selling goods	9,894,987
11b	Companies' 2016 sales, revenues, and grants from selling services	10,105,454
11c	Companies' 2016 sales, revenues, and grants from licensing	1,321,584
11d	Companies' 2016 sales, revenues, and grants from grants	436,240
11e	Companies' 2016 sales, revenues, and grants from other sources	338,238
12	Companies' 2016 sales and revenues from sales in the United States	18,116,565
25	Total 2016 R&D performance	4,843,494
26a	Total 2016 R&D for salaries, wages, and benefits	2,713,154
26b	Total 2016 R&D for equipment	467,592
26c	Total 2016 R&D for software purchases and licenses	227,276
26d	Total 2016 R&D for other costs	1,435,472
27a	Total 2016 R&D paid for by company	3,779,668
27b	Total 2016 R&D paid for by foreign owner	107,587
27c	Total 2016 R&D paid for by another U.S. company	410,451
27d	Total 2016 R&D paid for by U.S. university or college	18,471
27e	Total 2016 R&D paid for by U.S. nonprofit organization	24,711
27f	Total 2016 R&D paid for by U.S. federal government	382,054
27g	Total 2016 R&D paid for by U.S. state or local government	23,797
27h	Total 2016 R&D paid for by other sources	96,755
28a	Total 2016 R&D paid for basic research	409,200
28b	Total 2016 R&D paid for applied research	1,852,038
28c	Total 2016 R&D paid for development	2,582,255

BRDI-M = Microbusiness R&D and Innovation Survey.

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 R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 2

Total R&D performance for companies with 1–4 employees, by industry and type of R&D: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Basic research	Applied research	Development
All industries	21–23, 31–33, 42–81	4,843,494	409,200	1,852,038	2,582,255
Manufacturing industries	31–33	554,091	36,282	222,024	295,786
Food	311	s	0	s	s
Beverage and tobacco products	312	s	0	s	0
Textiles, apparel, and leather products	313–16	s	s	s	s
Wood products	321	s	s	s	s
Paper	322	0	0	0	0
Printing and related support activities	323	s	s	s	s
Petroleum and coal products	324	936	0	0	s
Chemicals	325	118,986	4,682	57,621	56,682
Basic chemicals	3251	s	0	s	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,490	83	584	823
Pesticides, fertilizers, and other agricultural chemicals	3253	26	0	26	0
Pharmaceuticals and medicines	3254	73,993	2,580	22,917	48,496
Soaps, cleaning compounds, and toilet preparations	3256	s	s	s	s
Paints, coatings, adhesives, and other chemicals	3255, 3259	17,592	1,987	8,721	6,885
Plastics and rubber products	326	s	s	s	s
Nonmetallic mineral products	327	s	s	s	s
Primary metals	331	s	s	s	s
Fabricated metal products	332	26,848	1,437	12,498	12,913
Machinery	333	114,951	7,167	49,395	58,389
Agricultural implements	33311	s	s	s	s
Semiconductor machinery	333242	s	0	s	s
Engines, turbines, and power transmission equipment	3336	s	0	s	5,180
Other machinery	other 333	67,821	1,256	23,821	42,744
Computer and electronic products	334	134,686	6,232	50,581	77,872
Communications equipment	3342	8,518	606	2,710	5,202
Semiconductors and other electronic components	3344	32,457	2,065	12,946	17,447
Navigational, measuring, electromedical, and control instruments	3345	64,131	2,407	29,032	32,692
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	20,745	632	7,622	12,491
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	4,733	275	1,103	3,355
Other measuring and controlling devices	other 3345	38,653	1,500	20,306	16,846
Other computer and electronic products	other 334	29,580	1,155	5,893	22,532
Electrical equipment, appliances, and components	335	23,861	827	7,291	15,743
Transportation equipment	336	29,131	3,943	7,923	17,265
Automobiles, bodies, trailers, and parts	3361–63	s	s	s	s
Aerospace products and parts	3364	D	D	D	D
Aircraft, aircraft engines, and aircraft parts	336411–13	3	0	0	3
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D	D	D
Military armored vehicles, tanks, and tank components	336992	63	21	21	21
Other transportation	other 336	D	D	D	D
Furniture and related products	337	s	s	s	s
Miscellaneous	339	76,731	8,351	25,868	42,512
Medical equipment and supplies	3391	s	s	s	s
Other miscellaneous manufacturing	3399	37,156	1,055	s	19,881
Nonmanufacturing industries	21–23, 42–81	4,289,402	372,918	1,630,014	2,286,470

TABLE 2

Total R&D performance for companies with 1–4 employees, by industry and type of R&D: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Basic research	Applied research	Development
Mining, extraction, and support activities	21	s	s	s	s
Utilities	22	s	s	s	s
Wholesale trade	42	295,290	34,258	95,304	165,728
Electronic shopping and electronic auctions	454111–12	39,818	1,825	s	22,496
Transportation and warehousing	48–49	s	s	s	s
Information	51	239,024	24,257	73,155	141,611
Publishing	511	108,978	9,649	29,831	69,498
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0
Software publishers	5112	108,978	9,649	29,831	69,498
Telecommunications	517	s	s	s	s
Data processing, hosting, and related services	518	63,032	5,772	18,893	38,367
Other information	other 51	55,222	s	s	30,258
Finance and insurance	52	s	s	s	s
Real estate and rental and leasing	53	s	s	s	s
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s	0	0	s
Other real estate and rental and leasing	other 53	s	s	s	s
Professional, scientific, and technical services	54	3,577,353	282,465	1,407,771	1,887,117
Architectural, engineering, and related services	5413	381,344	18,364	189,913	173,067
Computer systems design and related services	5415	1,456,420	121,639	493,846	840,934
Scientific research and development services	5417	889,127	67,561	379,770	441,796
Biotechnology research and development	541711	337,866	26,069	151,232	160,565
Physical, engineering, and life sciences (except biotechnology) research and development	541712	529,224	39,067	215,896	274,261
Social sciences and humanities research and development	541720	22,037	2,424	12,642	6,971
Other professional, scientific, and technical services	other 54	850,462	74,900	344,241	431,320
Health care services	621–23	49,510	s	s	24,113
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s	s	35	s

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification is based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 3

Total R&D performance for companies with 1–4 employees, by industry and R&D program size: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	Less than \$100,000	\$100,000 – \$999,999	\$1 million or more
All industries	21–23, 31–33, 42–81	4,843,494	794,450	3,011,465	1,037,579
Manufacturing industries	31–33	554,091	77,634	369,926	106,532
Food	311	s	0	s	0
Beverage and tobacco products	312	s	s	0	0
Textiles, apparel, and leather products	313–16	s	s	0	0
Wood products	321	s	s	0	0
Paper	322	0	0	0	0
Printing and related support activities	323	s	s	0	0
Petroleum and coal products	324	s	s	0	0
Chemicals	325	118,986	4,548	71,948	42,489
Basic chemicals	3251	s	s	s	0
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,490	637	853	0
Pesticides, fertilizers, and other agricultural chemicals	3253	26	26	0	0
Pharmaceuticals and medicines	3254	73,993	1,309	s	37,104
Soaps, cleaning compounds, and toilet preparations	3256	s	s	0	0
Paints, coatings, adhesives, and other chemicals	3255, 3259	17,592	1,687	10,520	5,385
Plastics and rubber products	326	s	s	0	0
Nonmetallic mineral products	327	s	s	s	0
Primary metals	331	s	s	0	0
Fabricated metal products	332	26,848	13,373	s	0
Machinery	333	114,951	11,910	103,041	0
Agricultural implements	33311	s	s	s	0
Semiconductor machinery	333242	s	100	s	0
Engines, turbines, and power transmission equipment	3336	s	s	s	0
Other machinery	other 333	67,821	9,883	57,937	0
Computer and electronic products	334	134,686	14,852	91,492	28,342
Communications equipment	3342	8,518	1,336	5,492	1,690
Semiconductor and other electronic components	3344	32,457	2,806	18,575	11,077
Navigational, measuring, electromedical, and control instruments	3345	64,131	6,552	45,066	12,513
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	20,745	1,200	8,904	10,641
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	4,733	434	2,427	1,872
Other measuring and controlling devices	other 3345	38,653	4,918	33,735	0
Other computer and electronic products	other 334	29,580	4,159	22,359	3,062
Electrical equipment, appliances, and components	335	23,861	D	13,449	D
Transportation equipment	336	29,131	D	s	D
Automobiles, bodies, trailers, and parts	3361–63	s	s	s	0
Aerospace products and parts	3364	D	D	0	D
Aircraft, aircraft engines, and aircraft parts	336411–13	3	3	0	0
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D	0	D
Military armored vehicles, tanks, and tank components	336992	63	63	0	0
Other transportation	other 336	D	D	s	0
Furniture and related products	337	s	s	0	0
Miscellaneous	339	76,731	17,348	31,915	27,468
Medical equipment and supplies	3391	s	5,024	s	s
Other miscellaneous manufacturing	3399	37,156	12,324	s	0
Nonmanufacturing industries	21–23, 42–81	4,289,402	716,816	2,641,539	931,048
Mining, extraction, and support activities	21	s	s	s	0

TABLE 3

Total R&D performance for companies with 1–4 employees, by industry and R&D program size: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	All companies	Less than \$100,000	\$100,000 – \$999,999	\$1 million or more
Utilities	22	s	s	s	0
Wholesale trade	42	295,290	101,234	194,056	0
Electronic shopping and electronic auctions	454111–12	39,818	16,852	s	0
Transportation and warehousing	48–49	s	s	0	0
Information	51	239,024	37,387	182,154	19,482
Publishing	511	108,978	11,844	77,651	19,482
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0
Software publishers	5112	108,978	11,844	77,651	19,482
Telecommunications	517	s	3,488	s	0
Data processing, hosting, and related services	518	63,032	8,472	54,560	0
Other information	other 51	55,222	13,583	41,639	0
Finance and insurance	52	s	s	s	0
Real estate and rental and leasing	53	s	s	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s	s	0	0
Other real estate and rental and leasing	other 53	s	s	0	0
Professional, scientific, and technical services	54	3,577,353	533,821	2,133,256	910,275
Architectural, engineering, and related services	5413	381,344	88,324	291,589	1,431
Computer systems design and related services	5415	1,456,420	200,628	875,737	380,054
Scientific research and development services	5417	889,127	33,596	490,379	365,151
Biotechnology research and development	541711	337,866	9,307	179,375	149,184
Physical, engineering, and life sciences (except biotechnology) research and development	541712	529,224	21,473	293,046	214,704
Social sciences and humanities research and development	541720	22,037	2,817	17,958	1,263
Other professional, scientific, and technical services	other 54	850,462	211,273	475,550	163,639
Health care services	621–23	49,510	s	48,139	1,290
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s	s	s	0

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D. R&D program size classifications are based on R&D expense.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 4

Total R&D performance for companies with 1–4 employees, by industry and age of company: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Five years or fewer	More than five years through ten years	More than ten years
All industries	21–23, 31–33, 42–81	4,843,494	1,874,421	1,112,334	1,856,739
Manufacturing industries	31–33	554,091	264,681	67,045	222,365
Food	311	s	s	0	0
Beverages and tobacco products	312	s	s	0	0
Textiles, apparel, and leather products	313–16	s	0	0	s
Wood products	321	s	0	0	s
Paper	322	0	0	0	0
Printing and related support activities	323	s	s	s	s
Petroleum and coal products	324	s	0	0	s
Chemicals	325	118,986	63,566	7,786	47,634
Basic chemicals	3251	s	s	0	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,490	26	202	1,261
Pesticides, fertilizers, and other agricultural chemicals	3253	26	0	0	26
Pharmaceuticals and medicines	3254	73,993	34,226	4,858	34,909
Soaps, cleaning compounds, and toilet preparations	3256	s	s	0	s
Paints, coatings, adhesives, and other chemicals	3255, 3259	17,592	3,820	2,725	11,047
Plastics and rubber products	326	s	s	s	s
Nonmetallic mineral products	327	s	s	s	s
Primary metals	331	s	0	0	s
Fabricated metal products	332	26,848	s	s	16,819
Machinery	333	114,951	s	s	51,223
Agricultural implements	33311	s	s	0	0
Semiconductor machinery	333242	s	s	0	414
Engines, turbines, and power transmission equipment	3336	s	s	s	0
Other machinery	other 333	67,821	s	s	50,809
Computer and electronic products	334	134,686	61,862	26,254	46,570
Communications equipment	3342	8,518	3,297	2,222	2,999
Semiconductors and other electronic components	3344	32,457	18,113	7,060	7,285
Navigational, measuring, electromedical, and control instruments	3345	64,131	20,107	13,139	30,885
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	20,745	10,264	7,568	2,913
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	4,733	2,545	839	1,349
Other measuring and controlling devices	other 3345	38,653	7,298	4,732	26,623
Other computer and electronic products	other 334	29,580	20,345	3,833	5,402
Electrical equipment, appliances, and components	335	23,861	12,782	5,138	5,941
Transportation equipment	336	29,131	2,021	1,666	25,444
Automobiles, bodies, trailers, and parts	3361–63	s	s	s	s
Aerospace products and parts	3364	D	D	0	3
Aircraft, aircraft engines, and aircraft parts	336411–13	3	0	0	3
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D	0	0
Military armored vehicles, tanks, and tank components	336992	63	63	0	0
Other transportation	other 336	D	D	315	2,891

TABLE 4

Total R&D performance for companies with 1–4 employees, by industry and age of company: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Five years or fewer	More than five years through ten years	More than ten years
Furniture and related products	337	s	0	s	s
Miscellaneous	339	76,731	s	s	16,690
Medical equipment and supplies	3391	s	s	s	6,435
Other miscellaneous manufacturing	3399	37,156	19,543	7,358	10,255
Nonmanufacturing industries	21–23, 42–81	4,289,402	1,609,740	1,045,289	1,634,374
Mining, extraction, and support activities	21	s	s	s	s
Utilities	22	s	211	s	s
Wholesale trade	42	295,290	76,193	58,859	160,238
Electronic shopping and electronic auctions	454111–12	39,818	s	s	10,352
Transportation and warehousing	48–49	3,668	3,006	661	0
Information	51	239,024	111,578	25,908	101,537
Publishing	511	108,978	39,012	14,768	55,198
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0
Software publishers	5112	108,978	39,012	14,768	55,198
Telecommunications	517	s	s	s	s
Data processing, hosting, and related services	518	63,032	41,327	1,521	20,184
Other information	other 51	55,222	29,578	8,623	s
Finance and insurance	52	s	s	0	s
Real estate and rental and leasing	53	s	0	s	s
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s	0	0	s
Other real estate and rental and leasing	other 53	s	0	s	0
Professional, scientific, and technical services	54	3,577,353	1,333,135	917,558	1,326,660
Architectural, engineering, and related services	5413	381,344	92,471	94,532	194,341
Computer systems design and related services	5415	1,456,420	540,964	355,261	560,194
Scientific research and development services	5417	889,127	340,853	255,618	292,656
Biotechnology research and development	541711	337,866	123,544	106,233	108,090
Physical, engineering, and life sciences (except biotechnology) research and development	541712	529,224	209,980	145,572	173,672
Social sciences and humanities research and development	541720	22,037	7,329	3,813	10,895
Other professional, scientific, and technical services	other 54	850,462	358,847	212,147	279,468
Health care services	621–23	49,510	s	s	s
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s	s	s	s

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 5

Total R&D performance for companies with 1–4 employees, by industry and source of funds: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	Other sources
All industries	21–23, 31–33, 42–81	4,843,494	3,779,668	107,587	410,451	18,471	24,711	382,054	23,797	96,755
Manufacturing industries	31–33	554,091	417,964	49,121	31,067	s	871	47,748	1,581	2,687
Food	311	s	s	0	0	0	0	0	0	0
Beverages and tobacco products	312	s	s	0	0	0	0	0	0	0
Textiles, apparel, and leather products	313–16	s	s	0	0	0	0	0	0	0
Wood products	321	s	s	0	0	0	s	0	0	0
Paper	322	0	0	0	0	0	0	0	0	0
Printing and related support activities	323	s	s	0	0	0	0	0	0	0
Petroleum and coal products	324	s	s	0	0	0	0	0	0	0
Chemicals	325	118,986	70,375	16,257	3,953	43	468	s	73	1,865
Basic chemicals	3251	s	s	0	s	0	0	s	0	0
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,490	1,210	0	82	0	0	197	0	0
Pesticides, fertilizers, and other agricultural chemicals	3253	26	26	0	0	0	0	0	0	0
Pharmaceuticals and medicines	3254	73,993	55,713	13,984	1,186	43	455	1,755	27	831
Soaps, cleaning compounds, and toilet preparations	3256	s	s	0	0	0	0	0	0	0
Paints, coatings, adhesives, and other chemicals	3255, 3259	17,592	12,536	2,273	1,434	0	13	256	46	1,034
Plastics and rubber products	326	s	s	0	0	0	0	0	0	0
Nonmetallic mineral products	327	s	s	0	0	s	0	0	s	0
Primary metals	331	s	s	0	0	0	0	0	0	0
Fabricated metal products	332	26,848	21,702	0	s	0	0	0	0	0
Machinery	333	114,951	71,605	16,748	16,253	2,515	0	7,832	0	0
Agricultural implements	33311	20,012	3,264	16,748	0	0	0	0	0	0
Semiconductor machinery	333242	20,321	20,321	0	0	0	0	0	0	0
Engines, turbines, and power transmission equipment	3336	6,797	6,797	0	0	0	0	0	0	0
Other machinery	other 333	67,821	41,222	0	16,253	2,515	0	7,832	0	0
Computer and electronic products	334	134,686	112,413	3,831	4,549	204	0	12,521	561	608
Communications equipment	3342	8,518	7,829	1	53	0	0	624	10	1

TABLE 5

Total R&D performance for companies with 1–4 employees, by industry and source of funds: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	Other sources
Semiconductors and other electronic components	3344	32,457	21,649	2,681	1,422	80	0	5,598	423	605
Navigational, measuring, electromedical, and control instruments	3345	64,131	55,187	295	2,782	124	0	5,615	127	0
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	20,745	16,363	47	1,715	0	0	2,567	52	0
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	4,733	4,312	0	421	0	0	0	0	0
Other measuring and controlling devices	other 3345	38,653	34,512	248	646	124	0	3,048	75	0
Other computer and electronic products	other 334	29,580	27,748	853	292	0	0	684	0	2
Electrical equipment, appliances, and components	335	23,861	21,002	83	1,035	0	0	1,442	84	215
Transportation equipment	336	29,131	16,928	12,203	0	0	0	0	0	0
Automobiles, bodies, trailers, and parts	3361–63	24,576	D	D	0	0	0	0	0	0
Aerospace products and parts	3364	D	D	D	0	0	0	0	0	0
Aircraft, aircraft engine, and aircraft parts	336411–13	3	3	0	0	0	0	0	0	0
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D	D	0	0	0	0	0	0
Military armored vehicles, tanks, and tank components	336992	63	63	0	0	0	0	0	0	0
Other transportation	other 336	D	D	0	0	0	0	0	0	0
Furniture and related products	337	412	412	0	0	0	0	0	0	0
Miscellaneous	339	76,731	76,572	0	131	27	0	0	0	0
Medical equipment and supplies	3391	39,575	39,443	0	131	0	0	0	0	0
Other miscellaneous manufacturing	3399	37,156	37,129	0	0	27	0	0	0	0
Nonmanufacturing industries	21–23, 42–81	4,289,402	3,361,704	58,466	379,383	15,419	23,840	334,307	22,216	94,068
Mining, extraction, and support activities	21	21,509	21,509	0	0	0	0	0	0	0

TABLE 5

Total R&D performance for companies with 1–4 employees, by industry and source of funds: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	Other sources
Utilities	22	2,671	2,671	0	0	0	0	0	0	0
Wholesale trade	42	295,290	252,644	6,579	28,767	43	43	2,551	386	4,277
Electronic shopping and electronic auctions	454111–12	39,818	39,070	0	749	0	0	0	0	0
Transportation and warehousing	48–49	3,668	3,668	0	0	0	0	0	0	0
Information	51	239,024	220,840	2,496	6,785	39	54	5,558	135	3,117
Publishing	511	108,978	98,016	2,496	2,952	39	54	2,169	135	3,117
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0	0	0	0	0	0
Software publishers	5112	108,978	98,016	2,496	2,952	39	54	2,169	135	3,117
Telecommunications	517	11,792	11,792	0	0	0	0	0	0	0
Data processing, hosting, and related services	518	63,032	56,373	0	3,270	0	0	3,389	0	0
Other information	other 51	55,222	54,658	0	564	0	0	0	0	0
Finance and insurance	52	30,252	30,252	0	0	0	0	0	0	0
Real estate and rental and leasing	53	1,763	1,763	0	0	0	0	0	0	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	311	311	0	0	0	0	0	0	0
Other real estate and rental and leasing	other 53	1,452	1,452	0	0	0	0	0	0	0
Professional, scientific, and technical services	54	3,577,353	2,726,802	49,391	337,681	15,310	23,744	319,436	18,314	86,673
Architectural, engineering, and related services	5413	381,344	271,796	50	52,118	1,118	4,322	38,995	497	12,448
Computer systems design and related services	5415	1,456,420	1,202,993	24,629	131,207	7,869	5,431	57,102	5,612	21,578
Scientific research and development services	5417	889,127	576,986	14,848	48,832	3,482	5,140	188,601	8,527	42,711
Biotechnology research and development	541711	337,866	224,308	5,600	10,915	613	885	83,620	4,810	7,114
Physical, engineering, and life sciences (except biotechnology) research and development	541712	529,224	342,195	9,206	35,710	2,265	3,406	98,634	2,623	35,185
Social sciences and humanities research and development	541720	22,037	10,483	41	2,207	604	850	6,347	1,094	412
Other professional, scientific, and technical services	other 54	850,462	675,027	9,865	105,524	2,842	8,850	34,738	3,679	9,936
Health care services	621–23	49,510	44,082	0	5,401	27	0	0	0	0

TABLE 5

Total R&D performance for companies with 1–4 employees, by industry and source of funds: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Paid for by the company	Foreign owner	Another U.S. company	U.S. university or college	U.S. nonprofit organization	U.S. federal government	U.S. state or local government	Other sources
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	28,545	18,404	0	0	0	0	6,761	3,381	0

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 6

Total R&D performance for companies with 1–4 employees, by industry and type of cost: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Equipment	Software purchases and licenses	Other
All industries	21–23, 31–33, 42–81	4,843,494	2,713,154	467,592	227,276	1,435,472
Manufacturing industries	31–33	554,091	267,299	81,796	23,489	181,507
Food	311	s	s	s	s	s
Beverages and tobacco products	312	s	0	0	s	s
Textiles, apparel, and leather products	313–16	s	s	s	0	0
Wood products	321	s	s	s	0	s
Paper	322	0	0	0	0	0
Printing and related support activities	323	s	s	s	s	s
Petroleum and coal products	324	s	s	0	0	0
Chemicals	325	118,986	50,219	11,449	2,378	54,940
Basic chemicals	3251	s	s	s	s	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	1,490	960	181	18	332
Pesticides, fertilizers, and other agricultural chemicals	3253	26	25	1	0	0
Pharmaceuticals and medicines	3254	73,993	20,902	3,777	1,364	47,950
Soaps, cleaning compounds, and toilet preparations	3256	s	s	s	0	s
Paints, coatings, adhesives, and other chemicals	3255, 3259	17,592	10,495	2,345	496	4,256
Plastics and rubber products	326	s	s	s	0	s
Nonmetallic mineral products	327	s	s	s	0	s
Primary metals	331	s	s	s	0	s
Fabricated metal products	332	26,848	15,349	s	s	s
Machinery	333	114,951	63,660	14,459	s	30,022
Agricultural implements	33311	s	s	s	s	s
Semiconductor machinery	333242	s	s	s	s	s
Engines, turbines, and power transmission equipment	3336	s	s	s	s	s
Other machinery	other 333	67,821	36,599	4,398	s	s
Computer and electronic products	334	134,686	68,224	19,200	6,465	40,796
Communications equipment	3342	8,518	4,628	1,282	347	2,262
Semiconductors and other electronic components	3344	32,457	17,021	5,698	2,371	7,367
Navigational, measuring, electromedical, and control instruments	3345	64,131	28,679	9,884	2,490	23,078
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	20,745	7,936	2,120	327	10,363
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	4,733	2,526	879	296	1,032
Other measuring and controlling devices	other 3345	38,653	18,218	6,885	1,867	11,683
Other computer and electronic products	other 334	29,580	17,896	2,337	1,257	8,090
Electrical equipment, appliances, and components	335	23,861	12,102	4,508	881	6,370
Transportation equipment	336	29,131	s	6,923	D	D
Automobiles, bodies, trailers, and parts	3361–63	s	s	s	0	s
Aerospace products and parts	3364	D	D	D	D	D
Aircraft, aircraft engines, and aircraft parts	336411–13	3	3	0	0	0

TABLE 6

Total R&D performance for companies with 1–4 employees, by industry and type of cost: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Total	Salaries, wages, and fringe benefits	Equipment	Software purchases and licenses	Other
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D	D	D	D
Military armored vehicles, tanks, and tank components	336992	63	50	3	3	6
Other transportation	other 336	D	D	D	0	D
Furniture and related products	337	s	s	s	s	s
Miscellaneous	339	76,731	24,740	16,928	D	D
Medical equipment and supplies	3391	s	s	s	s	s
Other miscellaneous manufacturing	3399	37,156	12,816	7,265	D	D
Nonmanufacturing industries	21–23, 42–81	4,289,402	2,445,855	385,796	203,787	1,253,964
Mining, extraction, and support activities	21	s	s	s	s	s
Utilities	22	s	s	s	s	s
Wholesale trade	42	295,290	141,129	52,086	10,203	91,873
Electronic shopping and electronic auctions	454111–12	39,818	14,182	s	1,791	19,749
Transportation and warehousing	48–49	s	s	s	s	s
Information	51	239,024	166,281	11,544	11,110	50,089
Publishing	511	108,978	78,954	4,803	5,342	19,879
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0	0
Software publishers	5112	108,978	78,954	4,803	5,342	19,879
Telecommunications	517	s	s	s	s	s
Data processing, hosting, and related services	518	63,032	38,629	2,825	2,553	19,025
Other information	other 51	55,222	42,685	2,006	2,800	7,730
Finance and insurance	52	s	s	s	s	s
Real estate and rental and leasing	53	s	s	s	s	s
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s	s	s	s	s
Other real estate and rental and leasing	other 53	s	s	0	0	s
Professional, scientific, and technical services	54	3,577,353	2,060,127	294,449	178,130	1,044,647
Architectural, engineering, and related services	5413	381,344	227,603	45,313	21,414	87,014
Computer systems design and related services	5415	1,456,420	901,215	99,020	92,751	363,434
Scientific research and development services	5417	889,127	377,600	90,677	15,865	404,986
Biotechnology research and development	541711	337,866	120,159	26,759	5,506	185,442
Physical, engineering, and life sciences (except biotechnology) research and development	541712	529,224	244,199	62,841	9,632	212,552
Social sciences and humanities research and development	541720	22,037	13,241	1,077	727	6,992
Other professional, scientific, and technical services	other 54	850,462	553,709	59,439	48,100	189,214
Health care services	621–23	49,510	23,240	s	s	14,516
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s	s	s	2	s

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 7

Total sales and R&D as a percent of total sales for companies with 1–4 employees, by industry: 2016

(Thousands of U.S. dollars and percent)

Industry	NAICS code	Total sales (US\$thousands)	R&D as percent of total sales
All industries	21–23, 31–33, 42–81	22,096,504	21.9
Manufacturing industries	31–33	2,468,171	22.5
Food	311	s	s
Beverages and tobacco products	312	s	4.0
Textiles, apparel, and leather products	313–16	s	9.1
Wood products	321	s	5.9
Paper	322	0	0.0
Printing and related support activities	323	30,974	4.5
Petroleum and coal products	324	s	8.6
Chemicals	325	349,647	34.0
Basic chemicals	3251	s	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	14,338	10.4
Pesticides, fertilizers, and other agricultural chemicals	3253	4,742	0.6
Pharmaceuticals and medicines	3254	68,345	108.3
Soaps, cleaning compounds, and toilet preparations	3256	s	0.8
Paints, coatings, adhesives, and other chemicals	3255, 3259	135,369	13.0
Plastics and rubber products	326	s	0.8
Nonmetallic mineral products	327	s	19.0
Primary metals	331	s	6.7
Fabricated metal products	332	264,724	10.1
Machinery	333	448,068	25.7
Agricultural implements	33311	s	12.0
Semiconductor machinery	333242	1,654	1228.7
Engines, turbines, and power transmission equipment	3336	30,207	22.5
Other machinery	other 333	249,657	27.2
Computer and electronic products	334	420,432	32.0
Communications equipment	3342	37,168	22.9
Semiconductors and other electronic components	3344	116,932	27.8
Navigational, measuring, electromedical, and control instruments	3345	167,962	38.2
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	26,815	77.4
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	10,035	47.2
Other measuring and controlling devices	other 3345	131,112	29.5
Other computer and electronic products	other 334	98,369	30.1
Electrical equipment, appliances, and components	335	143,824	16.6
Transportation equipment	336	157,382	18.5
Automobiles, bodies, trailers, and parts	3361–63	121,447	20.2
Aerospace products and parts	3364	5,266	D
Aircraft, aircraft engines, and aircraft parts	336411–13	D	D
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D
Military armored vehicles, tanks, and tank components	336992	625	10.0
Other transportation	other 336	s	D
Furniture and related products	337	s	0.7
Miscellaneous	339	356,080	21.6
Medical equipment and supplies	3391	117,395	33.7
Other miscellaneous manufacturing	3399	238,684	15.6
Nonmanufacturing industries	21–23, 42–81	19,628,333	21.9

TABLE 7

Total sales and R&D as a percent of total sales for companies with 1–4 employees, by industry: 2016

(Thousands of U.S. dollars and percent)

Industry	NAICS code	Total sales (US\$thousands)	R&D as percent of total sales
Mining, extraction, and support activities	21	s	135.0
Utilities	22	s	35.7
Wholesale trade	42	6,310,216	4.7
Electronic shopping and electronic auctions	454111–12	578,599	6.9
Transportation and warehousing	48–49	s	4.0
Information	51	771,470	31.0
Publishing	511	325,871	33.4
Newspaper, periodical, book, and directory publishers	5111	0	0.0
Software publishers	5112	325,871	33.4
Telecommunications	517	s	22.2
Data processing, hosting, and related services	518	187,190	33.7
Other information	other 51	205,293	26.9
Finance and insurance	52	76,867	39.4
Real estate and rental and leasing	53	s	40.7
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s	30.0
Other real estate and rental and leasing	other 53	s	44.1
Professional, scientific, and technical services	54	11,653,639	30.7
Architectural, engineering, and related services	5413	1,795,681	21.2
Computer systems design and related services	5415	4,459,161	32.7
Scientific research and development services	5417	897,979	99.0
Biotechnology research and development	541711	246,106	137.3
Physical, engineering, and life sciences (except biotechnology) research and development	541712	606,762	87.2
Social sciences and humanities research and development	541720	45,112	48.9
Other professional, scientific, and technical services	other 54	4,500,817	18.9
Health care services	621–23	46,543	106.4
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55– 56, 624, 71–72, 81	71,557	39.9

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 8

Total R&D performance for companies with 1–4 employees, by state and type of R&D: 2016

(Thousands of U.S. dollars)

State	Total	Basic research	Applied research	Development
All states	4,843,494	409,200	1,852,038	2,582,255
Alabama	14,155	1,421	6,355	6,379
Alaska	1,154	176	206	772
Arizona	70,950	4,715	30,144	36,091
Arkansas	14,411	s	6,056	7,268
California	1,194,408	89,716	432,278	672,414
Colorado	114,389	9,986	43,843	60,560
Connecticut	71,880	6,712	15,432	49,737
Delaware	7,971	494	2,437	5,040
District of Columbia	11,965	132	4,544	7,289
Florida	237,130	30,809	94,911	111,409
Georgia	93,933	10,557	38,539	44,837
Hawaii	s	s	s	s
Idaho	s	s	s	s
Illinois	162,022	12,879	61,370	87,773
Indiana	50,643	3,605	11,484	35,554
Iowa	30,624	s	9,180	19,105
Kansas	12,771	1,466	5,785	5,520
Kentucky	19,640	3,821	7,364	8,455
Louisiana	11,229	606	3,282	7,341
Maine	21,035	s	s	s
Maryland	150,978	11,726	73,172	66,081
Massachusetts	267,037	21,948	87,809	157,280
Michigan	67,411	7,340	23,754	36,317
Minnesota	121,090	s	51,997	51,242
Mississippi	3,395	s	628	2,377
Missouri	23,465	1,973	9,638	11,854
Montana	9,629	448	5,946	3,235
Nebraska	19,053	1,298	s	9,023
Nevada	48,748	5,853	15,750	27,144
New Hampshire	21,715	1,869	7,887	11,959
New Jersey	150,029	9,441	46,503	94,085
New Mexico	20,260	665	8,075	11,519
New York	390,061	19,808	205,001	165,253
North Carolina	165,762	6,885	69,363	89,514
North Dakota	s	s	s	s
Ohio	89,044	11,999	32,641	44,403
Oklahoma	45,354	s	16,404	23,510
Oregon	43,417	4,587	11,563	27,267
Pennsylvania	194,601	13,311	90,671	90,619
Rhode Island	15,570	890	3,232	11,448
South Carolina	38,267	4,851	18,278	15,137
South Dakota	5,823	695	1,181	3,948
Tennessee	32,301	1,832	10,519	19,949
Texas	302,041	29,005	99,548	173,487
Utah	43,950	4,076	17,091	22,782
Vermont	11,893	228	2,778	s
Virginia	149,361	8,994	59,328	81,039
Washington	131,326	18,450	44,627	68,249
West Virginia	1,396	191	604	600
Wisconsin	41,767	4,359	14,761	22,646

TABLE 8

Total R&D performance for companies with 1–4 employees, by state and type of R&D: 2016

(Thousands of U.S. dollars)

State	Total	Basic research	Applied research	Development
Wyoming	s	s	s	s
Undistributed	101	10	51	40

s = suppressed for reliability; standard error exceeds publication standards.

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 R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 9

Total R&D performance for companies with 1–4 employees, by state and source of funds: 2016

(Thousands of U.S. dollars)

State	Total	Paid for by the company	Paid for by others
All states	4,843,494	3,779,668	1,063,826
Alabama	14,155	8,493	5,663
Alaska	1,154	660	493
Arizona	70,950	62,932	8,018
Arkansas	14,411	7,608	6,803
California	1,194,408	1,003,117	191,292
Colorado	114,389	90,049	24,340
Connecticut	71,880	61,654	10,226
Delaware	7,971	4,675	3,296
District of Columbia	11,965	8,079	3,886
Florida	237,130	198,444	38,686
Georgia	93,933	77,066	16,867
Hawaii	s	s	s
Idaho	s	s	2,064
Illinois	162,022	120,131	41,891
Indiana	50,643	27,120	23,523
Iowa	30,624	20,584	10,040
Kansas	12,771	8,795	3,976
Kentucky	19,640	14,542	5,098
Louisiana	11,229	9,780	1,449
Maine	21,035	s	s
Maryland	150,978	110,817	40,161
Massachusetts	267,037	182,514	84,523
Michigan	67,411	46,677	20,734
Minnesota	121,090	89,470	31,620
Mississippi	3,395	2,623	772
Missouri	23,465	20,140	3,324
Montana	9,629	5,252	4,377
Nebraska	19,053	16,308	2,745
Nevada	48,748	27,515	21,233
New Hampshire	21,715	15,535	6,181
New Jersey	150,029	125,280	24,749
New Mexico	20,260	13,202	7,058
New York	390,061	346,939	43,122
North Carolina	165,762	105,633	60,128
North Dakota	s	s	s
Ohio	89,044	66,674	22,370
Oklahoma	45,354	43,316	2,038
Oregon	43,417	35,574	7,843
Pennsylvania	194,601	123,437	71,164
Rhode Island	15,570	12,545	3,025
South Carolina	38,267	33,657	4,609
South Dakota	5,823	5,542	281
Tennessee	32,301	26,738	5,563
Texas	302,041	235,493	66,547
Utah	43,950	32,448	11,501
Vermont	11,893	s	2,407
Virginia	149,361	95,826	53,536
Washington	131,326	107,777	23,549
West Virginia	1,396	1,270	126
Wisconsin	41,767	34,045	7,722

TABLE 9

Total R&D performance for companies with 1–4 employees, by state and source of funds: 2016

(Thousands of U.S. dollars)

State	Total	Paid for by the company	Paid for by others
Wyoming	s	s	703
Undistributed	101	101	0

s = suppressed for reliability; standard error exceeds publication standards.

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 R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 10

Total R&D performance for companies with 1–4 employees, by state and age of company: 2016

(Thousands of U.S. dollars)

State	Total	Five years or fewer	More than five years through ten years	More than ten years
All states	4,843,494	1,874,421	1,112,334	1,856,739
Alabama	14,155	5,029	3,261	5,866
Alaska	1,154	652	245	256
Arizona	70,950	12,000	13,094	45,856
Arkansas	14,411	s	2,191	7,525
California	1,194,408	575,237	229,059	390,113
Colorado	114,389	32,322	38,353	43,714
Connecticut	71,880	33,105	20,790	17,985
Delaware	7,971	2,222	2,429	3,320
District of Columbia	11,965	4,939	4,343	2,684
Florida	237,130	72,227	66,680	98,223
Georgia	93,933	30,267	24,500	39,166
Hawaii	s	s	s	668
Idaho	s	s	s	5,474
Illinois	162,022	46,926	36,330	78,767
Indiana	50,643	12,525	10,014	28,104
Iowa	30,624	8,018	s	17,779
Kansas	12,771	3,512	2,734	6,525
Kentucky	19,640	7,970	5,688	5,981
Louisiana	11,229	3,676	1,657	5,897
Maine	21,035	s	1,138	s
Maryland	150,978	41,913	40,101	68,964
Massachusetts	267,037	137,178	66,294	63,565
Michigan	67,411	20,582	19,501	27,328
Minnesota	121,090	44,052	35,870	41,167
Mississippi	3,395	1,325	618	1,452
Missouri	23,465	10,266	5,744	7,455
Montana	9,629	1,355	1,821	6,453
Nebraska	19,053	s	1,784	s
Nevada	48,748	11,005	11,869	25,874
New Hampshire	21,715	4,850	1,890	14,975
New Jersey	150,029	57,595	42,211	50,223
New Mexico	20,260	2,543	s	9,612
New York	390,061	s	52,295	s
North Carolina	165,762	28,146	40,009	97,606
North Dakota	s	s	s	669
Ohio	89,044	23,931	23,058	42,055
Oklahoma	45,354	s	s	7,874
Oregon	43,417	13,767	10,121	19,529
Pennsylvania	194,601	76,659	41,474	76,468
Rhode Island	15,570	1,917	1,462	12,192
South Carolina	38,267	7,276	5,386	25,605
South Dakota	5,823	1,018	319	4,486
Tennessee	32,301	14,311	5,993	11,997
Texas	302,041	96,796	90,424	114,821
Utah	43,950	22,823	11,027	10,100
Vermont	11,893	s	s	2,994
Virginia	149,361	50,597	49,660	49,105
Washington	131,326	57,053	35,807	38,467
West Virginia	1,396	621	79	696
Wisconsin	41,767	19,594	10,551	11,622

TABLE 10

Total R&D performance for companies with 1–4 employees, by state and age of company: 2016

(Thousands of U.S. dollars)

State	Total	Five years or fewer	More than five years through ten years	More than ten years
Wyoming	s	s	256	s
Undistributed	101	0	0	101

s = suppressed for reliability; standard error exceeds publication standards.

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 R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 11

Total number of workers for R&D-performing companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	Owners (who receive a W-2)	Owners (who do not receive a W-2)	Employees (who are not considered owners)	Contractors	Unpaid workers
All industries	21–23, 31–33, 42–81	46,400	26,916	47,786	74,930	10,120
Manufacturing industries	31–33	4,415	4,582	8,044	6,810	1,309
Food	311	0	s	s	s	0
Beverages and tobacco products	312	0	s	s	s	0
Textiles, apparel, and leather products	313–16	s	s	s	0	s
Wood products	321	s	s	s	s	s
Paper	322	0	0	0	0	0
Printing and related support activities	323	s	s	s	s	s
Petroleum and coal products	324	s	0	s	s	0
Chemicals	325	449	756	853	831	121
Basic chemicals	3251	s	s	s	s	0
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	22	21	46	12	3
Pesticides, fertilizers, and other agricultural chemicals	3253	D	0	D	4	D
Pharmaceuticals and medicines	3254	116	369	233	398	47
Soaps, cleaning compounds, and toilet preparations	3256	s	s	266	s	s
Paints, coatings, adhesives, and other chemicals	3255, 3259	D	205	D	230	D
Plastics and rubber products	326	s	s	s	s	s
Nonmetallic mineral products	327	s	s	s	s	0
Primary metals	331	0	0	s	s	s
Fabricated metal products	332	661	270	969	459	0
Machinery	333	782	648	1,299	991	126
Agricultural implements	33311	0	s	s	s	0
Semiconductor machinery	333242	s	5	s	s	i 0
Engines, turbines, and power transmission equipment	3336	0	s	s	s	s
Other machinery	other 333	711	s	818	450	105
Computer and electronic products	334	918	632	1,227	1,530	187
Communications equipment	3342	90	48	109	63	13
Semiconductors and other electronic components	3344	248	107	218	283	38
Navigational, measuring, electromedical, and control instruments	3345	393	329	583	733	71
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	62	80	110	200	10
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	26	39	39	40	D
Other measuring and controlling devices	other 3345	306	210	434	494	D
Other computer and electronic products	other 334	187	148	317	452	65
Electrical equipment, appliances, and components	335	222	186	290	250	57
Transportation equipment	336	274	188	460	s	s
Automobiles, bodies, trailers, and parts	3361–63	243	s	s	s	0
Aerospace products and parts	3364	D	D	D	D	0

TABLE 11

Total number of workers for R&D-performing companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	Owners (who receive a W-2)	Owners (who do not receive a W-2)	Employees (who are not considered owners)	Contractors	Unpaid workers
Aircraft, aircraft engines, and aircraft parts	336411–13	D	0	D	D	0
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D	D	D	0
Military armored vehicles, tanks, and tank components	336992	3	0	D	13	0
Other transportation	other 336	D	D	D	D	26
Furniture and related products	337	s	s	s	s	0
Miscellaneous	339	681	1,113	1,680	919	342
Medical equipment and supplies	3391	332	332	712	s	s
Other miscellaneous manufacturing	3399	349	780	968	511	215
Nonmanufacturing industries	21–23, 42–81	41,985	22,334	39,743	68,120	8,811
Mining, extraction, and support activities	21	s	s	s	s	0
Utilities	22	s	s	s	0	D
Wholesale trade	42	5,591	3,682	7,523	8,609	1,347
Electronic shopping and electronic auctions	454111–12	720	270	1,170	1,408	s
Transportation and warehousing	48–49	s	s	s	s	0
Information	51	2,034	2,083	2,266	5,605	654
Publishing	511	683	663	822	1,294	154
Newspaper, periodical, book, and directory publishers	5111	0	0	0	0	0
Software publishers	5112	683	663	822	1,294	154
Telecommunications	517	s	s	s	s	s
Data processing, hosting, and related services	518	597	s	392	892	s
Other information	other 51	621	620	820	3,219	225
Finance and insurance	52	s	s	184	s	D
Real estate and rental and leasing	53	s	0	s	s	0
Lessors of nonfinancial intangible assets (except copyrighted works)	533	0	0	s	0	0
Other real estate and rental and leasing	other 53	s	0	0	s	0
Professional, scientific, and technical services	54	32,941	15,585	27,227	50,514	6,424
Architectural, engineering, and related services	5413	4,999	965	4,638	5,935	945
Computer systems design and related services	5415	12,794	4,847	10,561	17,869	2,402
Scientific research and development services	5417	2,433	3,726	3,182	5,199	618
Biotechnology research and development	541711	726	1,728	1,004	1,789	212
Physical, engineering, and life sciences (except biotechnology) research and development	541712	1,543	1,934	1,997	3,094	364
Social sciences and humanities research and development	541720	164	64	182	317	42
Other professional, scientific, and technical services	other 54	12,715	6,047	8,845	21,510	2,460
Health care services	621–23	169	195	386	s	s

TABLE 11

Total number of workers for R&D-performing companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	Owners (who receive a W-2)	Owners (who do not receive a W-2)	Employees (who are not considered owners)	Contractors		Unpaid workers
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s	s	s	s		0

D = data withheld to avoid disclosing operations of individual companies; i = > 50% of the estimate is a combination of imputation and reweighting to account for nonresponse; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 12

Total number of R&D workers for companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	R&D workers
All industries	21–23, 31–33, 42–81	105,906
Manufacturing industries	31–33	11,809
Food	311	s
Beverages and tobacco products	312	s
Textiles, apparel, and leather products	313–16	s
Wood products	321	s
Paper	322	0
Printing and related support activities	323	s
Petroleum and coal products	324	s
Chemicals	325	1,238
Basic chemicals	3251	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	47
Pesticides, fertilizers, and other agricultural chemicals	3253	D
Pharmaceuticals and medicines	3254	416
Soaps, cleaning compounds, and toilet preparations	3256	332
Paints, coatings, adhesives, and other chemicals	3255, 3259	D
Plastics and rubber products	326	237
Nonmetallic mineral products	327	s
Primary metals	331	s
Fabricated metal products	332	1,257
Machinery	333	2,064
Agricultural implements	33311	s
Semiconductor machinery	333242	s
Engines, turbines, and power transmission equipment	3336	s
Other machinery	other 333	1,585
Computer and electronic products	334	2,480
Communications equipment	3342	190
Semiconductors and other electronic components	3344	489
Navigational, measuring, electromedical, and control instruments	3345	1,163
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	279
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	89
Other measuring and controlling devices	other 3345	795
Other computer and electronic products	other 334	637
Electrical equipment, appliances, and components	335	477
Transportation equipment	336	663
Automobiles, bodies, trailers, and parts	3361–63	432
Aerospace products and parts	3364	15
Aircraft, aircraft engines, and aircraft parts	336411–13	D
Guided missiles, space vehicles, and related parts	336414–15, 336419	D
Military armored vehicles, tanks, and tank components	336992	6
Other transportation	other 336	s
Furniture and related products	337	s
Miscellaneous	339	1,872
Medical equipment and supplies	3391	662
Other miscellaneous manufacturing	3399	1,210
Nonmanufacturing industries	21–23, 42–81	94,097
Mining, extraction, and support activities	21	s
Utilities	22	s
Wholesale trade	42	11,623
Electronic shopping and electronic auctions	454111–12	1,770
Transportation and warehousing	48–49	s

TABLE 12

Total number of R&D workers for companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	R&D workers
Information	51	5,823
Publishing	511	1,939
Newspaper, periodical, book, and directory publishers	5111	0
Software publishers	5112	1,939
Telecommunications	517	299
Data processing, hosting, and related services	518	1,433
Other information	other 51	2,151
Finance and insurance	52	500
Real estate and rental and leasing	53	s
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s
Other real estate and rental and leasing	other 53	s
Professional, scientific, and technical services	54	71,987
Architectural, engineering, and related services	5413	10,928
Computer systems design and related services	5415	26,669
Scientific research and development services	5417	9,525
Biotechnology research and development	541711	3,304
Physical, engineering, and life sciences (except biotechnology) research and development	541712	5,700
Social sciences and humanities research and development	541720	520
Other professional, scientific, and technical services	other 54	24,865
Health care services	621–23	1,036
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Industries (number)													
All industries	21–23, 31–33, 42–81	1,696,380	474,603	1,221,777	1,698,302	428,230	1,270,072	1,705,094	284,632	1,420,462	2,036,079	352,028	1,684,051
Manufacturing industries	31–33	57,830	21,960	35,870	58,185	18,382	39,803	58,097	14,089	44,008	64,227	12,733	51,494
Food	311	3,509	1,353	2,156	3,569	997	2,572	3,479	1,145	2,334	4,108	814	3,293
Beverages and tobacco products	312	1,079	482	597	1,051	397	654	1,079	539	540	1,136	398	738
Textiles, apparel, and leather products	313–16	3,905	1,183	2,722	3,844	819	3,025	3,935	577	3,358	4,358	606	3,752
Wood products	321	2,503	673	1,830	2,530	700	1,830	2,530	296	2,234	2,747	323	2,423
Paper	322	376	107	269	403	s	322	403	s	322	429	D	D
Printing and related support activities	323	8,435	3,375	5,060	8,490	3,213	5,276	8,462	2,314	6,148	9,169	2,096	7,073
Petroleum and coal products	324	117	D	D	140	D	D	140	D	D	117	0	117
Chemicals	325	1,878	899	979	1,863	773	1,090	1,876	663	1,213	2,028	647	1,382
Basic chemicals	3251	146	146	0	146	D	D	146	D	D	175	s	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	95	53	42	93	39	54	96	26	70	108	28	81
Pesticides, fertilizers, and other agricultural chemicals	3253	168	D	D	168	D	D	168	D	D	168	49	119
Pharmaceuticals and medicines	3254	287	140	147	278	116	162	284	107	178	338	116	222
Soaps, cleaning compounds, and toilet preparations	3256	606	270	336	606	270	336	606	236	369	606	203	403
Paints, coatings, adhesives, and other chemicals	3255, 3259	576	D	D	573	D	D	576	D	D	634	164	470
Plastics and rubber products	326	1,361	395	967	1,387	394	994	1,361	370	991	1,440	290	1,149
Nonmetallic mineral products	327	1,779	557	1,221	1,805	424	1,381	1,858	451	1,407	1,964	319	1,645
Primary metals	331	651	180	471	651	179	472	651	D	D	742	119	623
Fabricated metal products	332	10,562	3,223	7,339	10,562	3,204	7,358	10,562	2,003	8,559	11,992	2,241	9,751
Machinery	333	3,922	1,594	2,328	4,083	1,289	2,794	3,929	882	3,047	4,634	777	3,857
Agricultural implements	33311	247	s	154	278	154	124	247	D	D	340	s	247
Semiconductor machinery	333242	14	8	6	13	5	8	14	4	10	55	9	46
Engines, turbines, and power transmission equipment	3336	108	D	D	108	D	D	87	D	D	s	D	s
Other machinery	other 333	3,553	D	D	3,685	D	D	3,581	D	D	4,131	D	D
Computer and electronic products	334	2,463	1,472	990	2,446	1,094	1,352	2,434	899	1,535	2,660	766	1,895

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Communications equipment	3342	230	142	88	231	101	130	232	82	150	247	61	185
Semiconductors and other electronic components	3344	639	330	308	639	288	350	641	205	436	712	226	486
Navigational, measuring, electromedical, and control instruments	3345	962	573	388	953	417	537	961	353	608	1,028	277	751
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	122	68	54	119	45	74	120	49	72	143	46	97
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	82	40	42	84	32	52	82	28	54	79	19	60
Other measuring and controlling devices	other 3345	758	465	293	750	340	411	758	276	482	805	211	595
Other computer and electronic products	other 334	633	427	206	623	288	335	600	260	341	674	202	472
Electrical equipment, appliances, and components	335	924	469	455	912	326	586	920	272	648	997	230	766
Transportation equipment	336	1,933	1,031	902	1,959	550	1,409	1,986	679	1,308	2,101	572	1,529
Automobiles, bodies, trailers, and parts	3361–63	1,081	595	486	1,081	324	757	1,108	459	649	1,162	324	838
Aerospace products and parts	3364	214	s	124	214	s	150	214	s	181	246	s	185
Aircraft, aircraft engines, and aircraft parts	336411–13	209	90	119	209	D	D	209	D	D	239	D	D
Guided missiles, space vehicles, and related parts	336414–15, 336419	5	s	5	5	D	D	5	D	D	7	D	D
Military armored vehicles, tanks, and tank components	336992	6	D	D	6	D	D	6	D	D	8	D	D
Other transportation	other 336	633	D	D	659	D	D	659	D	D	685	D	D
Furniture and related products	337	4,080	1,135	2,945	4,135	798	3,337	4,163	715	3,448	4,520	523	3,997
Miscellaneous	339	8,355	D	D	8,355	D	D	8,330	D	D	9,088	D	D
Medical equipment and supplies	3391	3,732	1,606	2,126	3,732	1,403	2,329	3,706	692	3,014	4,113	989	3,124
Other miscellaneous manufacturing	3399	4,624	D	D	4,624	D	D	4,624	D	D	4,974	D	D
Nonmanufacturing industries	21–23, 42–81	1,638,550	452,644	1,185,907	1,640,117	409,848	1,230,269	1,646,996	270,543	1,376,453	1,971,852	339,295	1,632,557
Mining, extraction, and support activities	21	5,863	852	5,011	5,975	1,025	4,950	5,918	682	5,236	7,732	875	6,858

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Utilities	22	871	207	664	895	99	797	920	s	846	1,168	331	837
Wholesale trade	42	102,517	35,230	67,287	102,483	27,049	75,434	103,007	27,405	75,602	116,636	20,666	95,971
Electronic shopping and electronic auctions	454111–12	11,214	5,578	5,637	11,244	5,246	5,998	11,242	4,944	6,298	11,994	3,058	8,936
Transportation and warehousing	48–49	50,015	10,587	39,428	50,105	9,350	40,755	50,137	4,543	45,594	66,321	8,576	57,745
Information	51	23,719	11,524	12,195	23,824	10,019	13,805	23,781	7,285	16,496	27,207	6,204	21,004
Publishing	511	5,618	3,122	2,496	5,576	2,350	3,226	5,612	2,035	3,577	6,266	1,582	4,684
Newspaper, periodical, book, and directory publishers	5111	3,876	1,800	2,076	3,849	1,445	2,404	3,877	1,254	2,623	4,397	958	3,440
Software publishers	5112	1,742	1,322	420	1,727	905	822	1,735	781	954	1,869	624	1,245
Telecommunications	517	2,658	1,163	1,495	2,691	1,030	1,661	2,725	831	1,894	3,025	665	2,361
Data processing, hosting, and related services	518	2,651	1,343	1,308	2,681	1,194	1,486	2,681	837	1,843	2,799	599	2,200
Other information	other 51	12,792	5,896	6,896	12,877	5,445	7,432	12,763	3,582	9,182	15,117	3,358	11,759
Finance and insurance	52	93,864	24,619	69,245	94,071	25,939	68,132	94,941	14,172	80,769	117,138	26,853	90,286
Real estate and rental and leasing	53	97,150	20,445	76,705	97,651	21,762	75,889	98,240	12,568	85,672	145,208	23,100	122,109
Lessors of nonfinancial intangible assets (except copyrighted works)	533	494	s	415	494	D	D	468	78	390	832	104	728
Other real estate and rental and leasing	other 53	96,657	20,366	76,290	97,158	D	D	97,773	12,491	85,282	144,376	22,995	121,381
Professional, scientific, and technical services	54	347,588	103,694	243,894	347,996	102,608	245,388	348,255	60,008	288,247	389,336	81,900	307,436
Architectural, engineering, and related services	5413	35,878	11,210	24,668	35,729	11,796	23,933	35,606	5,491	30,115	39,512	7,628	31,884
Computer systems design and related services	5415	53,021	25,663	27,359	52,746	21,132	31,615	52,770	13,627	39,143	58,003	17,026	40,977
Scientific research and development services	5417	2,842	1,497	1,345	2,795	1,115	1,680	2,846	861	1,985	3,849	1,235	2,615
Biotechnology research and development	541711	600	378	222	563	262	302	601	207	394	980	388	591
Physical, engineering, and life sciences (except biotechnology) research and development	541712	1,862	964	899	1,857	716	1,141	1,870	578	1,292	2,436	736	1,700
Social sciences and humanities research and development	541720	380	155	225	375	138	237	375	76	299	433	110	323

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Other professional, scientific, and technical services	other 54	255,846	65,325	190,521	256,725	68,565	188,160	257,033	40,029	217,003	287,972	56,011	231,961
Health care services	621–23	145,738	42,532	103,206	145,933	39,415	106,518	147,514	19,395	128,119	176,983	35,446	141,537
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	760,012	197,377	562,635	759,939	167,337	592,602	763,043	119,468	643,575	912,127	132,289	779,838
Industry proportions (percent)													
All industries	21–23, 31–33, 42–81	1,696,380	28.0	72.0	1,698,302	25.2	74.8	1,705,094	16.7	83.3	2,036,079	17.3	82.7
Manufacturing industries	31–33	57,830	38.0	62.0	58,185	31.6	68.4	58,097	24.3	75.7	64,227	19.8	80.2
Food	311	3,509	38.6	61.4	3,568	27.9	72.1	3,479	32.9	67.1	4,107	19.8	80.2
Beverages and tobacco products	312	1,079	44.7	55.3	1,051	37.8	62.2	1,079	49.9	50.1	1,136	35.0	65.0
Textiles, apparel, and leather products	313–16	3,905	30.3	69.7	3,844	21.3	78.7	3,935	14.7	85.3	4,358	13.9	86.1
Wood products	321	2,503	26.9	73.1	2,530	27.7	72.3	2,530	11.7	88.3	2,747	11.8	88.2
Paper	322	376	28.5	71.5	402	19.9	80.1	402	19.9	80.1	429	D	D
Printing and related support activities	323	8,435	40.0	60.0	8,490	37.8	62.2	8,462	27.3	72.7	9,169	22.9	77.1
Petroleum and coal products	324	117	D	D	140	D	D	140	D	D	117	0.0	100.0
Chemicals	325	1,878	47.9	52.1	1,863	41.5	58.5	1,876	35.3	64.7	2,028	31.9	68.1
Basic chemicals	3251	146	100.0	0.0	146	D	D	146	D	D	175	50.0	50.0
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	95	55.5	44.5	93	42.1	57.9	96	27.4	72.6	108	25.5	74.5
Pesticides, fertilizers, and other agricultural chemicals	3253	168	D	D	168	D	D	168	D	D	168	29.1	70.9
Pharmaceuticals and medicines	3254	287	48.8	51.2	278	41.8	58.2	284	37.5	62.5	338	34.3	65.7
Soaps, cleaning compounds, and toilet preparations	3256	606	44.5	55.5	606	44.5	55.5	606	39.0	61.0	606	33.5	66.5
Paints, coatings, adhesives, and other chemicals	3255, 3259	576	D	D	572	D	D	576	D	D	634	25.8	74.2
Plastics and rubber products	326	1,361	29.0	71.0	1,387	28.4	71.6	1,361	27.2	72.8	1,440	20.2	79.8
Nonmetallic mineral products	327	1,778	31.3	68.7	1,805	23.5	76.5	1,858	24.3	75.7	1,964	16.2	83.8
Primary metals	331	651	27.7	72.3	651	27.5	72.5	651	D	D	742	16.1	83.9
Fabricated metal products	332	10,562	30.5	69.5	10,562	30.3	69.7	10,562	19.0	81.0	11,992	18.7	81.3
Machinery	333	3,922	40.6	59.4	4,083	31.6	68.4	3,929	22.4	77.6	4,634	16.8	83.2

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Agricultural implements	33311	247	37.5	62.5	278	55.6	44.4	247	D	D	340	27.3	72.7
Semiconductor machinery	333295	14	54.5	45.5	13	40.0	60.0	14	27.3	72.7	s	15.9	84.1
Engines, turbines, and power transmission equipment	3336	108	D	D	108	D	D	87	D	D	108	D	D
Other machinery	other 333	3,553	D	D	3,685	D	D	3,581	D	D	4,131	D	D
Computer and electronic products	334	2,463	59.8	40.2	2,446	44.7	55.3	2,434	36.9	63.1	2,660	28.8	71.2
Communications equipment	3342	230	61.9	38.1	231	43.6	56.4	232	35.3	64.7	247	24.9	75.1
Semiconductors and other electronic components	3344	639	51.7	48.3	639	45.1	54.9	641	31.9	68.1	712	31.7	68.3
Navigational, measuring, electromedical, and control instruments	3345	962	59.6	40.4	953	43.7	56.3	960	36.7	63.3	1,028	26.9	73.1
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	122	55.8	44.2	119	37.8	62.2	120	40.5	59.5	143	32.5	67.5
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	82	49.2	50.8	83	38.2	61.8	82	33.8	66.2	79	24.5	75.5
Other measuring and controlling devices	other 3345	758	61.4	38.6	750	45.2	54.8	758	36.4	63.6	805	26.2	73.8
Other computer and electronic products	other 334	633	67.4	32.6	623	46.2	53.8	600	43.3	56.7	674	29.9	70.1
Electrical equipment, appliances, and components	335	924	50.8	49.2	912	35.8	64.2	920	29.6	70.4	997	23.1	76.9
Transportation equipment	336	1,933	53.4	46.6	1,959	28.1	71.9	1,986	34.2	65.8	2,101	27.2	72.8
Automobiles, bodies, trailers, and parts	3361–63	1,081	55.0	45.0	1,081	30.0	70.0	1,108	41.4	58.6	1,162	27.9	72.1
Aerospace products and parts	3364	214	41.9	58.1	214	29.6	70.4	214	15.5	84.5	246	24.9	75.1
Aircraft, aircraft engines, and aircraft parts	336411–13	209	42.9	57.1	209	D	D	209	D	D	239	D	D
Guided missiles, space vehicles, and related parts	336414–15, 336419	5	0.0	100.0	5	D	D	5	D	D	7	D	D
Military armored vehicles, tanks, and tank components	336992	6	D	D	6	D	D	6	D	D	8	D	D
Other transportation	other 336	633	D	D	659	D	D	659	D	D	685	D	D
Furniture and related products	337	4,080	27.8	72.2	4,135	19.3	80.7	4,163	17.2	82.8	4,520	11.6	88.4
Miscellaneous	339	8,355	D	D	8,355	D	D	8,330	D	D	9,087	D	D

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Medical equipment and supplies	3391	3,731	43.0	57.0	3,731	37.6	62.4	3,706	18.7	81.3	4,113	24.0	76.0
Other miscellaneous manufacturing	3399	4,624	D	D	4,624	D	D	4,624	D	D	4,974	D	D
Nonmanufacturing industries	21–23, 42–81	1,638,550	27.6	72.4	1,640,117	25.0	75.0	1,646,996	16.4	83.6	1,971,852	17.2	82.8
Mining, extraction, and support activities	21	5,863	14.5	85.5	5,975	17.2	82.8	5,918	11.5	88.5	7,732	11.3	88.7
Utilities	22	871	23.8	76.2	895	11.0	89.0	920	8.0	92.0	1,168	28.3	71.7
Wholesale trade	42	102,517	34.4	65.6	102,483	26.4	73.6	103,007	26.6	73.4	116,636	17.7	82.3
Electronic shopping and electronic auctions	454111–12	11,214	49.7	50.3	11,244	46.7	53.3	11,242	44.0	56.0	11,994	25.5	74.5
Transportation and warehousing	48–49	50,015	21.2	78.8	50,105	18.7	81.3	50,137	9.1	90.9	66,321	12.9	87.1
Information	51	23,719	48.6	51.4	23,824	42.1	57.9	23,781	30.6	69.4	27,207	22.8	77.2
Publishing	511	5,618	55.6	44.4	5,576	42.1	57.9	5,612	36.3	63.7	6,266	25.2	74.8
Newspaper, periodical, book, and directory publishers	5111	3,876	46.4	53.6	3,849	37.5	62.5	3,877	32.4	67.6	4,397	21.8	78.2
Software publishers	5112	1,742	75.9	24.1	1,727	52.4	47.6	1,735	45.0	55.0	1,869	33.4	66.6
Telecommunications	517	2,658	43.8	56.2	2,691	38.3	61.7	2,725	30.5	69.5	3,025	22.0	78.0
Data processing, hosting, and related services	518	2,651	50.7	49.3	2,681	44.6	55.4	2,681	31.2	68.8	2,799	21.4	78.6
Other information	other 51	12,792	46.1	53.9	12,876	42.3	57.7	12,763	28.1	71.9	15,117	22.2	77.8
Finance and insurance	52	93,864	26.2	73.8	94,071	27.6	72.4	94,940	14.9	85.1	117,138	22.9	77.1
Real estate and rental and leasing	53	97,150	21.0	79.0	97,651	22.3	77.7	98,240	12.8	87.2	145,208	15.9	84.1
Lessors of nonfinancial intangible assets (except copyrighted works)	533	493	16.0	84.0	493	D	D	468	16.6	83.4	832	12.5	87.5
Other real estate and rental and leasing	other 53	96,657	21.1	78.9	97,158	D	D	97,773	12.8	87.2	144,376	15.9	84.1
Professional, scientific, and technical services	54	347,588	29.8	70.2	347,995	29.5	70.5	348,254	17.2	82.8	389,336	21.0	79.0
Architectural, engineering, and related services	5413	35,878	31.2	68.8	35,729	33.0	67.0	35,606	15.4	84.6	39,512	19.3	80.7
Computer systems design and related services	5415	53,021	48.4	51.6	52,746	40.1	59.9	52,770	25.8	74.2	58,003	29.4	70.6
Scientific research and development services	5417	2,842	52.7	47.3	2,795	39.9	60.1	2,846	30.2	69.8	3,849	32.1	67.9

TABLE 13

Companies with 1–4 employees that reported innovation by industry, industry proportions, and type of innovation: 2014–16

(Number and percent)

Industry	NAICS code	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
		Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Biotechnology research and development	541711	600	63.0	37.0	563	46.5	53.5	601	34.4	65.6	980	39.6	60.4
Physical, engineering, and life sciences (except biotechnology) research and development	541712	1,862	51.7	48.3	1,857	38.5	61.5	1,870	30.9	69.1	2,436	30.2	69.8
Social sciences and humanities research and development	541720	380	40.9	59.1	375	36.7	63.3	375	20.2	79.8	433	25.4	74.6
Other professional, scientific, and technical services	other 54	255,846	25.5	74.5	256,725	26.7	73.3	257,032	15.6	84.4	287,972	19.5	80.5
Health care services	621–23	145,738	29.2	70.8	145,933	27.0	73.0	147,514	13.1	86.9	176,983	20.0	80.0
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	760,012	26.0	74.0	759,939	22.0	78.0	763,043	15.7	84.3	912,127	14.5	85.5

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

^a Statistics for number of companies are based on companies in the United States responding either yes to at least one of the items or no to all of the items on the survey relating to product, process, marketing, or organizational innovations, regardless of whether the company performed or funded R&D. These statistics do include an adjustment to the weight to account for unit nonresponse.**Note(s)**

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 14

Companies with 1–4 employees with and without R&D that reported innovation, by size of R&D program and type of innovation: 2014–16

(Number and percent)

Company type	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Companies (number)												
All companies	1,696,380	474,603	1,221,777	1,698,302	428,230	1,270,072	1,705,094	284,632	1,420,462	2,036,079	352,028	1,684,051
R&D activity	40,419	31,422	8,997	40,093	26,674	13,419	39,990	22,175	17,814	43,709	23,023	20,686
Less than \$100,000	28,971	22,121	6,850	28,795	18,934	9,861	28,700	15,316	13,384	30,734	15,362	15,372
\$100,000–\$999,999	11,101	8,990	2,111	10,953	7,507	3,446	10,945	6,662	4,283	12,446	7,352	5,094
\$1 million or more	347	311	36	344	233	112	345	198	147	529	309	220
No R&D activity	1,655,961	443,182	1,212,779	1,658,209	401,556	1,256,653	1,665,104	262,457	1,402,647	1,992,370	329,005	1,663,365
Industry proportions (percent)												
All companies	1,696,380	28.0	72.0	1,698,302	25.2	74.8	1,705,094	16.7	83.3	2,036,079	17.3	82.7
R&D activity	40,419	77.7	22.3	40,093	66.5	33.5	39,990	55.5	44.5	43,709	52.7	47.3
Less than \$100,000	28,971	76.4	23.6	28,795	65.8	34.2	28,700	53.4	46.6	30,734	50.0	50.0
\$100,000–\$999,999	11,101	81.0	19.0	10,953	68.5	31.5	10,945	60.9	39.1	12,446	59.1	40.9
\$1 million or more	347	89.5	10.5	344	67.5	32.5	345	57.4	42.6	529	58.3	41.7
No R&D activity	1,655,961	26.8	73.2	1,658,209	24.2	75.8	1,665,104	15.8	84.2	1,992,370	16.5	83.5

^a Statistics for number of companies are based on companies in the United States responding either yes to at least one of the items or no to all of the items on the survey relating to product, process, marketing, or organizational innovations, regardless of whether the company performed or funded R&D. These statistics do include an adjustment to the weight to account for unit nonresponse.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 15

Companies with 1–4 employees that reported innovation, by age of company and type of innovation: 2014–16

(Number and percent)

Company age	Product innovation			Process innovation			Marketing innovation			Organizational innovation		
	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No	Companies ^a	Yes	No
Companies (number)												
All companies	1,696,380	474,603	1,221,777	1,698,302	428,230	1,270,072	1,705,094	284,632	1,420,462	2,036,079	352,028	1,684,051
Five years or fewer	348,499	117,879	230,620	349,938	106,192	243,746	350,017	74,529	275,488	423,298	93,725	329,572
More than five years through ten years	341,923	105,251	236,672	340,033	93,371	246,662	342,552	65,791	276,760	402,260	84,573	317,687
More than ten years	1,005,958	251,474	754,484	1,008,332	228,667	779,664	1,012,525	144,312	868,213	1,210,522	173,730	1,036,792
Industry proportions (percent)												
All companies	1,696,380	28.0	72.0	1,698,302	25.2	74.8	1,705,094	16.7	83.3	2,036,079	17.3	82.7
Five years or fewer	348,499	33.8	66.2	349,938	30.3	69.7	350,017	21.3	78.7	423,298	22.1	77.9
More than five years through ten years	341,923	30.8	69.2	340,033	27.5	72.5	342,552	19.2	80.8	402,260	21.0	79.0
More than ten years	1,005,958	25.0	75.0	1,008,332	22.7	77.3	1,012,525	14.3	85.7	1,210,522	14.4	85.6

^a Statistics for number of companies are based on companies in the United States responding either yes to at least one of the items or no to all of the items on the survey relating to product, process, marketing, or organizational innovations, regardless of whether the company performed or funded R&D. These statistics do 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.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 16

Total number of patent applications and patents currently owned for companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	Patent applications	Patents currently owned
All industries	21–23, 31–33, 42–81	13,021	20,606
Manufacturing industries	31–33	2,814	5,808
Food	311	s	s
Beverages and tobacco products	312	0	0
Textiles, apparel, and leather products	313–16	0	0
Wood products	321	0	0
Paper	322	0	0
Printing and related support activities	323	0	0
Petroleum and coal products	324	s	s
Chemicals	325	321	494
Basic chemicals	3251	0	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	5	50
Pesticides, fertilizers, and other agricultural chemicals	3253	D	4
Pharmaceuticals and medicines	3254	s	228
Soaps, cleaning compounds, and toilet preparations	3256	0	0
Paints, coatings, adhesives, and other chemicals	3255, 3259	D	72
Plastics and rubber products	326	0	s
Nonmetallic mineral products	327	s	s
Primary metals	331	0	0
Fabricated metal products	332	s	s
Machinery	333	442	818
Agricultural implements	33311	s	s
Semiconductor machinery	333242	s	s
Engines, turbines, and power transmission equipment	3336	s	0
Other machinery	other 333	212	s
Computer and electronic products	334	459	836
Communications equipment	3342	27	75
Semiconductors and other electronic components	3344	92	156
Navigational, measuring, electromedical, and control instruments	3345	226	470
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	65	124
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	10	15
Other measuring and controlling devices	other 3345	152	330
Other computer and electronic products	other 334	113	135
Electrical equipment, appliances, and components	335	104	224
Transportation equipment	336	s	s
Automobiles, bodies, trailers, and parts	3361–63	s	D
Aerospace products and parts	3364	0	0
Aircraft, aircraft engines, and aircraft parts	336411–13	0	0
Guided missiles, space vehicles, and related parts	336414–15, 336419	0	0
Military armored vehicles, tanks, and tank components	336992	D	D
Other transportation	other 336	D	0
Furniture and related products	337	0	0
Miscellaneous	339	930	2,151
Medical equipment and supplies	3391	s	s
Other miscellaneous manufacturing	3399	725	1,960
Nonmanufacturing industries	21–23, 42–81	10,207	14,798
Mining, extraction, and support activities	21	s	s
Utilities	22	s	s
Wholesale trade	42	1,763	2,804

TABLE 16

Total number of patent applications and patents currently owned for companies with 1–4 employees, by industry: 2016

(Number)

Industry	NAICS code	Patent applications	Patents currently owned
Electronic shopping and electronic auctions	454111–12	s	s
Transportation and warehousing	48–49	0	0
Information	51	381	178
Publishing	511	147	178
Newspaper, periodical, book, and directory publishers	5111	0	0
Software publishers	5112	147	178
Telecommunications	517	0	0
Data processing, hosting, and related services	518	s	0
Other information	other 51	s	0
Finance and insurance	52	0	0
Real estate and rental and leasing	53	s	s
Lessors of nonfinancial intangible assets (except copyrighted works)	533	s	s
Other real estate and rental and leasing	other 53	0	0
Professional, scientific, and technical services	54	7,431	10,943
Architectural, engineering, and related services	5413	1,012	2,186
Computer systems design and related services	5415	1,607	1,956
Scientific research and development services	5417	3,879	5,578
Biotechnology research and development	541711	1,382	2,333
Physical, engineering, and life sciences (except biotechnology) research and development	541712	2,487	3,188
Social sciences and humanities research and development	541720	11	57
Other professional, scientific, and technical services	other 54	933	1,224
Health care services	621–23	s	s
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	s	422 i

D = data withheld to avoid disclosing operations of individual companies; i = > 50% of the estimate is imputation to account for nonresponse; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 17

Importance of utility patents, design patents, and trademarks for companies with 1–4 employees, by industry: 2016

(Percent)

Industry	NAICS code	Utility patents			Design patents			Trademarks		
		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	14.3	9.4	76.3	6.8	11.3	81.9	16.7	21.4	61.8
Manufacturing industries	31–33	22.9	13.2	63.8	10.3	13.4	76.3	23.1	19.4	57.5
Food	311	D	D	D	D	D	D	D	D	D
Beverages and tobacco products	312	D	D	D	D	D	D	D	D	D
Textiles, apparel, and leather products	313–16	D	D	D	D	D	D	D	D	D
Wood products	321	D	D	D	D	D	D	D	D	D
Paper	322	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Printing and related support activities	323	D	D	D	D	D	D	D	D	D
Petroleum and coal products	324	D	D	D	D	D	D	D	D	D
Chemicals	325	24.6	14.3	61.0	5.5	5.9	88.6	30.0	21.0	49.0
Basic chemicals	3251	D	D	D	D	D	D	D	D	D
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	D	D	68.8	D	D	75.0	17.6	35.3	47.1
Pesticides, fertilizers, and other agricultural chemicals	3253	D	D	D	D	D	D	D	D	D
Pharmaceuticals and medicines	3254	49.3	12.4	38.3	7.5	11.8	80.6	47.3	20.0	32.7
Soaps, cleaning compounds, and toilet preparations	3256	D	D	D	D	D	D	D	D	D
Paints, coatings, adhesives, and other chemicals	3255, 3259	D	D	D	D	10.1	D	D	D	41.8
Plastics and rubber products	326	D	D	D	D	D	D	D	D	D
Nonmetallic mineral products	327	D	D	D	D	D	D	D	D	D
Primary metals	331	D	D	D	D	D	D	D	D	D
Fabricated metal products	332	12.3	16.4	71.3	12.8	12.9	74.3	20.7	12.3	67.0
Machinery	333	28.1	20.3	51.6	14.1	19.5	66.4	24.5	13.9	61.6
Agricultural implements	33311	D	D	D	D	D	D	D	D	D
Semiconductor machinery	333242	93.5	D	D	D	D	D	D	D	D
Engines, turbines, and power transmission equipment	3336	D	D	D	D	D	D	D	D	D
Other machinery	other 333	D	D	55.9	D	D	70.9	D	D	68.0
Computer and electronic products	334	26.6	13.4	60.0	11.2	19.3	69.4	24.3	32.5	43.2
Communications equipment	3342	29.1	18.2	52.7	9.4	17.1	73.5	22.3	25.9	51.8
Semiconductors and other electronic components	3344	20.2	13.5	66.3	4.7	14.2	81.1	12.2	39.4	48.3

Importance of utility patents, design patents, and trademarks for companies with 1–4 employees, by industry: 2016

[illegible]

TABLE 17

Importance of utility patents, design patents, and trademarks for companies with 1–4 employees, by industry: 2016

(Percent)

Industry	NAICS code	Utility patents			Design patents			Trademarks		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
Software publishers	5112	11.0	10.1	78.9	4.3	8.9	86.7	29.7	34.7	35.6
Telecommunications	517	D	D	D	D	D	D	D	D	D
Data processing, hosting, and related services	518	D	D	76.5	D	D	D	29.7	17.6	52.7
Other information	other 51	D	D	91.7	D	D	D	20.8	29.1	50.1
Finance and insurance	52	D	D	D	D	D	D	D	D	D
Real estate and rental and leasing	53	D	D	D	D	D	D	D	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	D	D	D	D	D	D	D	D	D
Other real estate and rental and leasing	other 53	D	D	D	D	D	D	D	D	D
Professional, scientific, and technical services	54	12.3	8.3	79.4	5.2	9.7	85.1	12.9	20.5	66.6
Architectural, engineering, and related services	5413	17.1	7.5	75.4	5.4	10.5	84.1	8.6	10.8	80.6
Computer systems design and related services	5415	7.9	9.8	82.3	5.3	9.9	84.8	14.9	24.4	60.7
Scientific research and development services	5417	39.8	14.2	46.0	9.8	13.6	76.6	14.3	23.6	62.0
Biotechnology research and development	541711	55.2	18.0	26.7	12.0	18.2	69.8	19.4	28.4	52.2
Physical, engineering, and life sciences (except biotechnology) research and development	541712	35.8	13.3	50.8	9.5	12.4	78.1	12.1	22.7	65.3
Social sciences and humanities research and development	541720	5.3	4.5	90.2	2.3	3.1	94.7	12.0	10.5	77.4
Other professional, scientific, and technical services	other 54	8.8	5.8	85.4	4.0	8.5	87.5	12.5	19.8	67.7
Health care services	621–23	D	D	75.7	D	D	D	D	D	65.0
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	D	D	D	D	D	D	D	D	D

D = data withheld to avoid disclosing operations of individual companies.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 18

Importance of copyrights, trade secrets, and nondisclosure agreements for companies with 1–4 employees, by industry: 2016

(Percent)

Industry	NAICS code	Copyrights			Trade secrets			Nondisclosure agreements		
		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	19.9	20.8	59.2	34.7	23.0	42.3	43.4	29.2	27.4
Manufacturing industries	31–33	14.6	17.6	67.8	45.6	19.4	34.9	43.2	21.5	35.3
Food	311	D	D	D	D	D	D	D	D	D
Beverages and tobacco products	312	D	D	D	D	D	D	D	D	D
Textiles, apparel, and leather products	313–16	D	D	D	D	D	D	D	D	D
Wood products	321	D	D	D	D	D	D	D	D	D
Paper	322	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Printing and related support activities	323	60.0	D	D	D	D	D	D	D	D
Petroleum and coal products	324	D	D	D	D	D	D	D	D	D
Chemicals	325	10.4	11.4	78.2	60.0	23.7	16.4	66.1	24.6	9.2
Basic chemicals	3251	D	D	D	D	D	D	D	D	D
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	D	D	58.8	D	D	16.7	55.6	27.8	16.7
Pesticides, fertilizers, and other agricultural chemicals	3253	D	D	D	D	D	D	D	D	D
Pharmaceuticals and medicines	3254	14.8	15.8	69.4	44.8	13.9	41.4	42.1	39.9	18.0
Soaps, cleaning compounds, and toilet preparations	3256	D	D	D	D	D	D	D	D	D
Paints, coatings, adhesives, and other chemicals	3255, 3259	21.6	D	D	65.1	18.7	16.2	D	D	13.2
Plastics and rubber products	326	D	D	D	D	D	D	D	D	D
Nonmetallic mineral products	327	D	D	D	D	D	D	D	D	D
Primary metals	331	D	D	D	D	D	D	D	D	D
Fabricated metal products	332	13.0	12.8	74.2	45.3	12.3	42.4	41.1	20.5	38.4
Machinery	333	D	D	74.3	41.2	16.5	42.4	48.4	22.9	28.6
Agricultural implements	33311	D	D	D	D	D	D	D	D	D
Semiconductor machinery	333242	D	D	D	D	D	D	D	D	D
Engines, turbines, and power transmission equipment	3336	D	D	D	D	D	D	D	D	D
Other machinery	other 333	D	D	79.9	32.2	D	D	40.1	D	D
Computer and electronic products	334	18.7	35.6	45.7	56.4	20.8	22.7	51.3	25.7	23.0
Communications equipment	3342	21.8	27.4	50.9	43.7	25.5	30.8	38.2	34.6	27.2
Semiconductors and other electronic components	3344	12.1	38.5	49.4	67.1	10.7	22.2	64.4	22.2	13.4

Importance of copyrights, trade secrets, and nondisclosure agreements for companies with 1–4 employees, by industry: 2016

[illegible]

TABLE 18

Importance of copyrights, trade secrets, and nondisclosure agreements for companies with 1–4 employees, by industry: 2016

(Percent)

Industry	NAICS code	Copyrights			Trade secrets			Nondisclosure agreements		
		Very important	Somewhat important	Not important	Very important	Somewhat important	Not important	Very important	Somewhat important	Not important
Software publishers	5112	37.7	32.0	30.3	48.6	23.6	27.8	44.6	33.4	22.0
Telecommunications	517	D	D	D	D	D	D	D	D	D
Data processing, hosting, and related services	518	23.8	23.4	52.7	41.4	29.3	29.3	47.3	23.4	29.3
Other information	other 51	33.3	33.3	33.5	D	D	45.7	D	D	37.4
Finance and insurance	52	D	D	D	D	D	D	66.7	D	D
Real estate and rental and leasing	53	D	D	D	D	D	D	D	D	D
Lessors of nonfinancial intangible assets (except copyrighted works)	533	D	D	D	D	D	D	D	D	D
Other real estate and rental and leasing	other 53	D	D	D	D	D	D	D	D	D
Professional, scientific, and technical services	54	20.3	21.2	58.5	31.0	22.6	46.4	43.5	29.8	26.7
Architectural, engineering, and related services	5413	15.3	10.9	73.8	33.2	20.8	46.0	34.5	31.9	33.5
Computer systems design and related services	5415	23.2	25.8	51.1	31.4	23.5	45.1	44.9	31.3	23.8
Scientific research and development services	5417	12.1	22.1	65.8	48.7	16.1	35.1	59.8	23.4	16.8
Biotechnology research and development	541711	12.4	29.4	58.2	62.3	12.2	25.5	71.1	20.1	8.7
Physical, engineering, and life sciences (except biotechnology) research and development	541712	10.8	18.5	70.7	45.5	18.2	36.3	57.3	24.2	18.5
Social sciences and humanities research and development	541720	21.8	21.8	56.4	15.2	15.9	68.9	30.1	30.8	39.1
Other professional, scientific, and technical services	other 54	21.1	20.7	58.2	26.0	23.8	50.2	42.1	28.9	29.0
Health care services	621–23	D	D	78.5	D	D	57.0	D	D	32.8
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	D	D	D	D	D	17.3	D	D	D

D = data withheld to avoid disclosing operations of individual companies.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 19

Companies with 1–4 employees with and without R&D that participated in intellectual property activities: 2016

(Percent)

Intellectual property activities	Companies (number)	Yes	No
With R&D			
Transferred intellectual property (IP) to others not owned by your company through participation in technical assistance or "know how" agreements	30,900	7.3	92.7
Received IP from others not owned by your company through participation in technical assistance or "know how" agreements	30,924	7.1	92.9
Participated in cross-licensing 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	30,922	3.8	96.2
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)	31,219	2.6	97.4
Made use of open source patents or other freely available IP not owned by your company	31,234	12.1	87.9
Without R&D			
Transferred intellectual property (IP) to others not owned by your company through participation in technical assistance or "know how" agreements	1,012,118	0.4	99.6
Received IP from others not owned by your company through participation in technical assistance or "know how" agreements	1,011,763	0.5	99.5
Participated in cross-licensing 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	1,011,456	0.2	99.8
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)	1,019,195	0.1	99.9
Made use of open source patents or other freely available IP not owned by your company	1,016,282	0.7	99.3

Note(s)

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 20

Types of business funding sources for companies with 1–4 employees: 2016

(Percent)

Business funding sources	Companies (number)	Yes, got funding	Yes, tried but did not get funding	No, did not try
Personal funds	2,043,929	14.2	1.0	84.8
Banks or credit unions	2,044,799	11.5	2.5	86.0
Friends or relatives	2,027,381	2.6	0.5	96.9
Angel investor	2,024,957	0.1	0.4	99.4
Venture capital	2,022,319	0.5	0.5	98.9
Federal government programs	2,026,857	0.1	0.5	99.4
Crowdfunding	2,026,283	0.1	0.3	99.6
Other	1,766,030	0.5	0.2	99.3

Note(s)

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 21

Importance of strategies for a competitive advantage and future success for companies with 1–4 employees: 2016

(Percent)

Strategies	Companies (number)	Very important	Somewhat important	Not at all important
For competitive advantage				
Your low prices	2,030,920	24.7	42.2	33.1
The quality of your goods or services	2,049,881	85.0	7.4	7.5
Your unique goods or services	2,032,351	50.2	28.4	21.4
The convenience you offer	2,033,359	52.6	30.3	17.2
Your reputation	2,043,038	88.0	6.1	5.8
For future success				
Updating or improving an existing good or service	2,042,265	41.0	36.2	22.8
Developing a good or service that will save customers money	2,037,931	30.0	33.0	37.0
Developing a good or service that will improve current customers' experience	2,036,507	41.7	30.2	28.1
Having a formal business strategic plan in writing	2,037,473	12.6	29.5	57.9
Partnerships with other businesses	2,036,341	12.5	24.8	62.6
Partnerships with one or more universities	2,029,269	3.3	9.7	87.0
Providing individualized goods or services	2,035,762	31.6	27.0	41.4

Note(s)

Detail may not add to total because of rounding. Statistics are representative of companies located in the United States.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TABLE 22

Total R&D performance of companies with 1–4 employees, by industry: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Companies (number)	Amount
All industries	21–23, 31–33, 42–81	44,139	4,843,494
Manufacturing industries	31–33	4,856	554,091
Food	311	D	s
Beverages and tobacco products	312	D	s
Textiles, apparel, and leather products	313–16	D	s
Wood products	321	s	s
Paper	322	0	0
Printing and related support activities	323	136	s
Petroleum and coal products	324	D	s
Chemicals	325	469	118,986
Basic chemicals	3251	D	s
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	24	1,490
Pesticides, fertilizers, and other agricultural chemicals	3253	D	26
Pharmaceuticals and medicines	3254	131	73,993
Soaps, cleaning compounds, and toilet preparations	3256	133	s
Paints, coatings, adhesives, and other chemicals	3255, 3259	124	17,592
Plastics and rubber products	326	106	s
Nonmetallic mineral products	327	106	s
Primary metals	331	D	s
Fabricated metal products	332	619	26,848
Machinery	333	805	114,951
Agricultural implements	33311	D	s
Semiconductor machinery	333242	39	s
Engines, turbines, and power transmission equipment	3336	D	s
Other machinery	other 333	658	67,821
Computer and electronic products	334	846	134,686
Communications equipment	3342	73	8,518
Semiconductors and other electronic components	3344	194	32,457
Navigational, measuring, electromedical, and control instruments	3345	375	64,131
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	68	20,745
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	25	4,733
Other measuring and controlling devices	other 3345	282	38,653
Other computer and electronic products	other 334	203	29,580
Electrical equipment, appliances, and components	335	211	23,861
Transportation equipment	336	273	29,131
Automobiles, bodies, trailers, and parts	3361–63	189	s
Aerospace products and parts	3364	D	D
Aircraft, aircraft engines, and aircraft parts	336411–13	D	3
Guided missiles, space vehicles, and related parts	336414–15, 336419	D	D
Military armored vehicles, tanks, and tank components	336992	D	63
Other transportation	other 336	D	D
Furniture and related products	337	s	s
Miscellaneous	339	839	76,731
Medical equipment and supplies	3391	382	s
Other miscellaneous manufacturing	3399	457	37,156
Nonmanufacturing industries	21–23, 42–81	39,283	4,289,402
Mining, extraction, and support activities	21	145	s
Utilities	22	s	s
Wholesale trade	42	5,340	295,290
Electronic shopping and electronic auctions	454111–12	720	39,818
Transportation and warehousing	48–49	120	s

TABLE 22

Total R&D performance of companies with 1–4 employees, by industry: 2016

(Thousands of U.S. dollars)

Industry	NAICS code	Companies (number)	Amount
Information	51	1,983	239,024
Publishing	511	632	108,978
Newspaper, periodical, book, and directory publishers	5111	0	0
Software publishers	5112	632	108,978
Telecommunications	517	166	s
Data processing, hosting, and related services	518	507	63,032
Other information	other 51	678	55,222
Finance and insurance	52	158	s
Real estate and rental and leasing	53	D	s
Lessors of nonfinancial intangible assets (except copyrighted works)	533	D	s
Other real estate and rental and leasing	other 53	D	s
Professional, scientific, and technical services	54	30,249	3,577,353
Architectural, engineering, and related services	5413	4,628	381,344
Computer systems design and related services	5415	11,577	1,456,420
Scientific research and development services	5417	2,497	889,127
Biotechnology research and development	541711	777	337,866
Physical, engineering, and life sciences (except biotechnology) research and development	541712	1,552	529,224
Social sciences and humanities research and development	541720	168	22,037
Other professional, scientific, and technical services	other 54	11,548	850,462
Health care services	621–23	250	49,510
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	D	s

D = data withheld to avoid disclosing operations of individual companies; s = suppressed for reliability; standard error exceeds publication standards.

NAICS = 2012 North American Industry Classification System.

Note(s)

Detail may not add to total because of rounding. Industry classification based on sample NAICS code. Statistics are representative of companies located in the United States that performed or funded R&D.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

Technical Notes

Survey Overview

Purpose. The Microbusiness R&D and Innovation Survey (BRDI-M) is the primary source of information on research and development expenditures, the R&D workforce, and innovative activity of microbusinesses operating in the 50 U.S. states and the District of Columbia.

Data collection authority. The information collected by BRDI-M 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 U.S. Census Bureau collects the data under the authority of Title 13, Section 8 of the United States Code. The Office of Management and Budget (OMB) control number is 0607-0912 and expires on 29 February 2020.

Survey sponsors. BRDI-M is co-sponsored by the National Center for Science and Engineering Statistics (NCSES) and the U.S. Census Bureau.

Survey collection and tabulation agent. The pilot expansion of the Business R&D and Innovation Survey (BRDIS) was conducted by the U.S. Census Bureau in accordance with an interagency agreement with NCSES within NSF.

Key Survey Information

Frequency. One time; questions from BRDI-M will be incorporated into the forthcoming Annual Business Survey (ABS).

Initial survey year. BRDI-M collected data for calendar year 2016 as a pilot expansion to BRDIS, which began collection in 2008 after replacing the Survey of Industrial Research and Development (SIRD) that collected data for 1953–2007.

Reference period. Calendar year 2016.

Response unit. Company.

Sample or census. Sample.

Population size. 3,460,816 companies.

Sample size. 199,991 companies.

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. BRDI-M has been designed to provide detailed statistics on domestic R&D expenditures of microbusinesses located in the United States and also statistics on these companies' R&D employees, intellectual property, and innovation activities.

Target Population

The target population for BRDI-M consists of all for-profit companies that have at least 1 paid employee but fewer than 10 paid employees in the United States, that have at least one establishment that is in business during the survey year and is located in the United States, and that are classified in certain industries based on the 2012 North American Industry Classification System (NAICS).

Sample Frame

The Business Register, a U.S. Census Bureau compilation that contains information on more than 3 million establishments with paid employees, serves as the primary input to the sample frame from which the 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. Companies are excluded from the frame if they are classified in a

NAICS industry that is outside the scope of BRDI-M or if they were selected in the 2016 BRDIS sample (to reduce response burden on these companies). Additionally, companies are excluded from the frame if they have no employees or more than nine employees, based on their prior year's aggregated employment data.

The scope of the 2016 BRDI-M is limited to companies that (1) have a majority of their payroll allocated to establishments classified as for-profit businesses; (2) are classified within a specific set of industries as defined by NAICS; (3) have at least 1 paid employee but fewer than 10 paid employees in the United States, based on employment on 12 March 2015; (4) have at least one establishment that is physically located in the United States and is in business at the end of calendar year 2016 (the time when the U.S. Census Bureau finished the 2015 Business Register processing); and (5) are not federally funded R&D centers.

Single-unit company records were extracted from the 2015 Business Register if the company had at least 1 paid employee but fewer than 10 paid employees in 2015 or, if employment information was unavailable, the company's 2015 payroll was greater than or equal to \$50,000. Companies were removed from the sample frame if: their NAICS codes were designated as Crop production (NAICS 111), Animal production (NAICS 112), Postal service (NAICS 491), Educational services (NAICS 61), Private households (NAICS 814), or Public administration (NAICS 92); they were no longer in business; they were nonprofits; 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 2015 Business Register if the given establishment's 2015 payroll was greater than zero or if the establishment employed at least one person in 2015. 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 Crop production (NAICS 111), Animal production (NAICS 112), or Educational services (NAICS 61) were not removed during the construction of multiunit company records. From the resulting set of multiunit companies, companies were removed from the sample frame if they had no paid employees, more than nine paid employees, or if the payroll associated with their nonprofit establishments was greater than the payroll of their for-profit establishments.

Industry Classification for Sampling

Each company was assigned to 1 of 60 industry-based strata for sampling based on the reported business segment in which the company performed the largest amount of total domestic R&D as reported in the prior period (2011–15 BRDIS), if available. If these business segment data were not reported for a given company, assignment is based on the NAICS codes of its establishments in the U.S. Census Bureau's 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 2-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 3-digit NAICS code that accounted for the highest percentage of its annual payroll within the economic sector. Next, the company was assigned a 4-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 6-digit NAICS code within the 4-digit NAICS code, based on the highest percentage of its aggregated annual payroll within the 4-digit NAICS code.

Stratification of the Sample Frame

Each company in an industry-based stratum for sampling was further assigned to one of two sizes of strata based on Business Register information on the number of employees in the company: (1) companies with 1–4 employees or payroll between \$50,000 and \$250,000 if the employment count was missing (*small stratum*), or (2) companies with 5–9 employees or payroll greater than \$250,000 if the employment count was missing (*large stratum*). Survey statistics are published for microbusinesses, those with 1–4 employees. Businesses with 5–9 employees were also sampled in order to compare microbusiness survey results with estimates from BRDIS, which also surveyed businesses with 5–9 employees. For 2016, there were 2,595,220 companies in the first stratum and 865,596 companies in the second stratum, for a total of 3,460,816.

Sample Selection

The sample for BRDI-M consisted of nearly 200,000 companies. The sample was selected separately within the two main strata: companies with 5–9 employees (large) and companies with 1–4 employees (small). Companies in the following NAICS codes were selected with certainty: 3252, 3254, 3255, 3259, 333242, 334, 335, 336414, 336415, 336419, 336992, 5112, and 5415. Additionally, the largest 100 companies by state based on payroll and companies with a NAICS code of 5417 were selected with certainty in the small stratum. The large stratum did not have any companies in the 5417 NAICS code on the frame because all such companies were selected with certainty for the 2016 BRDIS. The remaining sample was allocated proportionally to the noncertainty industry strata based on payroll.

For the remaining strata, a simple random sample was selected without replacement. BRDI-M coverage was intended to complement BRDIS coverage for the 1–4 employer component of the business sector, but there is also overlap with the 5–9 employee portion. The BRDIS sample was selected first and the BRDI-M sample was selected from those cases not selected in the BRDIS sample.

In the large stratum, probabilities of selection were assigned based on the proportion of the industry total on the large stratum frame. In the small stratum, probabilities of selection were assigned by using proportions of state and industry totals on the frame. The exception was for companies with an “Other nonmanufacturing” (ONM) NAICS code that had their probabilities set so the maximum weight would be approximately 100. The stratum of small companies was the primary focus of the survey and received most of the sample cases. The selection probabilities of the BRDI-M sampling units were adjusted to account for the BRDIS companies in the frame that were not removed from the sampling frame.

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, companies that were selected in an industry other than ONM had a maximum weight of 23, and companies that were selected in an ONM industry had a maximum weight of 100. A complete and detailed description of the sample design and estimation methodology is given in the 2016 BRDI-M methodology report available from the NCSES project officer.

Sample Size

With the above sample design parameters, a total of 200,000 companies were selected. The small stratum contained 161,066 companies (86,939 certainties), and the large stratum contained 38,934 companies (15,482 certainties). After sample selection, 9 companies no longer had a domestic address on the Business Register. These companies were dropped from the sample, leaving a final sample size of 199,991 companies.

Data Collection and Processing Methods

In addition to paper questionnaires, an electronic mode of data reporting via the U.S. Census Bureau’s Centurion data collection instrument was available to all BRDI-M respondents. Respondents were made aware of Centurion in BRDI-M-related correspondence and transmittals from the U.S. Census Bureau. For paper versus electronic response rates, see section **Response by Mode**.

Questionnaires

For the 2016 cycle of BRDI-M, a single questionnaire was used to collect data for the survey.

Response Rates

Unit Response Rates

Of the companies surveyed for the 2016 survey, 22.2% did not submit any response, and an additional 0.5% did not provide enough information to be treated as responses. Nonresponse studies are conducted periodically to assess reasons for nonresponse and possible nonresponse bias. Two metrics used by NSF and the U.S. Census Bureau to measure unit response to BRDI-M were check-in rates and unit response rates.

Check-in rate. The check-in rate is defined as the unweighted number of surveys that were either mailed in or submitted online 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.

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., another U.S. company owned more than 50%, ceased operations, or employment), divided by the unweighted total number of in-scope companies in the sample.

For companies with 1–4 employees, the check-in rate was 77.2%, and the URR was 76.7%.

Item Response Rates

BRDI-M collects data for over 40 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 for companies with 1–4 employees in 2016 was 76.4%.

Total quantity nonresponse rate (TQNR). For a given published estimate, TQNR, defined as 100% minus TQRR, is calculated for each tabulation cell from BRDI-M, 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 BRDIS estimate. TQNR tables corresponding to each data table are available from the NCSES project officer.

Response by Mode

Overall, 42% of checked-in cases responded to BRDI-M by mailing in the paper form, and 58% responded using the online version of the survey.

Data Editing

Given the size and complexity of BRDI-M, many survey responses included errors that required correction or unusual patterns that required validation. Several edit checks were programmed to improve the efficiency of analyst data review and correction (see ABS Methodology Report, Appendix A, available from the project officer).

BRDI-M had 20 separate edits to check for outliers. Of those 20 edits, 13 were “range tests,” 5 were “survey rule tests,” and 2 were “balance tests.” The 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 available from the NCSES project officer.

During the editing and review process, several cases were flagged as potential false-positive cases. The analysis of false-positive cases began by using a prepared data set with the following data items: company ID, status, check-in date, sample weight, company name, contact e-mail address, sample NAICS, primary business, employment variables, sales, R&D expenditures, and R&D yes-or-no indicators. Variables for the companies' 2-, 3-, and 4-digit NAICS were added to the data set as well as categorical variables for R&D activity (1 = positive R&D, 0 = no R&D), and R&D intensity or R&D-to-sales ratio (R&D/sales). Once the data set was complete, SAS, JMP, and Excel was utilized to calculate the following for each NAICS level: count of sampled companies, count of active companies, checked-in cases, and count of cases with positive R&D, median R&D expenditures, and mean R&D expenditures. These summarized data were then used to identify possible outliers by sorting the data by descending R&D and NAICS level. Once the data were sorted by largest R&D, BRDI-M analysts analyzed the following:

- Are units reasonable? If not, flag for correction.
- Does reported primary business align with sample NAICS? If not, flag for further review.

- Does company explicitly note R&D activities in its primary business? If so, OK. If not, check company website (if available) for evidence of R&D.
- If the R&D-to-sales ratio is high, is it likely that the company is reporting all business expenses as R&D? This is only valid if the company is a startup or is doing R&D that is paid for by a customer, grant, or business partner.

In addition, BRDI-M analysts also reviewed R&D cases in NAICS levels where R&D is rare. For statistical purposes, R&D involves creative, systematic work aimed at resolving scientific or technological uncertainty. Respondents, however, sometimes apply a more common definition of research or development that includes activities instructed to be *excluded*, such as market research, literature reviews (“researching” current knowledge from published papers, books, and other resources), routine testing or technical activities (including routine software development and website design), and management or policy studies. When reviewing the R&D cases in NAICS levels where R&D is rare, the BRDI-M analysts looked for the following:

- Does reported primary business align with sample NAICS? If not, flag for further review.
- Does company explicitly note R&D activities in its primary business? If so, OK. If not, check company website (if available) for evidence of R&D.
- Is there any indication on company website that this case is more likely to have R&D activity than its peers? If not, flag as possible false positive. *This involves analyst judgement.*

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 BRDI-M 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

Unit nonresponse is handled by adjusting weighted reported data and imputed data as follows. Each company’s sampling weight is multiplied 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 industry-based strata for sampling described in the section **Stratification of the Sample Frame**. For a given adjustment cell, the nonresponse adjustment factor is the ratio of the sum of the weights for all companies in the cell to the sum of the weights for all companies in the cell with reported or imputed data.

Item Nonresponse

Item nonresponse for a given company is handled by item imputation. 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, and (2) imputation using averages from other companies in the industry. Tables of imputation rates corresponding to each data table are available from the NCSES project officer.

Estimation

The general methodology used to produce estimates from BRDI-M involves sums of weighted data (reported or imputed) in which the weights are the product of the sampling weight and the nonresponse adjustment factor.

Weighting

Estimates published for BRDI-M 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 BRDI-M estimate is multiplied by both its sampling weight and its nonresponse adjustment factor (if applicable), and these weighted values are then summed to create the estimate.

Survey Quality Measures

The estimates produced from BRDI-M are subject to both sampling and nonsampling errors.

Sampling and Nonsampling Errors

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 all types of errors that could also occur if a complete enumeration of the sample 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 data for reasonableness and consistency. Though nonsampling error is not measured directly, quality control procedures were employed throughout the survey process to minimize this type of error.

Sampling error is the difference between estimates obtained from the sample and results theoretically obtainable from a comparable complete enumeration of the sample frame. This error results because only a subset of the sample frame is measured in a sample survey. For published estimates from BRDI-M, 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 NCSES project officer.

Standard errors may be used to define confidence intervals about the corresponding estimates with a desired level of confidence. If a confidence interval were constructed for each possible sample that could be selected, then it would be expected that the percentage of confidence intervals containing the result of a complete enumeration of the sample frame would equal the percentage of the level of confidence. For example, the interval defined by a margin of error of two 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 BRDI-M. The sample size is sufficiently large 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 expected to have a higher percentage of companies with 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 all microbusinesses was 3.74% in 2016.

Measurement Error

Variations in respondent interpretations of the definitions of R&D activities are of particular concern. Little public information exists for most of the small businesses surveyed by BRDI-M, so it is difficult to determine whether or not companies are reporting R&D that satisfies the survey's definitions, particularly where the development of software and internet applications are concerned. While 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.

Definitions

Employment, total and R&D. Involves the number of people employed by the company as well as those involved in R&D activities during the pay period that included 12 March of the survey year (2016). (The date 12 March is what most employers use when paying first-quarter employment taxes to the Internal Revenue Service.) 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.

Innovation. BRDI-M questions on innovation activities refer to product, process, marketing, and organizational innovation. A *product innovation* is the market introduction of a new or significantly improved good or service with respect to its capabilities, user-friendliness, components, or subsystems. A *process innovation* is the implementation of a new or significantly improved production process or delivery method for the company's goods or services. Product and process innovations (new or improved) must be new to the respondent company, but they do not need to be new to the company's market, and the innovations could have been originally developed by the respondent company or by other companies. A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion, or pricing. An organizational innovation is the implementation of a new organizational method in the company's business practices, workplace organization, or external relations.

R&D and business R&D. R&D is planned, creative work aimed at discovering new knowledge or developing new or significantly improved goods and services. 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 to produce new or significantly 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.

Sales. Dollar values for sales, revenues, and grants. Included are revenues from the company's domestic 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 nonoperating income such as dividends and interest as well as excise, sales, and other revenue-based taxes.

Data Availability

Publications

The data from BRDI-M can be found online at <https://www.nsf.gov/statistics/srvymicrobus/#tabs-2>. Information from BRDI-M is also included in *Science and Engineering Indicators* and in *National Patterns of R&D Resources*.

Electronic Access

BRDI-M contains confidential data that are protected under Title 13 and Title 26 of the United States Code. Two types of data are currently available: public-use tabular statistics, and restricted microdata. Detailed tabular statistics can be obtained by contacting the BRDI-M project officer. Microdata for the BRDI-M can only be accessed at the U.S. Census Bureau's secure **Research Data Centers** (RDCs). To learn more about RDCs and for instructions on how to apply for data use, please visit the Center for Economic Studies page on **research opportunities**.

Technical Tables

Table Title

A-1	Companies in the target population and selected for the sample, by industry: 2016
A-2	Response measures: 2016
A-3	Unit response rates, by industry: 2016

TECHNICAL TABLE A-1

Companies in the target population and selected for the sample, by industry: 2016

(Number of companies)

Industry	NAICS code	Companies in target population ^a	Companies selected for the sample		
			All companies	Noncertainties	Certainties
All industries	21–23, 31–33, 42–81	2,595,220	161,066	74,127	86,939
Manufacturing industries	31–33	82,479	9,801	3,667	6,134
Food	311	6,229	313	298	15
Beverages and tobacco products	312	2,214	107	106	1
Textiles, apparel, and leather products	313–16	5,804	280	279	1
Wood products	321	3,542	177	170	7
Paper	322	443	26	21	5
Printing and related support activities	323	10,443	501	501	0
Petroleum and coal products	324	209	12	10	2
Chemicals	325	2,448	1,503	48	1,455
Basic chemicals	3251	240	12	11	1
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	150	150	0	150
Pesticides, fertilizers, and other agricultural chemicals	3253	183	11	9	2
Pharmaceuticals and medicines	3254	453	453	0	453
Soaps, cleaning compounds, and toilet preparations	3256	573	28	28	0
Paints, coatings, adhesives, and other chemicals	3255, 3259	849	849	0	849
Plastics and rubber products	326	1,886	102	90	12
Nonmetallic mineral products	327	2,530	130	121	9
Primary metals	331	774	40	37	3
Fabricated metal products	332	15,034	739	721	18
Machinery	333	5,490	299	262	37
Agricultural implements	33311	314	15	15	0
Semiconductor machinery	333242	30	30	0	30
Engines, turbines, and power transmission equipment	3336	155	9	8	1
Other machinery	other 333	4,991	245	239	6
Computer and electronic products	334	3,222	3,222	0	3,222
Communications equipment	3342	328	328	0	328
Semiconductors and other electronic components	3344	798	798	0	798
Navigational, measuring, electromedical, and control instruments	3345	1,286	1,286	0	1,286
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	212	212	0	212
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	107	107	0	107
Other measuring and controlling devices	other 3345	967	967	0	967
Other computer and electronic products	other 334	810	810	0	810
Electrical equipment, appliances, and components	335	1,303	1,303	0	1,303
Transportation equipment	336	2,663	158	127	31
Automobiles, bodies, trailers, and parts	3361–63	1,519	78	73	5
Aerospace products and parts	3364	308	27	14	13
Aircraft, aircraft engines, and aircraft parts	336411–13	297	16	14	2
Guided missiles, space vehicles, and related parts	336414, 336415, 336419	11	11	0	11
Military armored vehicles, tanks, and tank components	336992	10	10	0	10
Other transportation	other 336	826	43	40	3

TECHNICAL TABLE A-1

Companies in the target population and selected for the sample, by industry: 2016

(Number of companies)

Industry	NAICS code	Companies in target population ^a	Companies selected for the sample		
			All companies	Noncertainties	Certainties
Furniture and related products	337	5,650	273	271	2
Miscellaneous	339	11,123	544	534	10
Medical equipment and supplies	3391	4,790	237	230	7
Other miscellaneous manufacturing	3399	6,333	307	304	3
Nonmanufacturing industries	–	1,472	72	71	1
Mining, extraction, and support activities	21–23, 42–81	2,512,741	151,265	70,460	80,805
Utilities	21	9,547	507	457	50
Wholesale trade	22	1,472	74	70	4
Electronic shopping and electronic auctions	42	140,879	7,115	6,746	369
Transportation and warehousing	454111–12	14,555	712	698	14
Information	48–49	84,922	4,171	4,073	98
Publishing	51	32,918	3,863	1,465	2,398
Newspaper, periodical, book, and directory publishers	511	7,409	2,573	244	2,329
Software publishers	5111	5,085	249	244	5
Telecommunications	5112	2,324	2,324	0	2,324
Data processing, hosting, and related services	517	3,908	194	187	7
Other information	518	3,432	178	164	14
Finance and insurance	other 51	18,169	918	870	48
Real estate and rental and leasing	52	138,678	7,078	6,637	441
Lessors of nonfinancial intangible assets (except copyrighted works)	53	175,724	8,604	8,428	176
Other real estate and rental and leasing	533	1,050	59	50	9
Professional, scientific, and technical services	other 53	174,674	8,545	8,378	167
Architectural, engineering, and related services	54	458,599	93,073	18,434	74,639
Computer systems design and related services	5413	47,532	2,356	2,278	78
Scientific research and development services	5415	68,252	68,252	0	68,252
Biotechnology research and development	5416	95,044	4,877	4,547	330
Physical, engineering, and life sciences (except biotechnology) research and development	5417	5,034	5,034	0	5,034
Social sciences and humanities research and development	541711	1,183	1,183	0	1,183
Other professional, scientific, and technical services	541712	3,329	3,329	0	3,329
Health care services	541720	522	522	0	522
Other nonmanufacturing	other 54	242,737	12,554	11,609	945
Health care services	621–23	224,912	11,899	10,743	1,156
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	1,219,532	13,635	12,181	1,454
Unclassified	–	11,003	534	528	6

NAICS = 2012 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 2016 Microbusiness R&D and Innovation Survey sample for the small stratum (companies with 1–4 employees).

^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.

Note(s)

Certainties were companies with a probability of selection of one because they were in an industry where all companies were included in the sample or they had a payroll that was in the top 100 in their state. Noncertainties are companies with a probability of selection of 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. The total sample size reflects the time between sample selection and survey mailout; that is, the sample was updated before actual mailout took place.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey, 2016.

TECHNICAL TABLE A-2

Response measures: 2016

(Percent)

Measure	2016
Check-in rate ^a	77.2
Response rate (unweighted) ^b	76.7

^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 companies responding to at least one of the human resources questions on owners who received a W-2, other owners, employees who received a W-2, individuals receiving payment in other ways, or unpaid individuals who worked for your company or, if human resources questions were not responded to, the number of companies indicating they ceased operations or were 50% or more owned by another U.S. company, divided by the total number of in-scope companies in the sample.

Note(s)

Rates are for companies with 1–4 employees, based on final employment.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Microbusiness R&D and Innovation Survey.

TECHNICAL TABLE A-3

Unit response rates, by industry: 2016

(Number)

Industry	NAICS code	Active reporting units ^a	Reporting units that met the response criteria ^b	Reporting units that met the response criteria (%)
All industries	21–23, 31–33, 42–81	137,479	105,444	76.7
Manufacturing industries	31–33	8,218	6,185	75.3
Food	311	238	158	66.4
Beverages and tobacco products	312	66	40	60.6
Textiles, apparel, and leather products	313–16	238	154	64.7
Wood products	321	152	116	76.3
Paper	322	20	17	85.0
Printing and related support activities	323	455	351	77.1
Petroleum and coal products	324	9	9	100.0
Chemicals	325	1,243	903	72.6
Basic chemicals	3251	12	9	75.0
Resins, synthetic rubber, and artificial synthetic fibers and filaments	3252	119	93	78.2
Pesticides, fertilizers, and other agricultural chemicals	3253	10	8	80.0
Pharmaceuticals and medicines	3254	337	248	73.6
Soaps, cleaning compounds, and toilet preparations	3256	29	18	62.1
Paints, coatings, adhesives, and other chemicals	3255, 3259	736	527	71.6
Plastics and rubber products	326	81	63	77.8
Nonmetallic mineral products	327	93	78	83.9
Primary metals	331	38	25	65.8
Fabricated metal products	332	621	494	79.5
Machinery	333	263	204	77.6
Agricultural implements	33311	17	12	70.6
Semiconductor machinery	333242	25	19	76.0
Engines, turbines, and power transmission equipment	3336	8	7	87.5
Other machinery	other 333	213	166	77.9
Computer and electronic products	334	2,732	2,096	76.7
Communications equipment	3342	270	201	74.4
Semiconductors and other electronic components	3344	694	529	76.2
Navigational, measuring, electromedical, and control instruments	3345	1,088	853	78.4
Electromedical, electrotherapeutic, and irradiation apparatuses	334510, 334517	159	124	78.0
Search, detection, navigation, guidance, aeronautical, and nautical systems and instruments	334511	87	66	75.9
Other measuring and controlling devices	other 3345	842	663	78.7
Other computer and electronic products	other 334	680	513	75.4
Electrical equipment, appliances, and components	335	1,112	827	74.4
Transportation equipment	336	130	101	77.7
Automobiles, bodies, trailers, and parts	3361–63	63	47	74.6
Aerospace products and parts	3364	21	18	85.7
Aircraft, aircraft engines, and aircraft parts	336411–13	13	10	76.9
Guided missiles, space vehicles, and related parts	336414–15, 336419	8	8	100.0

TECHNICAL TABLE A-3

Unit response rates, by industry: 2016

(Number)

Industry	NAICS code	Active reporting units ^a	Reporting units that met the response criteria ^b	Reporting units that met the response criteria (%)
Military armored vehicles, tanks, and tank components	336992	9	7	77.8
Other transportation	other 336	37	29	78.4
Furniture and related products	337	235	171	72.8
Miscellaneous	339	476	378	79.4
Medical equipment and supplies	3391	211	178	84.4
Other miscellaneous manufacturing	3399	265	200	75.5
Nonmanufacturing industries	21–23, 42–81	129,261	99,259	76.8
Mining, extraction, and support activities	21	427	326	76.3
Utilities	22	58	52	89.7
Wholesale trade	42	6,177	4,679	75.7
Electronic shopping and electronic auctions	454111–12	616	433	70.3
Transportation and warehousing	48–49	3,499	2,427	69.4
Information	51	3,281	2,467	75.2
Publishing	511	2,199	1,665	75.7
Newspaper, periodical, book, and directory publishers	5111	219	169	77.2
Software publishers	5112	1,980	1,496	75.6
Telecommunications	517	163	101	62.0
Data processing, hosting, and related services	518	145	105	72.4
Other information	other 51	774	596	77.0
Finance and insurance	52	6,254	4,942	79.0
Real estate and rental and leasing	53	7,558	5,635	74.6
Lessors of nonfinancial intangible assets (except copyrighted works)	533	46	36	78.3
Other real estate and rental and leasing	other 53	7,512	5,599	74.5
Professional, scientific, and technical services	54	80,484	63,124	78.4
Architectural, engineering, and related services	5413	2,032	1,702	83.8
Computer systems design and related services	5415	59,330	46,354	78.1
Scientific research and development services	5417	3,844	2,985	77.7
Biotechnology research and development	541711	853	634	74.3
Physical, engineering, and life sciences (except biotechnology) research and development	541712	2,551	1,991	78.0
Social sciences and humanities research and development	541720	440	360	81.8
Other professional, scientific, and technical services	other 54	15,278	12,083	79.1
Health care services	621–23	10,037	7,753	77.2
Other nonmanufacturing	23, 44–45 (excluding 454111–12), 55–56, 624, 71–72, 81	10,702	7,421	69.3

NAICS = 2012 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, 1-4 employees, business activities in the survey year, and primary business activities in the NAICS codes listed above) after all data have been processed.

^b Reporting units were considered to have fulfilled the response criteria if they responded to at least one of the human resources questions on owners who received a W-2, other owners, employees who received a W-2, individuals receiving payment in other ways, or unpaid individuals who worked for

your company or, if human resources questions were not responded to, the number of companies indicating they ceased operations or were 50% or more owned by another U.S. company.

Source(s)

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