National Center for Science and Engineering Statistics

InfoBrief

Businesses Spent Over a Half Trillion Dollars for R&D Performance in the United States During 2020, a 9.1% Increase Over 2019

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Businesses spent $538 billion on research and development performance in the United States in 2020, a 9.1% increase from 2019 (table 1). Funding from the companies' own sources was $466 billion in 2020, an 8.7% increase from 2019. Funding from other sources was $71 billion, an 11.7% increase from 2019. These increases follow a 2-year period of double-digit annual growth in the level of national domestic R&D performance,[1] which is especially notable because of the low rate of inflation during the period 2017–20. This robust rate of growth may continue based on the large increase in the amount that companies projected they would spend from their own funds for domestic R&D performance during 2021 as they began to recover from the COVID-19 pandemic.[2] Data for this InfoBrief are from the 2020 Business Enterprise Research and Development Survey (BERD), developed and cosponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF) and by the Census Bureau, which collected and tabulated data for the survey.[3]

Table 1

Funds spent for business R&D performed in the United States, by type of R&D, source of funds, and size of company: 2017–20

(Millions of dollars)

Selected characteristic and company size	2017	2018	2019	2020
Domestic R&D performance[a]	400,100	441,036	492,956	537,619
Type of R&D[b]				
Basic research	24,829	28,980	32,239	36,017
Applied research	62,132	65,222	74,031	76,088
Development	313,139	346,834	386,686	425,514
Paid for by the company[c]	339,036	377,806	428,968	466,162
Basic research	18,732	22,312	25,916	29,330
Applied research	49,149	53,229	59,697	60,620

Table 1

Funds spent for business R&D performed in the United States, by type of R&D, source of funds, and size of company: 2017–20

(Millions of dollars)

Selected characteristic and company size	2017		2018		2019		2020	
Development	271,155		302,264		343,355		376,213	
Paid for by others	61,065		63,230		63,989		71,457	
Basic research	6,097		6,668		6,324		6,688	
Applied research	12,984		11,993		14,333		15,468	
Development	41,984		44,570		43,332		49,301	
Source of funds								
Federal	24,277	i	24,685		21,941		28,905	
Other[d]	36,788		38,545		42,048		42,552	
Size of company (number of domestic employees)								
Small companies[e]								
10–19	3,311		4,390		5,501		5,047	
20–49	9,435		11,252		12,418		12,994	
Medium companies								
50–99	10,141		12,321		14,021		12,993	
100–249	17,216		18,547		19,793		25,411	
Large companies								
250–499	14,103		19,645		18,883		20,878	
500–999	17,871		17,657		23,969		21,264	
1,000–4,999	65,112		68,578		75,671		88,238	
5,000–9,999	40,198		45,337		50,811		48,397	
10,000–24,999	73,485		84,420		88,263		88,567	
25,000 or more	149,227		158,889		183,626		213,829	

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

[a] Domestic R&D performance is the cost of R&D paid for and performed by the respondent company and paid for by others outside of the company and performed by the respondent company.

[b] R&D comprises creative and systematic work undertaken in order to increase the stock of knowledge and to devise new applications of available knowledge. This includes (1) activities aimed at acquiring new knowledge or understanding without specific immediate commercial applications or uses (basic research), (2) activities aimed at solving a specific problem or meeting a specific commercial objective (applied research), and (3) systematic work, drawing on research and practical experience and resulting in additional knowledge, which is directed to producing new processes or to improving existing products—goods or services—or processes (development).

[c] Includes foreign subsidiaries of U.S. companies.

[d] Includes companies located inside and outside the United States; U.S. state government agencies and laboratories; U.S. universities, colleges, and academic researchers; and all other organizations located inside and outside the United States.

[e] Includes only companies with 10 or more domestic employees.

Note(s):
Detail may not add to total because of rounding. Beginning in survey year 2018, companies that performed or funded less than $50,000 of R&D were excluded from tabulation. These companies in aggregate represented a very small share of total R&D expenditures in prior years. Had the companies under this threshold been included in the 2018 estimates, they would have contributed approximately $90 million to overall R&D expenditures. Excludes data for federally funded research and development centers.

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

R&D Performance, by Type of R&D, Industry Sector, and Source of Funding

In 2020, of the $538 billion that companies spent on R&D, $36 billion (7%) was spent on basic research, $76 billion (14%) on applied research, and $426 billion (79%) on development. The distribution was similar to the 2019 distribution (7%, 15%, and 78%, respectively) (table 1). In 2020, companies in manufacturing industries performed $308 billion (57%) of *domestic R&D*, defined as R&D performed in the 50 states and Washington, DC (table 2). Most of the funding came from these companies' own funds (86%). Companies in nonmanufacturing industries performed $229 billion of domestic R&D (43% of total domestic R&D performance), 88% of which was paid for from companies' own funds.

Table 2

Funds spent for business R&D performed in the United States, by source of funds, selected industry, and company size: 2020

(Millions of dollars)

Industry, NAICS code, and company size	All R&D[a]	Paid for by the company[b]	Paid for by others				
			Total	Federal	Companies		All other organizations[d]
					Domestic	Foreign[c]	
All industries, 21–33, 42–81	537,619	466,162	71,457	28,905	21,572	19,854	1,126
Manufacturing industries, 31–33	308,445	264,596	43,848	21,710 i	5,929	15,798	411
Chemicals, 325	101,079	89,403	11,675	1,101	2,602	7,906	D
Pharmaceuticals and medicines, 3254	91,776	80,858	10,918	1,066	2,592	7,198	D
Other 325	9,303	8,545	757	35	10	708	D
Machinery, 333	16,223	15,071	1,152	98	214	825	15
Computer and electronic products, 334	99,535	88,505	11,030	6,434 i	1,586	2,954	58
Electrical equipment, appliance, and components, 335	4,998	4,492	506	29	48	423	5
Transportation equipment, 336	48,796	30,232	18,564	13,961 i	1,355	3,026	222
Motor vehicles, bodies, trailers, and parts, 3361–63	23,121	19,522	3,599	68	654	2,843	35
Aerospace products and parts, 3364	22,914 i	9,111	13,803 i	12,797 i	D	D	188
Other 336	2,761	1,599	1,162	1,096	D	D	0
Manufacturing nec, other 31–33	37,814	36,893	921	87 i	124	664	D
Nonmanufacturing industries, 21–23, 42–81	229,174	201,566	27,608	7,195	15,643 i	4,057	715
Information, 51	129,463	128,350	1,113	364	206	455	89
Software publishers, 5112	34,965	34,456	509	65	181	187	76
Other 51	94,498	93,894	604	299	25	268	13
Finance and insurance, 52	12,296	12,204	92	45	5	0	41
Professional, scientific, and technical services, 54	54,367	28,322	26,045	6,733	15,297 i	3,491	524
Computer systems design and related services, 5415	17,935	14,293	3,643	662	581	2,315	85
Scientific research and development services, 5417	25,600	6,246	19,354	3,914	14,109 i	1,073	257
Other 54	10,832	7,783	3,048	2,157	607	103	182
Nonmanufacturing nec, other 21–23, 42–81	33,048	32,690	358	53	135	111	61
Size of company (number of domestic employees)							
Small companies[e]							
10–19	5,047	4,019	1,029	445	300	156	128
20–49	12,994	10,970	2,025	856	601	456	112
Medium companies							
50–99	12,993	11,177	1,816	604	490	656	65
100–249	25,411	22,132	3,280	1,499	723	842	216
Large companies							
250–499	20,878	18,067	2,811	1,070	550	1,043	149

Table 2

Funds spent for business R&D performed in the United States, by source of funds, selected industry, and company size: 2020

(Millions of dollars)

Industry, NAICS code, and company size	All R&D[a]	Paid for by the company[b]	Paid for by others				
			Total	Federal	Companies		All other organizations[d]
					Domestic	Foreign[c]	
500–999	21,264	18,458	2,807	467	712	1,591	35
1,000–4,999	88,238	75,917	12,322	2,744	1,825 i	7,653	99
5,000–9,999	48,397	42,451	5,945	814	3,677 i	1,332	124
10,000–24,999	88,567	72,827	15,739 i	1,330	8,356 i	5,995	58
25,000 or more	213,829	190,145	23,684	19,075 i	4,338	131	138

D = suppressed to avoid disclosure of confidential information; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = North American Industry Classification System; nec = not elsewhere classified.

[a] All R&D is the cost of R&D paid for and performed by the respondent company and paid for by others outside of the company and performed by the respondent company.

[b] Includes foreign subsidiaries of U.S. companies ($27.0 billion).

[c] Includes foreign parent companies of U.S. subsidiaries ($17.8 billion) and unaffiliated companies ($2.1 billion). Excludes funds from foreign subsidiaries to U.S. companies paid for through intercompany transactions ($27.0 billion).

[d] Includes U.S. state government agencies and laboratories ($0.2 billion); U.S. universities, colleges, and academic researchers (< $0.01 billion); and all other organizations located inside ($0.7 billion) and outside the United States (< $0.01 billion).

[e] Includes only companies with 10 or more domestic employees.

Note(s):
Detail may not add to total because of rounding. Beginning in survey year 2018, companies that performed or funded less than $50,000 of R&D were excluded from tabulation. These companies in aggregate represented a very small share of total R&D expenditures in prior years. Had the companies under this threshold been included in the 2018 estimates, they would have contributed approximately $90 million to overall R&D expenditures. Industry classification was based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Excludes data for federally funded research and development centers.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2020.

The U.S. federal government was a large source of *external funding for R&D* (also referred to as *R&D paid for by others*) across all industries. Of the $71 billion paid for by others, the federal government accounted for $29 billion. Ninety percent of federal government funding went to three industry groups: aerospace products and parts (North American Industry Classification System [NAICS] code 3364) ($13 billion), professional, scientific, and technical services (NAICS 54) ($7 billion), and computer and electronic products (NAICS 334) ($6 billion). Companies also received funds from other U.S. companies ($22 billion) and foreign companies—including foreign parent companies of U.S. subsidiaries ($20 billion). The distribution of this external nonfederal R&D funding was spread more broadly across multiple industries (table 2). (See "Survey Information and Data Availability" for information on the availability of data tables with full industry detail.)

Sales, R&D Intensity, and Employment of Companies That Performed or Funded R&D

U.S. companies that performed or funded R&D reported domestic net sales of $11 trillion in 2020 (table 3).[4] For all industries, the R&D intensity (R&D-to-sales ratio) was 4.8%; for manufacturers, 5.4%; and for nonmanufacturers, 4.1%. Manufacturing industries with high levels of R&D intensity in 2020 were pharmaceuticals and medicines (NAICS 3254) (16.6%), computer and electronic products (NAICS 334) (13.1%), and aerospace products and parts (NAICS 3364) (8.5%). Among the nonmanufacturing industries, industries with high levels of R&D intensity were scientific research and development services (NAICS 5417) (36.4%), software publishers (NAICS 5112) (13.9%), and computer systems design and related services (NAICS 5415) (10.7%).

Table 3

Sales, R&D, R&D intensity, and employment for companies that performed or funded business R&D in the United States, by selected industry and company size: 2020

(Millions of dollars, percent, and number)

Industry, NAICS code, and company size	Domestic net sales ($millions)[a]	All R&D ($millions)[b]		R&D intensity (%)[c]	Domestic employment (thousands)[d]	
					Total	R&D[e]
All industries, 21–33, 42–81	11,296,552	537,619		4.8	22,034	1,936
Manufacturing industries, 31–33	5,694,734	308,445		5.4	10,065	985
Chemicals, 325	1,117,545	101,079		9.0	1,459	193
Pharmaceuticals and medicines, 3254	551,305	91,776		16.6	606	146
Other 325	566,240	9,303		1.6	853	47
Machinery, 333	356,214	16,223		4.6	899	101
Computer and electronic products, 334	757,047	99,535		13.1	1,337	264
Electrical equipment, appliance, and components, 335	153,123	4,998		3.3	296	27
Transportation equipment, 336	917,847	48,796		5.3	1,638	174
Motor vehicles, bodies, trailers, and parts, 3361–63	578,503	23,121		4.0	832	101
Aerospace products and parts, 3364	268,261	22,914	i	8.5	636	62
Other 336	71,083	2,761		3.9	170	11
Manufacturing nec, other 31–33	2,392,958	37,814		1.6	4,436	226
Nonmanufacturing industries, 21–23, 42–81	5,601,818	229,174		4.1	11,970	952
Information, 51	1,653,526	129,463		7.8	2,244	422
Software publishers, 5112	251,461	34,965		13.9	447	113
Other 51	1,402,065	94,498		6.7	1,797	309
Finance and insurance, 52	1,447,133	12,296		0.8	1,751	66
Professional, scientific, and technical services, 54	417,867	54,367		13.0	1,308	300
Computer systems design and related services, 5415	167,910	17,935		10.7	428	94
Scientific research and development services, 5417	70,334	25,600		36.4	257	107
Other 54	179,623	10,832		6.0	623	99
Nonmanufacturing nec, other 21–23, 42–81	2,083,292	33,048		1.6	6,667	164
Size of company (number of domestic employees)						
Small companies[f]						
10–19	23,576	5,047		21.4	75	32
20–49	101,277	12,994		12.8	319	94
Medium companies						
50–99	128,409	12,993		10.1	394	89
100–249	406,650	25,411		6.2	789	145
Large companies						
250–499	299,155	20,878		7.0	750	112
500–999	411,894	21,264		5.2	910	96
1,000–4,999	1,517,137	88,238		5.8	2,899	327
5,000–9,999	1,177,564	48,397		4.1	1,815	169
10,000–24,999	2,071,049	88,567		4.3	3,345	277
25,000 or more	5,159,841	213,829		4.1	10,739	595

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

NAICS = North American Industry Classification System; nec = not elsewhere classified.

[a] Dollar values are for goods sold or services rendered by R&D-performing or R&D-funding companies located in the United States to customers outside of the company, including the U.S. federal government, foreign customers, and the company's foreign subsidiaries. Included are revenues from a company's foreign operations and subsidiaries and from discontinued operations. If a respondent company is owned by a foreign parent company, sales to the parent company and to affiliates not owned by the respondent company are included. Excluded are intracompany transfers, returns, allowances, freight charges, and excise, sales, and other revenue-based taxes.

[b] All R&D is the cost of R&D paid for and performed by the respondent company and paid for by others outside of the company and performed by the respondent company.

[c] R&D intensity is the cost of domestic R&D paid for by the respondent company and others outside of the company and performed by the company divided by domestic net sales of companies that performed or funded R&D.

[d] Data recorded on 12 March represent employment figures for the year.

[e] Includes researchers, R&D managers, technicians, clerical staff, and others assigned to R&D groups.

[f] Includes only companies with 10 or more domestic employees.

Note(s):
Detail may not add to total because of rounding. Beginning in survey year 2018, companies that performed or funded less than $50,000 of R&D were excluded from tabulation. These companies in aggregate represented a very small share of total R&D expenditures in prior years. Had the companies under this threshold been included in the 2018 estimates, they would have contributed approximately $90 million to overall R&D expenditures. Estimates of aggregate sales and total domestic employment would have been similarly affected. Industry classification was based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Excludes data for federally funded research and development centers.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2020.

Businesses that performed or funded R&D employed 22.0 million people in the United States in 2020 (table 3).[5] Approximately 1.9 million (9%) were business R&D employees.[6] Not surprisingly, industries with high levels of R&D intensity also had high numbers of R&D employees: computer and electronic products (NAICS 334) (264,000 R&D employees), pharmaceuticals and medicines (NAICS 3254) (146,000), and aerospace products and parts (NAICS 3364) (62,000). Nonmanufacturing industry groups with high numbers of R&D employees were software publishers (NAICS 5112) (113,000 R&D employees), scientific research and development services (NAICS 5417) (107,000), and computer systems design and related services (NAICS 5415) (94,000).

Of the 1.9 million people working on R&D in companies that performed or funded business R&D in 2020, 1.4 million were men, and 0.5 million were women; 52% of the men and 48% of the women worked in manufacturing industries (table 4). Researchers—that is, scientists, engineers, and their managers—accounted for 1.3 million of the 1.9 million R&D workers (68%). Of the R&D workers, 129,000 (7%) held PhD degrees. R&D technicians numbered 443,000, and there were 181,000 grouped as other supporting staff.

Table 4

Domestic employment, R&D employment by sex and work activity, R&D researchers by level of education, and full-time equivalent researcher employment for companies that performed or funded business R&D in the United States, by industrial sector: 2020

(Thousands of employees)

Industry and NAICS code	Domestic employment[a]	R&D employment								
		Total	Male	Female	Researchers[b]		Technicians and equivalent staff	Other supporting staff[c]	Full-time equivalent[d]	
					Total	With PhD			Total	Researchers[b]
All industries, 21–33, 42–81	22,034	1,936	1,419	517	1,312	129	443	181	1,765	1,201
Manufacturing industries, 31–33	10,065	985	736	249	668	82	204	112	888	608
Nonmanufacturing industries, 21–23, 42–81	11,970	952	683	268	643	46 i	239	69	878	593

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

NAICS = North American Industry Classification System.

[a] Data recorded on 12 March represent employment figures for the year.

[b] Includes R&D scientists and engineers and their managers.

[c] Includes clerical staff and others assigned to R&D groups.

[d] The number of persons employed who were assigned full time to R&D, plus a prorated number of employees who worked on R&D only part of the time.

Note(s):
Detail may not add to total because of rounding. Beginning in survey year 2018, statistics are representative of companies located in the United States that performed or funded $50,000 or more of R&D. These changes have affected the comparability of these estimates with estimates published for years prior to 2018. Industry classification was based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Excludes data for federally funded research and development centers. Also available in the full set of data tables are statistics on domestic R&D employment, by state; foreign R&D personnel headcounts, by country; and headcounts of leased (i.e., external) R&D personnel, by function.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2020.

R&D Performance, by Company Size

Small- and medium-sized companies (10–249 domestic employees) performed 10% of the nation's total business R&D in 2020 (table 1).[7] For these companies as a group, the R&D intensity was 8.6% (table 1 and table 3). These companies accounted for 6% of sales and employed 7% of the 22.0 million employees who worked for R&D-performing or R&D-funding companies. They employed 19% of the 1.9 million employees engaged in business R&D in the United States.

Large companies with 250–24,999 domestic employees performed 50% of the nation's total business R&D in 2020, and their R&D intensity was 4.9%. They accounted for 48% of sales, employed 44% of those who worked for R&D-performing or R&D-funding companies, and employed 51% of R&D employees in the United States.

The largest companies (25,000 or more domestic employees) performed 40% of the nation's total business R&D in 2020, and their R&D intensity was 4.1%. They accounted for 46% of sales, employed 49% of those who worked for R&D-performing or R&D-funding companies, and employed 31% of business R&D employees in the United States.

R&D Performance, by State

In 2020, of the $538 billion of R&D performed in the United States, businesses in California alone accounted for 36% (table 5). Other states with large amounts of business R&D were Washington (8% of the national total in 2020); Massachusetts (6%); Texas (5%); New York, New Jersey, and Michigan (4% each); Pennsylvania and Illinois (3% each); and North Carolina (2%).[8]

Table 5

Funds spent for business R&D performed in the United States, by state and source of funds: 2020

(Millions of dollars)

State	All R&D[a]		Paid for by the company		Paid for by others	
United States	537,619		466,162		71,457	
Alabama	2,937		1,329		1,609	
Alaska	47	e	43	e	3	
Arizona	7,110		4,899		2,211	i
Arkansas	414		360		54	
California	193,063		175,459		17,604	
Colorado	7,145		6,042		1,103	
Connecticut	7,902		6,487		1,415	
Delaware	2,499		1,688		811	
District of Columbia	659		509		150	
Florida	7,885		5,762		2,122	
Georgia	5,389		4,426		963	i
Hawaii	279		216		62	
Idaho	2,210	i	2,139	i	71	
Illinois	14,097		13,415		683	
Indiana	8,305	i	7,202	i	1,102	
Iowa	3,455		2,664		791	i

Table 5

Funds spent for business R&D performed in the United States, by state and source of funds: 2020

(Millions of dollars)

State	All R&D[a]		Paid for by the company		Paid for by others	
Kansas	2,771		1,956		814	i
Kentucky	1,259		852		407	
Louisiana	535		475		60	
Maine	434		385		49	
Maryland	5,923		3,964		1,959	
Massachusetts	32,737		27,704		5,033	
Michigan	21,589		18,507		3,081	i
Minnesota	7,824		7,421		403	
Mississippi	278		244		34	
Missouri	6,502		4,581		1,921	i
Montana	242		224		18	i
Nebraska	838		769		68	
Nevada	931	i	707		224	i
New Hampshire	2,755		1,093		1,661	
New Jersey	22,009		18,054		3,955	
New Mexico	1,140		857		283	
New York	23,414		21,062		2,353	
North Carolina	13,369		9,242		4,127	i
North Dakota	342		331		12	
Ohio	11,005		7,511		3,494	i
Oklahoma	1,012		945		67	i
Oregon	10,472		10,190		283	
Pennsylvania	15,443		13,544		1,899	i
Rhode Island	700	i	581	i	119	
South Carolina	1,567		1,337		230	
South Dakota	216		209		7	
Tennessee	1,820		1,568		251	
Texas	26,084		22,834		3,250	i
Utah	3,285		2,981		304	
Vermont	368		295		73	
Virginia	7,235		5,072		2,163	
Washington	41,615		40,576		1,038	
West Virginia	229		203		25	
Wisconsin	6,430		5,506		924	
Wyoming	1,047		1,035		11	
Undistributed funds[b]	807		707		100	

e = more than 50% the value of the state estimate uses a hybrid estimator modeling technique; see section "Survey Information and Data Availability" for more details. i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

[a] All R&D is the cost of domestic R&D paid for by the respondent company and others outside of the company and performed by the respondent company.

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

Note(s):
Beginning in survey year 2018, companies that performed or funded less than $50,000 of R&D were excluded from tabulation. These companies in aggregate represented a very small share of total R&D expenditures in prior years. Had the companies under this threshold been included in the 2018 estimates, they would have contributed approximately $90 million to overall R&D expenditures. Excludes data for federally funded research and development centers.

Source(s):
National Center for Science and Engineering Statistics and Census Bureau, Business Enterprise Research and Development Survey, 2020.

Capital Expenditures

Companies that performed or funded R&D in the United States in 2020 spent $686 billion on capital, that is, assets with expected useful lives of more than 1 year (table 6). Of this amount, $32 billion (5%) was for assets used for domestic R&D operations—land acquisitions, buildings and land improvement, equipment, capitalized software, and other assets: $20 billion by companies in manufacturing industries, and $13 billion by companies in nonmanufacturing industries. Manufacturing industries with high levels of capital expenditures on assets used for domestic R&D in 2020 were pharmaceuticals and medicines (NAICS 3254) ($5 billion, or 14% of national capital expenditures on assets used for R&D), semiconductor and other electronic products (NAICS 3344) ($4 billion, or 12%), and motor vehicles, bodies, trailers, and parts (NAICS 3361–63) ($1 billion, or 4%). Among the nonmanufacturing industries with high levels of capital assets used for domestic R&D were computer systems design and related services (NAICS 5415) ($1 billion, or 4%), software publishers (NAICS 5112) ($1 billion, or 3%), and scientific research and development services (NAICS 5417) ($1 billion, or 3%). Among all types of capital assets, manufacturing industries spent the most on equipment ($12 billion, or 59% of total capital assets used for domestic R&D), and nonmanufacturing industries disbursed the most on capitalized software ($6 billion, or 46%).

Table 6

Capital expenditures in the United States and for domestic R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2020

(Millions of U.S. dollars)

Selected industry, NAICS code, and company size	Total[b]	Used for domestic R&D[a]					
		Total[b,c]	Land acquisition	Buildings and land improvement[d]	Equipment	Capitalized software	All other and undistributed[e]
All industries, 21–33, 42–81	686,393	32,494	147	4,060	15,731	8,436	4,120
Manufacturing industries, 31–33	288,842	19,727	123	3,073	11,666	2,576	2,289
Chemicals, 325	57,186	5,311	19	1,661	2,336	452	844
Pharmaceuticals and medicines, 3254	22,872	4,619	16	1,545	1,841	425	792
Other 325	34,314	692	3	116	495	27	52
Machinery, 333	16,259	1,298	2	157	727	290	122
Computer and electronic products, 334	39,845	7,578	4 i	532	5,349	1,207	485
Communication equipment, 3342	4,053	742	0	6 i	429	259 i	48
Semiconductor and other electronic products, 3344	21,535 i	3,850	0	88	2,983	561	218
Other 334	14,257	2,986	4	438	1,937	387	219
Electrical equipment, appliance, and components, 335	3,817	638	0	34	479	21	104
Transportation equipment, 336	63,159	1,924	42	275	1,208	234	164
Motor vehicles, bodies, trailers, and parts, 3361–63	52,378	1,418	28	203	865	214	108
Aerospace products and parts, 3364	8,223	403	1	59	301	13	29
Other 336	2,558	103	13	13	42	7	27
Manufacturing nec, other 31–33	108,576	2,978	56	414	1,567	372	570
Nonmanufacturing industries, 21–23, 42–81	397,551	12,767	24	987	4,065	5,859	1,831
Information, 51	153,819	5,301	1	361	2,554	2,010	374
Software publishers, 5112	22,445	1,085	*	186	547	231	121
Telecommunications services, 517	61,468	205 i	0	*	53	148 i	3
Other 51	69,906	4,011	*	*	1,954	1,631	250
Finance and insurance, 52	28,420	1,969	* i	*	119	1,639 i	211
Professional, scientific, and technical services, 54	12,142	2,838	19	522	1,064	865	370
Computer systems design and related services, 5415	4,543	1,148	0	63	573	363	149

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Capital expenditures in the United States and for domestic R&D paid for and performed by the company, by type of expenditure, industry, and company size: 2020

(Millions of U.S. dollars)

Selected industry, NAICS code, and company size	Total[b]	Used for domestic R&D[a]											
		Total[b,c]		Land acquisition		Buildings and land improvement[d]		Equipment		Capitalized software		All other and undistributed[e]	
Scientific research and development services, 5417	3,532	1,063		18		446		415		100		84	
Other 54	4,067	627		1		13		76		402		137	
Nonmanufacturing nec, other 21–23, 42–81	203,170	2,659		*		*		328		1,345		876	
Size of company (number of domestic employees)													
Small companies[f]													
10–19	1,784	452		2		50		152		108		141	
20–49	8,869	1,025		1		121		525		199		178	
Medium companies													
50–99	5,891	1,152		11		212		484		218	i	228	
100–249	19,307	1,593		33		350		726		320		164	
Large companies													
250–499	21,765	1,295		2	i	188		506		442		157	
500–999	18,493	1,559		15		128		739		485		192	
1,000–4,999	81,956	6,406		24	i	1,185		2,564		1,538		1,095	
5,000–9,999	79,859	2,803		18		267		1,261		915		342	
10,000–24,999	125,016	6,249		17		606		2,990		1,921		715	
25,000 or more	323,454	9,960		23		953		5,785		2,290	i	908	i

* = amount < $500,000; i = more than 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = North American Industry Classification System; nec = not elsewhere classified.

[a] Domestic R&D is the R&D paid for by the respondent company and others outside of the company and performed by the company.

[b] Capital expenditures are payments by a business for assets that usually have a useful life of more than 1 year. The value of assets acquired or improved through capital expenditures is recorded on a company's balance sheet. BERD statistics exclude the cost of assets acquired through mergers and acquisitions.

[c] Capital expenditures for long-lived assets used in a company's R&D operations are not included in its R&D expense, but any depreciation recorded for those assets is included in its R&D expense. For 2020, depreciation associated with domestic R&D paid for and performed by the company was $18.6 billion and with domestic R&D performed by the company and paid for by others was $2.4 billion.

[d] Includes the cost of purchased or improved buildings and other facilities that are fixed to the land.

[e] Includes the cost of other capital expenditures, including purchased patents and other intangible assets, and expenditures not distributed among the categories shown.

[f] Includes only companies with 10 or more domestic employees.

Note(s):
Detail may not add to total because of rounding. Beginning in survey year 2018, companies that performed or funded less than $50,000 of R&D were excluded from tabulation. These companies in aggregate represented a very small share of total R&D expenditures in prior years. Had the companies under this threshold been included in the 2018 estimates, they would have contributed approximately $90 million to overall R&D expenditures. Estimates of aggregate capital expenditures would have been similarly affected. Industry classification was based on dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Excludes data for federally funded research and development centers.

Source(s):
National Center for Science and Engineering Statistics and U.S. Census Bureau, Business Enterprise Research and Development Survey, 2020.

Survey Information and Data Availability

The sample for BERD was selected to represent all for-profit, nonfarm companies that were publicly or privately held, had 10 or more employees in the United States, and performed or funded R&D either domestically or abroad. The estimates in this InfoBrief are based on responses from a sample of the population and may differ from actual values because of sampling variability or other factors. As a result, apparent differences between the estimates for two or more groups may not be statistically significant. All comparative statements in this InfoBrief have undergone statistical testing and are significant at the 90% confidence level unless otherwise noted. The variances of estimates in this report were calculated using design-based formulas. Also, because the statistics from the survey are based on a sample, they are subject to both sampling and nonsampling errors. (See "Technical Notes" in the data tables reports at https://www.nsf.gov/statistics/srvyberd/#tabs-2.)

Beginning in survey year 2018, companies that performed or funded less than $50,000 of R&D were excluded from tabulation. In prior years, companies that performed or funded any amount of R&D were tabulated. This change has affected the comparability of these estimates to those published for years prior to 2018. These companies in aggregate represented a very small share of total R&D expenditures in prior years, but they accounted for a larger share of the company count estimates.[9] (Company counts are available in the full set of data tables.)

In this InfoBrief, money amounts are expressed in current U.S. dollars and are not adjusted for inflation. A *company* is defined as a business organization located in the United States, either U.S. owned or a U.S. affiliate of a foreign parent company, of one or more establishments under common ownership or control.

For 2019, a total of 46,000 companies were sampled to represent the population of 1,125,000 companies; for 2020, a total of 47,500 companies were sampled, representing 1,140,000 companies. The actual numbers of reporting units in the sample that remained within the scope of the survey between sample selection and tabulation were 42,500 for 2019 and 44,500 for 2020. These lower counts represent the number of reporting units that were determined to be within the scope of the survey after all data collected were processed. Reasons for the reduced counts include mergers, acquisitions, and instances where companies had fewer than 10 employees in the United States or had gone out of business in the interim. Of these in-scope reporting units, 69% were considered to have met the criteria for a complete response to the 2019 survey; 67% fulfilled the 2020 complete response criteria. Among the units with account managers—that is, the top R&D companies based on prior year reported or imputed data that were assigned an analyst to act as a single point of contact for all communications—80% met the 2019 complete response criteria, and 82% met the 2020 criteria. Coverage of the previous year's known positive R&D stratum for 2019 was 83%; the coverage rate for 2020 was 85%. Industry classification was based on the dominant business activity for domestic R&D performance, where available. For reporting units that did not report business activity codes for R&D, the classification used for sampling was assigned.[10]

The estimation methodology for state estimates in BERD takes the form of a hybrid estimator, combining the unweighted reported amount, by state, with a weighted amount apportioned (or raked) across states with relevant industrial activity. The hybrid estimator smooths the estimate over states with R&D activity, by industry, and accounts for real observed change within a state. Table 5 shows the results of this estimation methodology for state estimates.

The full set of data tables from this survey will be available in the report ***Business Enterprise Research and Development: 2020***. Individual data tables and tables with relative standard errors and imputation rates from the 2020 survey are available from the author in advance of the full report. To minimize reporting burden, survey items are rotated on and off the survey on an odd- and even-numbered year schedule. Statistics on patents, intellectual property, and technology transfer activities for 2020 are available in the full set of data tables. Items rotated off of the survey for 2020 included questions on activities with academia, R&D performed by others by type of performer, federal R&D by government agency, and R&D by application area. Statistics on these items will be available again for the 2021 cycle.

BERD contains confidential data that are protected under Title 13 and Title 26 of the U.S. Code. Restricted microdata can be accessed at the secure Federal Statistical Research Data Centers (FSRDC) administered by the Census Bureau. FSRDCs are partnerships between federal statistical agencies and leading research institutions. FSRDCs provide secure environments supporting qualified researchers using restricted-access data while protecting respondent confidentiality. Researchers interested in using the microdata can submit a proposal to the Census Bureau, which evaluates proposals based on their benefit to Census, scientific merit, feasibility, and risk of disclosure. To learn more about the FSRDCs and how to apply, please visit https://www.census.gov/about/adrm/fsrdc.html.

Notes

1 See Wolfe R; NCSES. 2021. *Businesses Reported an 11.8% Increase to Nearly a Half Trillion Dollars for U.S. R&D Performance During 2019*. NSF 22-303. Alexandria, VA: National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf22303.

2 When responding to the 2020 survey, companies projected they would spend $575 billion of their own funds for R&D performance in the United States during 2021. For more information about recent trends in national R&D, see Boroush M; NCSES. 2022. *U.S. R&D Increased by $62 Billion in 2019 to $667 Billion; Estimate for 2020 Indicates a Further Rise to $708 Billion*. NSF 22-330. Alexandria, VA: National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf22330.

3 NSF has cosponsored an annual business R&D survey since 1953. The Survey of Industrial Research and Development (SIRD) collected data for 1953–2007, and its successor, the Business R&D and Innovation Survey (BRDIS), collected data for 2008–16. Beginning with 2017, the collection of innovation data was moved to the Annual Business Survey (ABS), another survey cosponsored with the Census Bureau, and BRDIS became the Business Research and Development Survey (BRDS). Beginning with 2019, the business R&D data collection reported here was renamed the Business Enterprise Research and Development Survey (BERD) for international comparability.

4 Determining the amount of domestic net sales and operating revenues was left to the reporting company. However, guidance was given to include revenues from foreign operations and subsidiaries and from discontinued operations and to exclude intracompany transfers, returns, allowances, freight charges, and excise, sales, and other revenue-based taxes.

5 Employment statistics in this InfoBrief are headcounts unless they are designated as full-time equivalent (FTE) estimates. R&D employees include researchers (defined as R&D scientists and engineers and their managers) and the technicians, technologists, and support staff members who work on R&D or who provide direct support to R&D activities.

6 The number of persons employed who were assigned full time to R&D plus a prorated number of employees who worked on R&D only part of the time was 1.8 million FTEs, of which 1.2 million FTEs were R&D researchers.

7 Company size classifications changed for 2017 and subsequent years in response to the revised *Frascati Manual*; see Organisation for Economic Co-operation and Development (OECD). 2015. *Frascati Manual: Guidelines for Collecting and Reporting Data on Research and Experimental Development. The Measurement of Scientific, Technological, and Innovation Activities*. Paris: OECD Publishing. Available at https://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015_9789264239012-en. Anderson and Kindlon (2019) provide estimates of R&D performance and employment using these new classifications over 2008–15. The authors also compare the trends to those observed in SIRD for the time prior to 2008. The ABS, also cosponsored by NCSES and the Census Bureau, collects R&D data from companies with fewer than 10 employees for 2017 and beyond. See Anderson G, Kindlon A; NCSES. 2019. *Indicators of R&D in Small Businesses: Data from the 2009–15 Business R&D and Innovation Survey*. InfoBrief NSF 19-316. Alexandria, VA: National Science Foundation. Available at https://www.nsf.gov/statistics/2019/nsf19316/.

8 In addition to statistics for all states and for all states by industry, below-state level statistics are available in the full set of data tables and in other InfoBriefs; see Shackelford B, Wolfe R; NCSES. 2019. *Over Half of U.S. Business R&D Performed in 10 Metropolitan Areas in 2015*. InfoBrief NSF 19-322. Alexandria, VA: National Science Foundation. Available at https://www.nsf.gov/statistics/2019/nsf19322/. Also see Shackelford B, Wolfe R; NCSES. 2020. *Businesses Performed 60% of*

Their U.S. R&D in 10 Metropolitan Areas in 2018. NSF 21-331. Alexandria, VA: National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf21331. Information and statistics on U.S. state trends in R&D, science and engineering education, workforce, patents and publications, and knowledge-intensive industries is also available in the Science and Engineering State Indicators data tool at https://ncses.nsf.gov/indicators/states.

9 Had the companies under this threshold been included in the 2020 estimates, they would have contributed approximately $130 million to overall R&D expenditures and would have added around 9,300 to the estimated number of U.S. companies with R&D expenditures.

10 The Census Bureau reviewed the information in this paragraph for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied per Census Bureau Data Review Board approval identification numbers CBDRB-FY20-432, CBDRB-FY21-145, CBDRB-FY21-032, CBDRB-FY21-221, and CBDRB-FY22-125.

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