

TABLE 65

## Domestic R&amp;D paid for by the company and others and performed by the company, by business activity: 2011–21

(Millions of U.S. dollars)

Business activity <sup>a</sup>	Business code <sup>b</sup>	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
All business activities	21100–81000	290,240	302,759	323,107	340,539	355,671	378,590	396,979	443,633	491,434	538,870	602,499
Oil and gas extraction	21100	D	D	D	1,108	D	867	0 - 11,355 i	0 - 16,964	712	681	813
Mining	21200	83	88	80	54	68	58	121	92	121	104	89 i
Support activities for mining, including oil and gas	21300	D	1,860	1,871	2,349	2,076	1,544	1,599 i	836 i	1,364	722	651 i
Utilities	22100	298	434	343	343	485	349	323 i	272	274	275	34 - 1,538
Construction	23000	752	756	244 i	204 i	521	258 i	507	686	868	1,071	783
Food manufacturing	31100	3,769	3,565	5,156	4,934 i	4,388 i	4,966	4,809	4,678	4,756	5,098	5,235
Beverage manufacturing	31210	D	D	628	D	664	0 - 28,354 i	734	702	654	663	740
Tobacco manufacturing	31220	D	140	163	D	153	153	175	196	189	217	233
Textile, apparel, and leather products manufacturing	31990	623	688	687	662 i	794	1,244 i	904	934	831	768	775
Wood products manufacturing	32100	202	278	234	322 i	227	238	236	261	232	234	476
Paper manufacturing	32200	755	982	1,166	1,028	D	1,165	1,411	1,302	1,472	1,244	1,534
Printing and related support activities	32300	244	305 i	389	363	287	304	265	321	439	352	307 - 1,044
Petroleum refineries	32401	D	596	438	D	443	441	396	491	0 - 17,119	0 - 25,158	392
Asphalt paving, roofing, and saturated materials manufacturing	32402	38	41	117 i	66	52 i	75	124	107	110	197	138
Other petroleum and coal products manufacturing, including motor oil, hydraulic fluid, and charcoal	32403	285	218	312 i	279 i	268	202	223	133	106 - 2,076	120	91
Basic chemicals manufacturing	32510	3,099	3,228	2,925	3,144	3,071	2,946	2,897	2,897	2,638	3,039	3,048
Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	32520	815	1,093	999	1,054	1,213	930	825	1,262	1,293	1,338	1,284 - 2,021
Pesticide, fertilizer, and other agricultural chemicals manufacturing	32530	D	1,951	2,114 i	2,057 i	D	1,900 i	1,977	2,384 i	2,094	1,512	1,266 - 2,003
Pharmaceutical, medicinal, botanical, and biological products (except diagnostic substances) manufacturing <sup>c</sup>	32541	42,381	43,672	42,456	43,748	40,540	43,964	45,846	48,489	55,243	56,811	58,651
In vitro diagnostic substances manufacturing <sup>c</sup>	32542	1,110	1,044 i	831	729	801	987	1,308	1,151	1,380	1,596	1,622
Biotechnology-based pharmaceutical and biological products (except diagnostic substances)	32543	NA	NA	7,118	10,337	14,071	16,440	18,629	23,591	29,477	32,452	38,166
Soap, cleaning compound, and toilet preparations manufacturing	32591	2,344	2,261	2,286	2,365	2,451	2,550	2,492	2,534	0 - 17,119	2,404	2,238 - 2,975
Paint, adhesive, and other chemical manufacturing	32592	1,552	1,630	1,489	1,562 i	D	0 - 28,354	1,636	1,361	1,423	1,472	1,325 - 2,062
Plastics and rubber products manufacturing	32600	2,669	3,277	3,010	3,072 i	2,910	3,396	3,264	3,128	2,997	2,921	3,226
Clay and glass products manufacturing	32710	801 i	987 i	973 i	1,003 i	948	987	1,199	1,333	1,326 i	1,376 i	1,376

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Cement, concrete, lime, gypsum, and other nonmetallic mineral products manufacturing	32790	303	367	458 i	564 i	393 i	374	378	331	437	374	418
Primary metal manufacturing	33100	552	750	644	703	596 i	0 - 28,354	608	708	742	915	1,023
Fabricated metal products manufacturing	33200	D	2,236	2,535 i	2,280	2,541	2,321	2,650	2,764	3,278	3,895	4,861
Agricultural machinery and equipment manufacturing	33311	989	1,175	1,193	1,230	1,172	1,194	1,224	1,529	1,549	0 - 25,158	1,475 - 2,212
Construction machinery manufacturing	33312	655	675	1,340	1,309	1,210	1,209	1,203	1,316 i	1,276	1,254	1,384
Mining, oil, and gas field machinery and equipment manufacturing	33319	1,735	1,999	1,436 i	1,142	1,431	1,107	1,272	1,324	1,104	1,028	1,223
Semiconductor machinery manufacturing	33321	2,207	1,308 i	3,146	2,979	3,218	3,374	3,707	4,131	4,396	4,752	5,308
Industrial machinery manufacturing (except semiconductor machinery)	33322	945	850	878	1,158	1,143	900	1,049	971	1,386	1,042	1,411
Photographic and photocopying equipment manufacturing	33331	656	23 i	458	79	133	92	61	59 i	162	0 - 25,158	70
Commercial, service industry, temperature control, and air-flow control machinery manufacturing	33332	D	1,182	1,367	1,446	1,380	0 - 28,354	1,780	1,667	1,712	1,440	1,907
Digital cameras manufacturing	33333	NA	NA	NA	25	491 i	421 i	475	230	409	313 i	398 - 1,135
Engine, turbine, and power transmission equipment manufacturing	33360	3,257	3,603	2,373	1,847	2,304	2,365	2,543	2,273	2,550	2,466	2,050
Metalworking and other general purpose machinery manufacturing	33390	1,832	1,607	1,780	2,089	2,292	2,139	2,039	2,468	2,394	2,881	2,532
Computers and peripheral equipment manufacturing and magnetic and optical media <sup>d</sup>	33412	10,311	10,893	11,162	9,651	10,997	18,321	20,751	21,765	19,060 i	22,842	24,633
Telephone apparatus manufacturing, including routers, modems, and gateways	33421	7,006	5,101	5,534	7,734	9,529	8,182	7,789	8,550	8,495	7,562	7,853 - 8,590
Radio, television, and wireless communication equipment manufacturing	33422	4,182	5,851	7,664	6,325 i	3,387 i	4,108 i	3,942 i	0 - 16,964 i	2,589 i	2,286	3,313
Other communication equipment manufacturing (except radio, television, and wireless communication equipment)	33429	871	1,937	1,729	1,687	1,695 i	1,798	1,536	0 - 16,964	1,686	1,641	681
Audio and video equipment manufacturing	33430	798	865	876	1,018	1,071 i	972	1,058	1,084	1,270	1,285	1,517
Semiconductor and other electronic components manufacturing	33440	24,580	28,983	30,792	31,986	30,805	31,428	30,858	31,240	35,725	44,110	46,882
Electromedical, electrotherapeutic, and irradiation apparatus manufacturing	33451	2,787	2,868 i	3,178 i	3,670	3,409	3,417 i	3,094	4,079	3,973	3,902	4,358
Search, detection, navigation, guidance, aeronautical, and nautical system and instruments manufacturing	33452	5,666	6,403	6,550	6,234	6,503	8,275	6,538	7,819	7,870	8,840 i	3,918
Measuring and control instruments manufacturing (not listed elsewhere)	33459	3,191	3,465	3,901	4,045	4,201	4,222	3,885	3,888	3,911	4,376	4,273
Electrical equipment, appliances, and components manufacturing	33500	3,007	3,391	4,208	4,461	4,378	4,805	4,512	4,362	5,230	5,295	5,420
Motor vehicles manufacturing	33610	9,320	11,314	11,696	12,134	12,502	15,095	16,308	17,447	15,241	15,574	18,365
Motor vehicle body and trailer manufacturing	33620	69	91 i	98 i	96	156 i	113	44	93	155	82	137

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Motor vehicle parts manufacturing	33630	3,010	D	4,554	6,022	6,158	6,401	6,946	7,800	8,146	i	7,780	7,728								
Aircraft manufacturing	33641	5,853	15,380	i	16,607	i	15,632	i	14,757	i	28,354	i	9,704	i	14,488	i	10,720	i	15,641	9,707	i
Aircraft engine and engine parts manufacturing	33642	1,636	1,296	1,758	2,294	i	1,580	1,738	1,850	2,226	2,104	2,038	8,246	i							
Other aircraft parts and auxiliary equipment manufacturing	33643	1,896	2,655	3,446	4,443	4,919	3,817	4,453	1,887	1,434	1,740	1,491									
Guided missiles, space vehicles, and related parts manufacturing	33644	3,526	2,850	2,703	2,826	i	3,011	3,063	i	3,269	3,405	3,496	3,357	2,426							
Railroad rolling stock manufacturing	33651	136	177	183	295	240	187	0 - 11,355	148	0 - 17,119	i	239	212	i							
Ship and boat building	33660	D	D	1,106	1,568	i	D	0 - 28,354	i	1,289	0 - 16,964	0 - 17,119	964	858							
Motorcycle, bicycle, and parts manufacturing	33691	212	i	176	i	214	i	251	282	286	0 - 11,355	372	368	417	447						
Military armored vehicle, tank, and tank components manufacturing	33692	D	122	215	358	335	392	653	i	664	i	541	468	731							
All other transportation equipment manufacturing	33699	415	D	362	428	D	368	564	465	465	552	559									
Furniture and related products manufacturing	33700	300	382	383	389	458	364	438	428	458	462	456									
Medical equipment and supplies manufacturing	33910	10,141	10,703	11,797	10,987	11,336	12,024	13,299	13,211	14,801	14,638	16,924									
Miscellaneous manufacturing not listed elsewhere (games, office supplies, slot machines, etc.)	33990	2,593	D	2,544	2,387	2,455	i	2,597	i	2,575	2,861	2,499	3,032	3,193							
Merchant wholesalers, durable goods	42300	505	1,461	i	449	i	414	i	1,507	i	551	i	364	730	i	750	855	1,301	i		
Merchant wholesalers, nondurable goods	42400	429	651	i	272	i	D	546	i	153	i	207	273	i	0 - 17,119	384	660	i			
Wholesale electronic markets and agents and brokers (business to business)	42500	54	182	i	D	139	D	23	41	i	94	i	37	i	36	i	50				
Retail trade (except electronic shopping and electronic auctions)	44000	52	101	i	96	i	58	i	87	149	69	190	280	216	362						
Electronic shopping and electronic auctions	45411	940	i	1,239	993	1,051	1,543	i	0 - 28,354	i	0 - 11,355	0 - 16,964	i	0 - 17,119	i	0 - 25,158	i	11,931 - 12,668	i		
Transportation	48000	123	D	D	388	205	i	100	691	2,045	i	9,398	i	25,158	i	5,929	i				
Couriers, messengers, and express delivery services	49200	D	D	D	344	D	394	421	446	290	923	1,115									
Warehousing and storage	49300	15	15	15	3	3	0	90	76	128	i	33	0 - 2,201								
Newspaper, periodical, book, and directory publishers (except Internet)	51110	345	i	229	i	316	i	89	i	99	i	80	i	83	151	84	0 - 25,158	127	i		
Software publishers (except Internet) <sup>e</sup>	51120	22,635	23,803	26,661	31,392	29,887	i	26,685	24,362	25,742	24,798	23,520	27,969								
Motion picture and sound recording (except Internet)	51200	61	73	i	86	71	i	10	16	27	i	148	72	81	0 - 1,503						
Broadcasting (except Internet)	51500	94	36	53	70	i	101	i	0 - 28,354	i	0 - 11,355	186	0 - 2,469	0 - 25,158	i	0 - 2,201	i				
Wired telecommunications carriers	51710	867	1,482	i	951	i	945	i	1,229	i	1,067	i	924	469	424	505	599				

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Wireless telecommunications carriers (except satellite)	51720	391 i	739 i	1,768 i	2,481	1,176 i	1,477 i	1,920	2,147	2,306	2,022	2,492
Satellite telecommunications	51740	D	195	106	107	681 i	699 i	593	451	475	0 - 25,158	510
Other telecommunications (not listed elsewhere)	51790	495	383	322	255	459	448	413	691	0 - 17,119	427	304
Data processing, hosting, and related services <sup>e</sup>	51800	4,922	3,997	4,009	4,754	5,839	6,295	6,217	6,809	8,885	11,223	13,122
Cloud computing applications and Internet-based software services	51801	NA	NA	3,727 i	5,718	5,783	9,981	16,812	20,600	28,631	39,147	43,204
Other information services, including Internet publishing, broadcasting, and Web search portals <sup>e</sup>	51910	D	11,397	13,485	15,306	21,534	23,962	28,445	37,435	46,171	53,228	63,299
Finance: banking and credit intermediation	52200	1,365	1,601	1,834	2,451	2,708	4,474	4,819	4,309	4,924	7,917	12,777
Securities, commodity contracts, and other financial investments and related activities, including funds and trusts	52310	1,148	893	1,153	937	1,352	1,516	1,587	1,248	1,445	1,815	4,427
Insurance carriers and related activities	52400	D	1,141	1,573	887	1,364	1,216	1,127	1,673	2,190	2,542	3,661
Real estate	53100	13	26 i	100	193	280	438	251	377	0 - 17,119	368	0 - 2,201
Rental and leasing services	53200	27	D	69	59	D	97 i	536 i	639	945	2,766	1,423
Lessors of nonfinancial intangible assets, including patent licensing	53300	319	369	74	78	79	40	58	23	59	0 - 25,158	0 - 831
Legal, accounting, tax preparation, bookkeeping, and payroll services	54111	578 i	417 i	514 i	826 i	1,283	892	875	1,148	1,901	2,492	2,674
Architectural, engineering, and related services	54130	2,028	4,206 i	3,398	3,392	4,143 i	3,259	2,664	4,293	4,421	4,347	4,900
Specialized design services	54140	271	207 i	101	97	83	77	198 i	0 - 16,964	163	212	170
Computer systems design and related services <sup>e</sup>	54150	11,129	12,390 i	11,472 i	13,216 i	13,647	14,159	12,607	16,346	19,604	16,755	18,843
Management, scientific, and technical consulting services	54160	1,745	2,280	2,030	1,958	1,761	2,137 i	1,903	2,796	2,561	2,671	3,761
Research and development services in the social sciences and humanities	54172	D	601	792	745	756	0 - 28,354	1,124	674	764	0 - 25,158	562
Research and development services in biotechnology <sup>c,f</sup>	54173	6,030	7,146	4,145	3,083 i	5,178 i	3,911 i	3,610	5,398	5,564	5,482	8,686
Research and development services in the physical, engineering, and life sciences (except biotechnology)	54174	7,196	9,427	9,139	9,068	10,907	10,621	11,842	14,904	15,130 i	19,362 i	24,511 i
Research and development services in nanotechnology	54175	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 - 25,158	231
Advertising and related services	54180	80	377 i	450 i	435	424	344	381	1,032 i	1,107 i	1,284 i	2,096 i
Professional, scientific, and technical services (not listed elsewhere)	54190	1,316	2,463 i	1,786	1,020	1,228	874	1,113	1,246	1,649	1,883	1,714
Management of companies and enterprises	55100	20	40	68	25 i	D	28	70	0 - 16,964	0 - 17,119	0 - 25,158	0 - 1,503
Administrative and support services	56100	338	436	556 i	401 i	202 i	418	1,405	2,302	3,285	3,521	3,293

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Waste management and remediation services	56200	19 i	D	39 i	31	24 i	25	20	20	20	0 - 25,158	530 r
Offices of physicians	62110	24	73 i	74 i	88 i	79 i	106 i	190	155	508	235	298
Medical and diagnostic laboratories	62150	764	1,027	959	965	1,204	0 - 28,354 i	1,210	2,049	2,467	2,065	2,721
Other ambulatory health care services (ambulance, dental, home health care)	62199	11	41 i	51 i	35 i	42 i	24 i	65	46	148	93	300
Hospitals and nursing care facilities	62200	2	2 i	2	7 i	7	9	0 - 11,355	0 - 10,879	0 - 11,355	0 - 25,158	0 - 1,503
Social assistance services	62400	7	36	38	16	2	2	0 - 11,355	0 - 16,964	0 - 17,119	0 - 25,158	0 - 1,503
Arts, entertainment, and recreation	71000	105	108	31	91 i	D	44	48	44	415	0 - 25,158	64 r
Accommodation and food services	72000	74	131 i	123 i	57	87	61	49	120	80	122	103
Other services (not listed elsewhere)	81000	366	553	366	576	682	0 - 28,354	0 - 11,355	0 - 16,964	654	0 - 25,158	6,736 i
Undistributed <sup>g</sup>	-	28,583 i	1,689 i	336 i	63	0	0	0	0	0	0	0

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

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

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

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

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

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

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

<sup>g</sup> Includes data reported that were not allocated to a business activity.

**Note(s):**

Detail may not add to total because of rounding. For companies that did not report business codes, the classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded \$50,000 or more of R&D and are not comparable with estimates published for years prior to 2018. For survey years 2009–13, industry classification was based on the 2007 NAICS. For survey years 2014–19, industry classification was based on the 2012 NAICS. For survey years beginning in 2020, classification was based on the 2017 NAICS. Most statistics for years prior to 2021 have been revised since original publication. Revised statistics include adjustments based on information obtained after the original statistics were prepared. An estimate range may be displayed in place of a single estimate to avoid disclosing operations of individual companies.

**Source(s):**

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