



U.S. Companies Performed \$73 Billion in R&D Outside the United States in 2013

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U.S. companies performed \$73 billion in research and development outside the United States in 2013, or 18% of their worldwide total R&D performance (table 1).² These same companies performed \$323 billion in R&D in the United States. These estimates include the R&D of U.S.-owned companies and U.S. subsidiaries of foreign-owned companies, but they exclude the foreign R&D of companies not owned or controlled by the surveyed U.S.-located companies.³ The R&D reported here includes costs paid for by the reporting company (R&D expenses) and costs paid for by customers, grant-making organizations, or partners. Data are from the Business R&D and Innovation Survey (BRDIS), cosponsored by the National Center for Science and Engineering Statistics within the National Science Foundation and by the Census Bureau.

Foreign R&D by Industry and Company Size

The four largest industries in terms of foreign R&D performance were software publishers (North American Industry Classification System [NAICS] code 5112), pharmaceuticals and medicines (NAICS 3254), semiconductor and other electronic components (NAICS 3344), and automobiles, bodies, trailers, and parts

(NAICS 3361–63) (table 1). These four industries accounted for over half (52%) of all foreign R&D performance by U.S. companies. Foreign R&D performance by U.S. companies is more concentrated by industry than is domestic R&D performance, where the four largest industries accounted for 45% of the total.

The share of R&D performed by U.S. companies outside the United States (18% overall) varies from less than 10% in industries such as aerospace products and parts (NAICS 3364) to over 25% in industries such as electrical equipment, appliances, and components (NAICS 335) and automobiles, bodies, trailers, and parts (NAICS 3361–63) (table 1). Of the four largest industries in terms of foreign R&D performance, all but pharmaceuticals and medicines (NAICS 3254) are estimated to have higher than average shares of R&D performed outside the United States. The relatively low share of foreign R&D performance in the aerospace products and parts industry is partly due to the fact that the single largest customer for aerospace and defense products worldwide is the United States government. Companies in this industry are often subject to federal procurement regulations and International Traffic in Arms Regulations (ITAR) that restrict U.S. companies

from performing some R&D—both federally funded and company funded—outside the United States.

Most of the foreign R&D of U.S. businesses is performed by large companies (companies with 500 or more domestic employees). Even though large companies tend to have relatively more R&D employees located outside the United States than do smaller companies, foreign R&D employment is somewhat less concentrated in large companies than is R&D performance in terms of dollars (89% versus 94% in 2013) (table 1).⁴ By comparison, large companies accounted for 84% of the R&D performed by companies within the United States and 70% of the domestic R&D employment.

R&D per Foreign and Domestic Employee

On the basis of cost per R&D employee, U.S. companies spent 77% more on R&D performed domestically than on R&D performed outside the United States (table 2). On average, U.S. companies spent \$216,000 on domestic R&D performance per U.S. R&D employee, compared with \$122,000 on foreign R&D performance per foreign R&D employee. There are large differences in spending per R&D employee between domestic and foreign

TABLE 1. Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company, by selected industry and company size: 2013
(Millions of U.S. dollars)

Industry and company size	NAICS code	R&D performance		
		Worldwide	Domestic	Foreign
All industries	21–23, 31–33, 42–81	395,628	322,528	73,100
Manufacturing industries	31–33	272,580	221,476	51,104
Beverage and tobacco products	312	1,358	827	531
Pharmaceuticals and medicines	3254	62,477	52,426	10,051
Chemicals except pharmaceuticals	325 less 3254	11,920	9,238	2,682
Machinery	333	15,502	12,650	2,852
Computer and electronic products	334	85,480	67,205	18,275
Communications equipment	3342	20,353	15,658	4,696
Semiconductor and other electronic components	3344	40,609	30,800	9,809
Navigational, measuring, electromedical, and control instruments	3345	16,769	14,478	2,291
Other computer and electronic products	other 334	7,748	6,269	1,480
Electrical equipment, appliances, and components	335	5,741	4,136	1,605
Automobiles, bodies, trailers, and parts	3361–63	23,605	16,729	6,877
Aerospace products and parts	3364	29,331	27,114	2,218
Other transportation equipment	other 336	2,255	2,129	124
Manufacturing nec	other 31–33	34,911	29,022	5,889
Nonmanufacturing industries	21–23, 42–81	123,048	101,052	21,996
Mining, extraction, and support activities	21	4,449	3,997	452
Information	51	70,857	57,207	13,650
Software publishers	5112	46,664	35,333	11,331
Other information	other 51	24,193	21,874	2,319
Finance and insurance	52	5,011	4,308	703
Computer systems design and related services	5415	10,563 i	9,268 i	1,294
Scientific research and development services	5417	18,464	14,201	4,263
Nonmanufacturing nec	other 21–23, 42–81	13,704	12,071	1,634
Size of company (number of domestic employees)				
5–24	–	11,034 i	10,297 i	737
25–49	–	8,381 i	7,941 i	440
50–99	–	9,254	8,910	344
100–249	–	14,941	13,666	1,275
250–499	–	13,562	12,189	1,373
500–999	–	13,658	12,002	1,656
1,000–4,999	–	69,097	55,517	13,580
5,000–9,999	–	42,350	31,514	10,836
10,000–24,999	–	60,999	51,218	9,782
25,000 or more	–	152,351	119,275	33,076

i = imputed; > 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2007 North American Industry Classification System; nec = not elsewhere classified.

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

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Business R&D and Innovation Survey, 2013.

TABLE 2. Worldwide, domestic, and foreign R&D paid for by the company and others and performed by the company per R&D employee, by selected industry: 2013
(Thousands of U.S. dollars)

Industry and company size	NAICS code	Company-performed R&D per R&D employee		
		Worldwide	Domestic	Foreign
All industries	21–23, 31–33, 42–81	189	216	122
Manufacturing industries	31–33	215	247	139
Beverage and tobacco products	312	218	226	207
Chemicals	325	324	371	202
Pharmaceuticals and medicines	3254	403	449	262
Chemicals except pharmaceuticals	325 less 3254	161	189	107
Machinery	333	136	152	94
Computer and electronic products	334	216	263	131
Communications equipment	3342	236	277	158
Semiconductor and other electronic components	3344	222	283	132
Navigational, measuring, electromedical, and control instruments	3345	209	238	117
Other computer and electronic products	other 334	171	214	93
Electrical equipment, appliances, and components	335	106	136	67
Automobiles, bodies, trailers, and parts	3361–63	198	202	190
Manufacturing nec	other 31–33	190	210	114
Nonmanufacturing industries	21–23, 42–81	149	169	95
Mining, extraction, and support activities	21	240	256	154
Information	51	175	207	106
Software publishers	5112	161	196	104
Other information	other 51	207	228	116
Finance and insurance	52	169	169	165
Computer systems design and related services	5415	94	124	34
Scientific research and development services	5417	174	197	126
Nonmanufacturing nec	other 21–23, 42–81	89	91	71

NAICS = 2007 North American Industry Classification System; nec = not elsewhere classified.

NOTES: Ratios were calculated using unrounded data. Industry classification based on dominant business code for domestic R&D performance where available. For companies that did not report business codes, classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded R&D.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Business R&D and Innovation Survey, 2013.

R&D performance in many industries, but they are most pronounced in the information and communications technologies (ICT) industries, such as computer and electronics products manufacturers (NAICS 334), software publishers (NAICS 5112), and computer systems design and related services (NAICS 5415). These ICT industries all have higher than average shares of foreign R&D employment.⁵ There are relatively small differences in R&D performance between domestic and foreign R&D employees in the industries for automobiles, bodies, trailers, and parts (NAICS 3361–63), beverage

and tobacco products (NAICS 312), and finance and insurance (NAICS 52).

Foreign R&D by Country and Region

Of the \$73 billion in R&D U.S. companies performed outside the United States, \$70 billion could be attributed to a specific foreign location (table 3).⁶ The United Kingdom and Germany were the two largest individual locations, and Europe as a whole accounted for almost 50% of the foreign R&D performance of U.S. companies. The Asia and Pacific region accounted for 31% of the foreign R&D, with India and

China being the two largest locations in the region. Outside of Europe and Asia and the Pacific, the largest locations for foreign R&D performance were Canada, Israel, and Brazil.

Of the top 10 locations for U.S. business R&D outside the United States, 9 exhibit industry concentrations that differ substantially from the average (table 4). The computer and electronic products manufacturing industries (NAICS 334) accounted for 25% of the foreign R&D performance of U.S. companies in 2013, but they were much more prominent in Singapore (58%),

TABLE 3. R&D paid for by the company and others and performed by the company outside of the United States, by selected location: 2013
(Millions of U.S. dollars)

Location	Total	Location	Total
Total	73,100	Europe	35,398
Puerto Rico	69	Austria	229
Canada	5,265	Belgium	1,713
Latin America and Other Western Hemisphere	3,320	Czech Republic	353
Argentina	327	Denmark	573
Brazil	1,584	Finland	556
Chile	46	France	3,082
Mexico	803	Germany	8,637
Other Latin American and Western Hemisphere locations	560	Hungary	121
Africa	229	Ireland	1,674
South Africa	156	Italy	1,148
Other African locations	73	Luxembourg	41
Asia and Pacific	21,935	Netherlands	1,052
Australia	1,545	Norway	421
China	5,774	Poland	430
Hong Kong	173	Russia	462
India	5,860	Spain	560
Indonesia	29	Sweden	734
Japan	2,761	Switzerland	2,495
Malaysia	803	Turkey	93
New Zealand	140	United Kingdom	8,949
Singapore	2,115	Other European locations	2,076
South Korea	1,195	Middle East	4,192
Taiwan	682	Israel	4,086
Thailand	193	Other Middle Eastern locations	106
Other Asian and Pacific locations	665	Undistributed	2,692 ⁱ

ⁱ = imputed; > 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NOTES: Detail may not add to total because of rounding. Country detail was not asked for on Form BRDI-1(S). Statistics are representative of companies located in the United States that performed or funded R&D.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Business R&D and Innovation Survey, 2013.

Israel (49%), India (45%), and China (37%). The foreign R&D of the information sector (NAICS 51) was much more concentrated than the average (19%) in the United Kingdom (31%), India (31%), Israel (29%), and Canada (27%). Combined, the computer and electronic products manufacturing (NAICS 334) and information industries (NAICS 51) accounted for over half of the foreign R&D located in India, China, Canada, Israel, and Singapore.⁵ Japan and Switzerland each had a higher than average share of R&D from the pharmaceuticals and medicines industry (NAICS 3254) and Germany had a high concentration of

R&D in the transportation equipment manufacturing industries (NAICS 336). The industry distribution of R&D performed in France was similar to the average for all foreign locations.

Data Sources and Limitations

The sample for BRDIS was selected to represent all for-profit, nonfarm companies that are publicly or privately held and have five or more employees in the United States. BRDIS defines a company as a business organization located in the United States, either U.S. owned or a U.S. affiliate of a foreign parent, of one or more establishments

under common ownership or control. Estimates produced from the survey and presented in this InfoBrief are restricted to companies that perform or fund R&D, either domestically or abroad. 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 survey's detailed statistical tables at <https://www.nsf.gov/statistics/industry/>).

For 2013, a total of 45,089 companies were sampled, representing 1,971,959 companies. The actual numbers of reporting units in the sample that

TABLE 4. Industry profile of top 10 locations of R&D paid for by the company and others and performed by the company outside of the United States, by selected industry: 2013

Location	Foreign R&D performance of U.S. companies (\$millions)	Computer and electronic products (NAICS 334) (%)	Information (NAICS 51) (%)	Pharmaceuticals and medicines (NAICS 3254) (%)	Transportation equipment (NAICS 336) (%)	All other industries (%)
Total	73,100	25	19	14	13	30
United Kingdom	8,949	8	31 i	17	12	32
Germany	8,637	21	9	5	32	33
India	5,860	45	31	4	7	13
China	5,774	37	21	7	6	30
Canada	5,265	27	27	12	12	21
Israel	4,086	49	29 i	1	D	D
France	3,082	26	16	16	11	31
Japan	2,761	12	12	34	4	37
Switzerland	2,495	7	17	27	*	49
Singapore	2,115	58	9 i	5	*	28

* = amount < 1%. D = data withheld to avoid disclosing operations of individual companies. i = imputed; > 50% of the estimate is a combination of imputation and reweighting to account for nonresponse.

NAICS = 2007 North American Industry Classification System.

NOTES: Detail may not add to total because of rounding. Rankings are based on point estimates and do not take into account the variance of the survey sample. Industry classification based on dominant business code for domestic R&D performance where available. For companies that did not report business codes, classification used for sampling was assigned. Statistics are representative of companies located in the United States that performed or funded R&D.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, and U.S. Census Bureau, Business R&D and Innovation Survey, 2013.

remained within the scope of the survey between sample selection and tabulation were 41,588 for 2013. This lower count represents 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 five paid employees in the United States or had gone out of business in the interim. Of these in-scope reporting units, 73.6% met the 2013 survey response criteria (i.e., at least one R&D data item was provided or at least one sales or employment question was answered by the respondent). 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.

In 2013, 4% of U.S. business R&D paid for by the company and others and performed outside the United States could not be assigned to a specific foreign location. Therefore, foreign location R&D data provided here are lower-bound estimates. Location and industry rankings are based on point estimates and do not take into account the sampling error in the estimates from the survey sample. Consequently, the rankings may not be statistically significant.

The full set of detailed tables from this survey, including R&D estimates for each state by industry, are available in the report *Business R&D and Innovation: 2013* (<https://www.nsf.gov/statistics/industry/>). For further infor-

mation concerning BRDIS or to request tables with relative standard errors and imputation rates, please see the author endnote for contact information.

Notes

1. Brandon Shackelford is the owner of Twin Ravens Consulting, Austin, TX. For more information on this report, contact Raymond M. Wolfe, Research and Development Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (rwolfe@nsf.gov; 703-292-7789).
2. The terms *domestic* and *U.S.-located* refer to the companies and R&D activity within the 50 states and the District of Columbia. Data for companies and R&D activity located

in Puerto Rico, as well as in other U.S. territories, are considered *foreign* in this InfoBrief.

3. U.S. subsidiaries of foreign-owned companies report foreign R&D performance to BRDIS in some cases. These include former U.S. companies with a global R&D footprint that were acquired by foreign companies, as well as U.S.-located subsidiaries that oversee a larger geographic region than the United States, such as North America or the Americas as a whole.

4. Shackelford B and Moris F. 2016. *A Snapshot of Business R&D Employ-*

ment in the United States. InfoBrief NSF 17-302. Arlington, VA: National Science Foundation, National Center for Science and Engineering Statistics. Available at <https://www.nsf.gov/statistics/2017/nsf17302/>.

5. Additional information on ICT industries and international comparisons of ICT business R&D can be found in Shackelford B and Jankowski J. 2016. *Information and Communications Technology Industries Account for \$133 Billion of Business R&D Performance in the United States in 2013*. InfoBrief NSF 16-309. Arlington, VA: National Science Foundation,

National Center for Science and Engineering Statistics. Available at <https://nsf.gov/statistics/2016/nsf16309/>.

6. Foreign R&D reported on Form BRDI-1 that is not allocated to a specific location and foreign R&D estimated from Form BRDI-1(S) are reported as undistributed in BRDIS data tables. This undistributed amount is business R&D performed outside the 50 United States and the District of Columbia, but where the specific location is not estimated by BRDIS. This InfoBrief does not include this undistributed amount when calculating location shares of total foreign R&D performance.

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