

U.S. R&D Increased by More Than \$20 Billion in Both 2013 and 2014, with Similar Increase Estimated for 2015

by Mark Boroush¹

New data from the National Center for Science and Engineering Statistics, National Science Foundation (NSF) indicate that research and experimental development (R&D) performed in the United States totaled \$477.7 billion in 2014 (table 1, figure 1). The estimated total for 2015, based on performer-reported projections, is \$499.3 billion. These numbers compare to U.S. R&D totals of \$436.2 billion in 2012 and \$456.6 billion in 2013. In 2008—just before the onset of the main economic effects of the national and international financial crisis and the Great Recession—the U.S. total was \$407.0 billion. (All amounts and calculations are in current dollars, unless otherwise noted.)

These data reflect sizable increases of \$20.4 billion in 2013, \$21.1 billion in 2014, and an estimated \$21.6 billion in 2015. These yearly increases in the U.S. total arise mainly from business R&D performance (figure 2). Across the other main R&D performing sectors, the annual changes were far smaller—and in some cases, were declines.

Adjusted for inflation, growth in U.S. total R&D averaged 1.2% annu-

ally over the 6-year period 2008–14, matching the average pace of U.S. gross domestic product (GDP) (table 2). By comparison, the average annual rate of growth was notably higher in the prior ten year period (1998–2008): 3.6% for total R&D, and 2.2% for GDP. The smaller rate of growth in 2008–14 partly reflects inclusion of the Great Recession years. Nonetheless, in 3 of the 6 years (2011, 2013, and 2014) the inflation-adjusted rate of growth of U.S. total R&D was substantially higher and well above the pace of GDP expansion (table 2). Including the estimate for 2015 would mean R&D growth was higher than GDP growth in 4 of 7 years.

R&D Performers and Funders

The U.S. R&D system consists of the R&D activities of multiple performers and the sources of funding for these activities. Performers and funders include private businesses, the federal government, nonfederal government agencies, higher education institutions, and other nonprofit organizations.² Organizations that perform R&D often receive significant levels of outside funding. Furthermore, R&D funders may also be significant performers.

R&D Performers

The business sector is by far the largest performer of U.S. R&D. In 2014, domestically performed business R&D accounted for \$340.7 billion, or 71% of the \$477.7 billion national total (tables 1, 3). The business sector's predominance in the composition of national R&D performance has long been the case, with its annual share ranging between 68% and 74% over the 20-year period 1994–2014. Business R&D performance increased \$18.2 billion in 2014, following gains of \$15.1 billion in 2011, \$8.2 billion in 2012, and \$20.3 billion in 2013. These increases are in contrast to the essentially unchanged levels of business R&D performance in both 2009 and 2010.³

Inflation-adjusted growth in business R&D averaged 1.1% annually over the 6-year period 2008–14, behind the 1.2% annual average for total R&D and the 1.2% annual average for GDP (table 2). Nonetheless, growth in business R&D substantially surpassed the growth rates for both total R&D and GDP in 2011, 2013, and 2014.

The higher education sector is the second-largest performer of U.S. R&D.

TABLE 1. U.S. R&D expenditures, by performing sector and source of funding: 2008–15

Performing sector and funding source	2008	2009	2010	2011	2012	2013	2014 ^a	2015 ^b
	Current \$millions							
All performing sectors	406,952	405,343	409,037	428,675	436,151	456,584	477,708	499,299
Business	290,680	282,393	278,977	294,092	302,251	322,528	340,728	359,652
Federal government	45,649	47,572	50,798	53,524	52,144	51,086	52,299	52,655
Federal intramural ^c	29,839	30,560	31,970	34,950	34,017	33,406	34,396	33,966
FFRDCs	15,810	17,013	18,828	18,574	18,128	17,680	17,903	18,689
Nonfederal government	343	405	490	493	468	470	480	485
Higher education	53,917	56,971	60,369	62,435	63,264	63,928	64,704	66,373
Other nonprofit organizations ^d	16,363	18,002	18,403	18,132	18,024	18,573	19,498	20,134
All funding sources	406,952	405,343	409,037	428,675	436,151	456,584	477,708	499,299
Business	258,131	246,770	248,315	266,605	275,896	297,368	318,598	344,977
Federal government	119,113	127,395	128,426	128,917	125,796	122,068	119,826	113,114
Nonfederal government	4,257	4,286	4,287	4,355	4,103	4,239	4,240	4,190
Higher education	11,640	11,916	12,103	12,949	14,140	15,197	16,040	17,109
Other nonprofit organizations ^d	13,811	14,976	15,906	15,849	16,215	17,713	19,004	19,909
	Constant 2009 \$millions							
All performing sectors	410,043	405,343	404,100	414,938	414,534	426,994	439,531	454,875
Business	292,888	282,393	275,610	284,667	287,271	301,626	313,498	327,652
Federal government	45,995	47,572	50,185	51,809	49,560	47,776	48,119	47,970
Federal intramural ^c	30,066	30,560	31,584	33,830	32,331	31,241	31,647	30,944
FFRDCs	15,930	17,013	18,601	17,978	17,229	16,534	16,473	17,026
Nonfederal government	345	405	484	477	444	439	442	442
Higher education	54,327	56,971	59,640	60,434	60,128	59,785	59,533	60,468
Other nonprofit organizations ^d	16,487	18,002	18,181	17,550	17,131	17,369	17,939	18,343
All funding sources	410,043	405,343	404,100	414,938	414,534	426,994	439,531	454,875
Business	260,092	246,770	245,318	258,061	262,222	278,096	293,137	314,283
Federal government	120,017	127,395	126,876	124,786	119,561	114,157	110,250	103,050
Nonfederal government	4,289	4,286	4,235	4,216	3,899	3,964	3,901	3,817
Higher education	11,728	11,916	11,957	12,534	13,440	14,212	14,759	15,587
Other nonprofit organizations ^d	13,916	14,976	15,714	15,341	15,411	16,565	17,485	18,137

FFRDCs = federally funded research and development centers.

^a Some data for 2014 are preliminary and may later be revised.

^b The data for 2015 are estimates and will later be revised.

^c Includes expenditures of federal intramural R&D, as well as costs associated with administering extramural R&D.

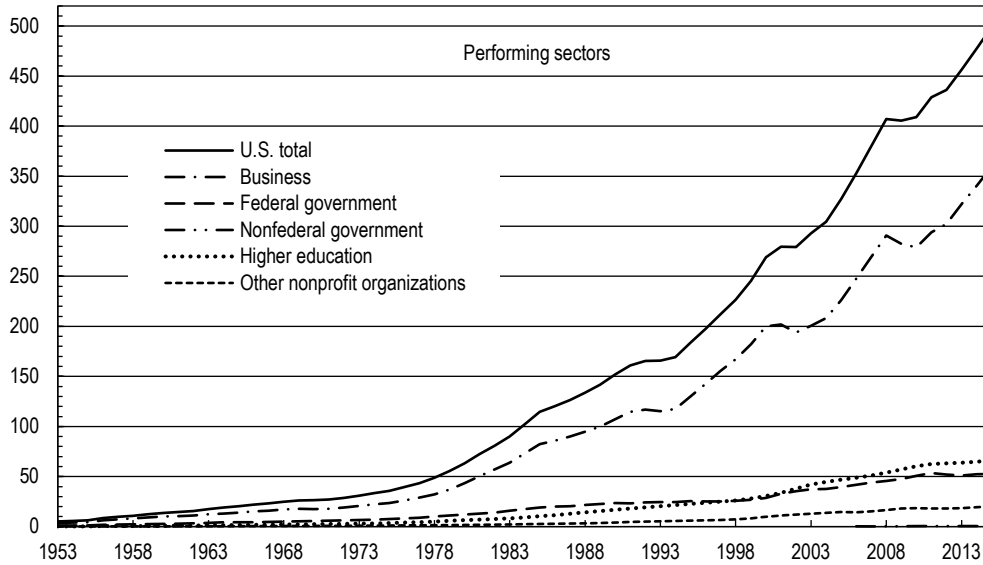
^d Some components of the R&D performed by other nonprofit organizations are projected and may later be revised.

NOTES: Data are based on annual reports by performers, except for the nonprofit sector. Expenditure levels for higher education, federal government, and nonfederal government performers are calendar-year approximations based on fiscal year data.

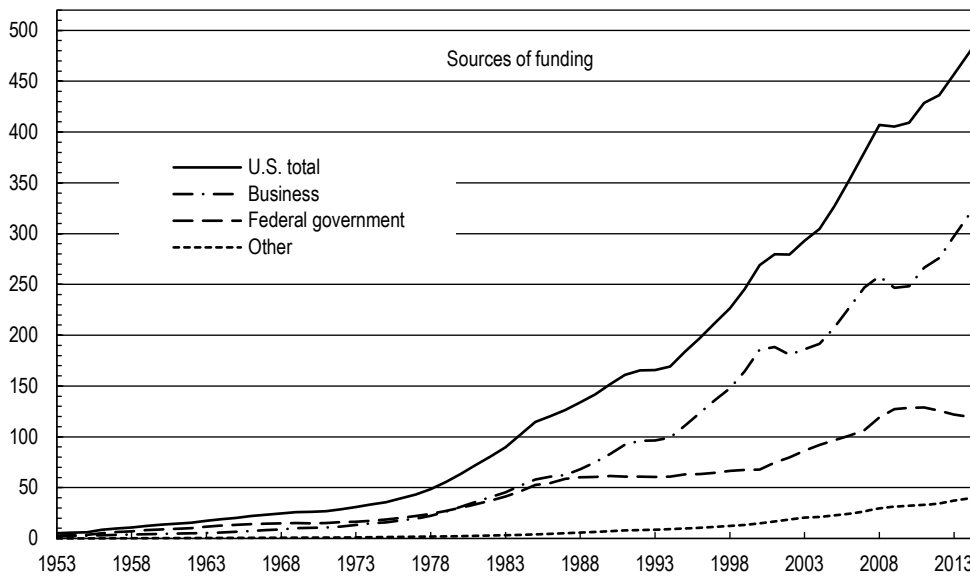
SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

FIGURE 1. U.S. R&D, by performing sectors and source of funding: 1953–2015

Current dollars (billions)



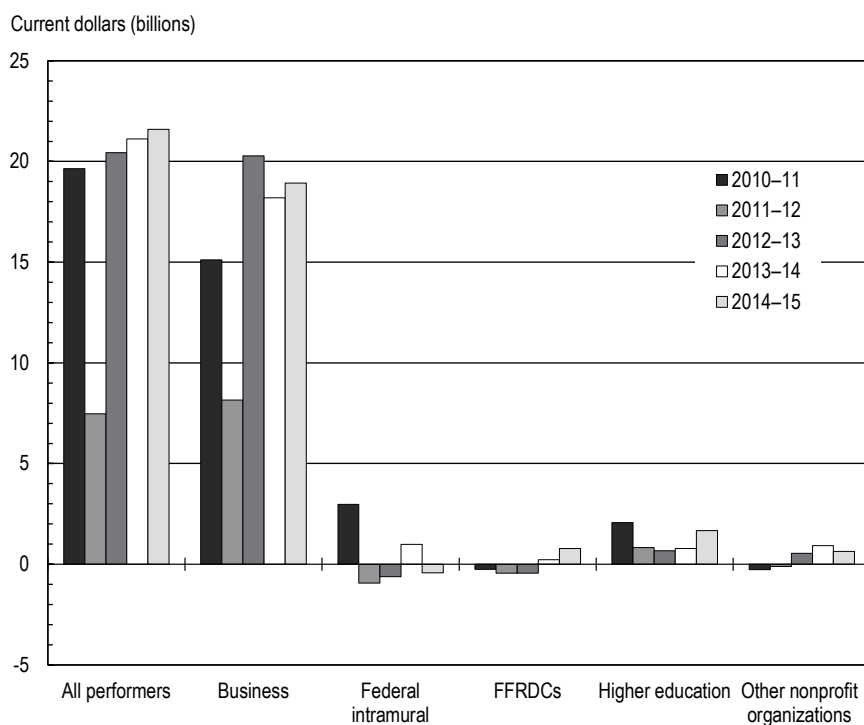
Current dollars (billions)



NOTES: Some data for 2014 are preliminary and may later be revised. The data for 2015 are estimates and will later be revised. Federal performers of R&D include federal agencies and federally funded research and development centers. Performance by nonfederal government is state only (data in this series are not available prior to 2006). Other funding includes support from higher education, nonfederal government (state and local), and nonprofit organizations.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

FIGURE 2. Year-to-year changes in U.S. R&D expenditures, by performing sector: 2010–15



FFRDCs = federally funded research and development centers.

NOTES: Based on the expenditures data reported in Table 1. Some data for 2014 are preliminary and may later be revised. The data for 2015 are estimates and will later be revised.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

Universities and colleges performed \$64.7 billion, or 14%, of U.S. R&D in 2014 (tables 1, 3). Over the 20-year period 1994–2014, the higher education share of U.S. R&D has ranged between 11% and 15%.

Higher education R&D performance increased by \$2 to \$3 billion each year over 2009–11, but annual increases dropped below \$1 billion in 2012–14 (figure 2). After adjusting for inflation, growth in this sector’s R&D performance averaged 1.5% annually over 2008–14, somewhat ahead of that for U.S. total R&D (1.2%) and GDP (1.2%). However, when the year-by-year track is examined, the sector’s growth was

noticeably stronger in the first half of this period (2009, 2010, and 2011) (table 2).

The federal government conducted \$52.3 billion, or 11%, of U.S. R&D in 2014 (tables 1, 3). This included \$34.4 billion (7% of the U.S. total) for intramural R&D performed by federal agencies in their own research facilities and \$17.9 billion (4%) of R&D performed by the 41 federally funded research and development centers (FFRDCs). In 1994, the federal performance share of U.S. R&D was about 15%, but it has gradually declined in the years since.

The federal performance total increased by \$2 to \$3 billion each year over

2009–11. But it decreased \$1.4 billion in 2012 and \$1.1 billion in 2013. In 2014, there was a \$1.2 billion increase. These changes affected both federal intramural R&D and FFRDCs (table 1). Adjusted for inflation, growth in this sector’s R&D performance averaged 0.8% annually over 2008–14, behind that for U.S. total R&D (1.2%) and GDP (1.2%). The shift from expansion to decline in recent years reflects both the waning after 2010 of the incremental funding from the American Recovery and Reinvestment Act of 2009 (ARRA) and the more challenging budget environment for increases in federal R&D funding after 2011.

R&D performed in the United States by other nonprofit organizations (which excludes universities and FFRDCs) is \$19.5 billion in 2014 (table 3). This was 4% of U.S. total R&D in 2014, a share that has increased only slightly since the late 1990s.

R&D Funders

The business sector is the predominant source of funding for R&D performed in the United States. In 2014, business sector funding accounted for \$318.6 billion, or 67%, of the \$477.7 billion of total U.S. R&D performance (tables 1, 3). Nearly all (98%) of the business sector’s funding for R&D that year was directed at business R&D performance (table 3). The small remainder went to R&D performers in higher education, other nonprofit organizations, and FFRDCs.

In 1994, R&D funding from the business sector accounted for 59% of the U.S. R&D total. It has been above that level throughout the years since, but fluctuating in the range of 60%–69%.

Funds from the federal government accounted for \$119.8 billion, or 25%, of U.S. total R&D in 2014 (tables 1, 3). This federal funding was directed mainly to R&D performance by the

TABLE 2. Annual rates of growth in U.S. R&D expenditures and gross domestic product, total and by performing sectors: 1988–2015 (Percent)

Expenditures and gross domestic product	Longer-term trends			Most recent years						
	1988–98	1998–2008	2008–14	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
	Current \$									
Total R&D, all performers	5.4	6.0	2.7	-0.4	0.9	4.8	1.7	4.7	4.6	4.5
Business	5.8	5.7	2.7	-2.9	-1.2	5.4	2.8	6.7	5.6	5.6
Federal government	1.8	5.9	2.3	4.2	6.8	5.4	-2.6	-2.0	2.4	0.7
Federal intramural ^a	1.9	5.6	2.4	2.4	4.6	9.3	-2.7	-1.8	3.0	-1.2
FFRDCs	1.6	6.4	2.1	7.6	10.7	-1.4	-2.4	-2.5	1.3	4.4
Nonfederal government ^d	NA	NA	5.8	NA	20.9	0.6	-5.1	0.4	2.2	1.0
Higher education	6.3	7.5	3.1	5.7	6.0	3.4	1.3	1.0	1.2	2.6
Other nonprofit organizations ^c	8.6	8.4	3.0	10.0	2.2	-1.5	-0.6	3.0	5.0	3.3
Gross domestic product	5.6	4.9	2.8	-2.0	3.8	3.7	4.1	3.1	4.1	3.4
	Constant 2009 \$									
Total R&D, all performers	2.9	3.6	1.2	-1.1	-0.3	2.7	-0.1	3.0	2.9	3.5
Business	3.3	3.3	1.1	-3.6	-2.4	3.3	0.9	5.0	3.9	4.5
Federal government	-0.6	3.4	0.8	3.4	5.5	3.2	-4.3	-3.6	0.7	-0.3
Federal intramural ^a	-0.5	3.2	0.9	1.6	3.4	7.1	-4.4	-3.4	1.3	-2.2
FFRDCs	-0.8	4.0	0.6	6.8	9.3	-3.3	-4.2	-4.0	-0.4	3.4
Nonfederal government ^d	NA	NA	4.2	NA	19.4	-1.4	-6.8	-1.2	0.6	0.0
Higher education	3.8	5.0	1.5	4.9	4.7	1.3	-0.5	-0.6	-0.4	1.6
Other nonprofit organizations ^c	6.0	5.9	1.4	9.2	1.0	-3.5	-2.4	1.4	3.3	2.2
Gross domestic product	3.4	2.2	1.2	-2.8	2.5	1.6	2.2	1.5	2.4	2.4

NA = not available.

FFRDCs = federally funded research and development centers.

^a Includes expenditures of federal intramural R&D, as well as costs associated with administering extramural R&D.

^b Survey data on state internal R&D performance was not available prior to 2006.

^c Some components of the R&D performed by other nonprofit organizations are projected and may later be revised.

NOTES: Longer-term trend rates are calculated as compound annual growth rates. Data for 2014 are preliminary and those for 2015 are estimates; some of these data may later be revised.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

federal government, business, and higher education (table 3). Federal funding accounted for all of the \$34.4 billion of federal intramural R&D performance in 2014 and most (98%) of the \$17.5 billion of R&D performed by FFRDCs. (Nonfederal support for FFRDC R&D has been around \$0.4 billion or so in recent years, or 2% of FFRDC's total support.) Federal funding to the business sector accounted for \$26.6 billion of business R&D performance in 2014, or 8% of the sector's R&D total that year (table 3). Federal funds to higher education supported \$35.1 billion, or 54%, of the \$64.7 billion spent on academic R&D in 2014. For the R&D performed by other nonprofit

organizations, \$6.1 billion (31%) of this sector's \$19.5 billion of performance was supported by federal funds.

In 1994, the federal funding share of U.S. total R&D was 36%. Thereafter, it declined to about 25% in 2000, rose again gradually to 31% in 2009 and 2010, and then declined to 25% in 2014.

The remainder of R&D funding from other sources is relatively small: \$39.3 billion in 2014, or about 8% of all U.S. R&D performance. Of this amount, \$16.0 billion (3%) was academia's own institutional funds, all of which remain in the academic sector; \$4.2 billion (1%) was from state and local governments,

primarily supporting academic research; and \$19.0 billion (4%) was from other nonprofit organizations, the majority of which funds this sector's own R&D. In addition, some funds from the nonprofit sector support academic R&D.

R&D by Type of Work

Basic research activities accounted for \$84.0 billion, or 18% of the total of U.S. R&D expenditures in 2014 (table 4). Applied research was \$93.6 billion, or 20% of the total. Most of the R&D total went toward experimental development: \$300.1 billion, or 63%.

Higher education accounted for just under half (49%) of the \$84.0 billion

TABLE 3. U.S. R&D expenditures, by performing sector, source of funds, and type of work: 2014

Performing sector and type of work	Source of funds (\$millions)						Percent distribution by performer
	Total	Business	Federal government	Nonfederal government	Higher education	Other nonprofit organizations	
R&D	477,708	318,598	119,826	4,240	16,040	19,004	100.0
Business	340,728	313,043	26,554	138	*	993	71.3
Federal government	52,299	218	51,918	26	*	137	10.9
Federal intramural	34,396	0	34,396	0	0	0	7.2
FFRDCs	17,903	218	17,523	26	*	137	3.7
Nonfederal government	480	*	192	288	*	*	0.1
Higher education	64,704	3,817	35,051	3,788	16,040	6,006	13.5
Other nonprofit organizations	19,498	1,520	6,111	*	*	11,867	4.1
Percent distribution by funding source	100.0	66.7	25.1	0.9	3.4	4.0	na
Basic research	84,012	23,026	38,105	2,447	9,961	10,472	100.0
Business	21,936	19,757	2,044	17	*	119	26.1
Federal government	10,047	55	9,951	6	*	34	12.0
Federal intramural	5,807	0	5,807	0	0	0	6.9
FFRDCs	4,239	55	4,144	6	*	34	5.0
Nonfederal government	NA	*	NA	NA	*	*	NA
Higher education	41,349	2,371	22,935	2,353	9,961	3,730	49.2
Other nonprofit organizations	10,560	844	3,127	*	*	6,589	12.6
Percent distribution by funding source	100.0	27.4	45.4	2.9	11.9	12.5	na
Applied research	93,631	48,365	33,721	1,369	4,985	5,192	100.0
Business	53,415	46,685	6,445	35	*	250	57.0
Federal government	15,519	108	15,330	13	*	68	16.6
Federal intramural	8,609	0	8,609	0	0	0	9.2
FFRDCs	6,910	108	6,721	13	*	68	7.4
Nonfederal government	NA	*	NA	NA	*	*	NA
Higher education	18,543	1,186	9,327	1,177	4,985	1,867	19.8
Other nonprofit organizations	5,915	385	2,522	*	*	3,008	6.3
Percent distribution by funding source	100.0	51.7	36.0	1.5	5.3	5.5	na
Development	300,065	247,208	48,001	424	1,094	3,339	100.0
Business	265,377	246,601	18,065	87	*	624	88.4
Federal government	26,734	55	26,637	7	*	35	8.9
Federal intramural	19,979	0	19,979	0	0	0	6.7
FFRDCs	6,754	55	6,658	7	*	35	2.3
Nonfederal government	NA	*	NA	NA	*	*	NA
Higher education	4,812	260	2,789	258	1,094	410	1.6
Other nonprofit organizations	3,022	291	461	*	*	2,270	1.0
Percent distribution by funding source	100.0	82.4	16.0	0.1	0.4	1.1	na

* = small to negligible amount, included as part of the funding provided by other sectors; na = not applicable; NA = not available.

FFRDCs = federally funded research and development centers.

NOTES: Data for 2014 include some estimates and may later be revised. Some components of R&D performance and funding by other nonprofit organizations are projected and may later be revised.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

TABLE 4. U.S. R&D expenditures by type of work: 1970–2015

Type of work	1970	1980	1990	2000	2010	2011	2012	2013	2014 ^a	2015 ^b
Current \$billions										
All R&D	26.3	63.2	152.0	268.9	409.0	428.7	436.2	456.6	477.7	499.3
Basic research	3.6	8.7	23.0	42.7	77.3	74.3	74.6	80.1	84.0	86.7
Applied research	5.8	13.7	34.9	56.7	81.0	84.1	89.1	90.3	93.6	96.3
Experimental development	16.9	40.7	94.1	169.5	250.7	270.3	272.4	286.2	300.1	316.3
Constant 2009 \$billions										
All R&D	115.3	142.5	227.6	328.4	404.1	414.9	414.5	427.0	439.5	454.9
Basic research	15.8	19.7	34.5	52.2	76.4	71.9	70.9	75.0	77.3	79.0
Applied research	25.2	30.9	52.3	69.2	80.0	81.4	84.6	84.4	86.1	87.7
Experimental development	74.3	91.8	140.9	207.0	247.7	261.6	258.9	267.6	276.1	288.2
Percent distribution										
All R&D	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Basic research	13.7	13.8	15.2	15.9	18.9	17.3	17.1	17.6	17.6	17.4
Applied research	21.9	21.7	23.0	21.1	19.8	19.6	20.4	19.8	19.6	19.3
Experimental development	64.4	64.5	61.9	63.0	61.3	63.1	62.5	62.7	62.8	63.3

^a Some data for 2014 are preliminary and may later be revised.

^b The data for 2015 are estimates and will later be revised.

NOTES: Data throughout the time series reported here are consistently based on the Organisation for Economic Co-operation and Development's Frascati Manual definitions for basic research, applied research, and experimental development. For 2010 and subsequent years, however, some changes have been introduced in the questionnaires of the sectoral expenditure surveys to improve the accuracy of respondents' classification of their R&D. Therefore, small percentage changes may not be meaningful when comparing data before 2010 with more recent data.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

of basic research performance in 2014 (table 3). The business sector was the second-largest basic research performer (26%). Business was the predominant performer (57%) of the \$93.6 billion of applied research in 2014. Higher education was second at 20%, and combining federal intramural performers and FFRDCs amounted to 17% of the applied research total. Business continues to dominate development, accounting for 88% of the \$300.1 billion in that category in 2014.

Federal funding accounted for 45% of the \$84.0 billion of basic research in 2014. But federal funds were less prominent on a proportional basis for applied research (36% of \$93.6 billion) and development (16% of \$300.1 billion). The business sector provided the greatest share of funding for applied research (52%) and the predominant

share for development (82%). It also accounted for a sizable share (27%) of funding for basic research.

Data on the split of U.S. total R&D among the three types of R&D work in previous years appear in table 4. The shares of basic research, applied research, and development were largely the same between 2010 and 2014. The shares are also not dramatically different in the more distant past—although care is needed in drawing trend conclusions from this data (see table 4 notes).

Trend in National R&D Intensity

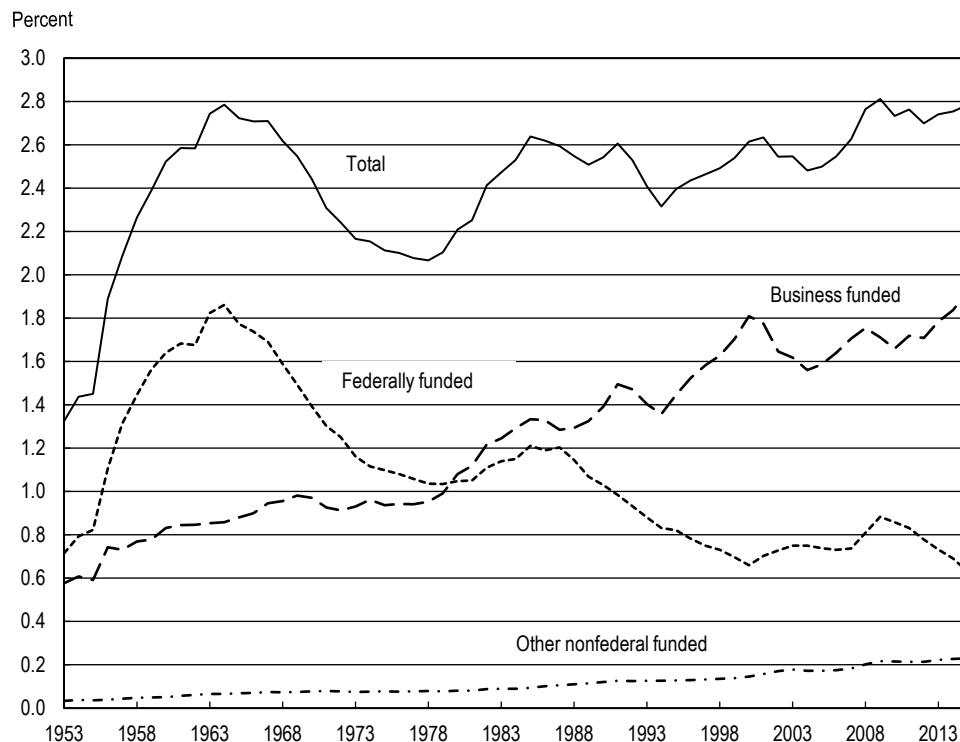
The ratio of total national R&D expenditures to GDP is often reported as a measure of the intensity of a nation's overall R&D effort and is widely used as an international benchmark for comparing countries' R&D systems.

The ratio of U.S. R&D expenditures to GDP was 2.75% in 2014 and an estimated 2.78% in 2015 (figure 3).⁴ In comparison, the ratio was 2.74% in 2013 and 2.70% in 2012.

The U.S. R&D-to-GDP ratio stood at 2.81% in 2009—the ratio's highest level since the start of the time series in 1953. Over the 10-year period 2004–14, the ratio has fluctuated year to year, between a low of 2.48% in 2004 and a high of 2.81% in 2009.³ The broader trend since the later 1990s has been a rising R&D-to-GDP ratio.

Most of the rise of the R&D-to-GDP ratio over the past several decades is from the increase of nonfederal spending on R&D, particularly by the business sector. This arises from the growing role of business R&D in the national R&D system, which in turn

FIGURE 3. Ratio of U.S. R&D to gross domestic product, by source of funding for R&D: 1953–2015



NOTES: Some data for 2014 are preliminary and may later be revised. The data for 2015 are estimates and will later be revised. The federally funded data represent the federal government as a funder of R&D by all performers; similarly for the business funded data. The other nonfederal category includes R&D funded by all other sources—mainly, higher education, nonfederal government, and other nonprofit organizations. The gross domestic product data used reflect the Bureau of Economic Analysis's comprehensive revisions of the National Income and Product Accounts of July 2013.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series).

reflects the unabated increase of R&D-dependent goods and services in the national and global economies.

By contrast, the federally funded R&D-to-GDP ratio declined from the mid-1980s to the late 1990s, notably from cuts in defense-related R&D. There had been a gradual uptick in the ratio through 2009, the result of increased federal spending on biomedical and national security R&D and the one-time incremental funding for R&D provided by ARRA. But the federally funded share has returned to a noticeable decline since 2010 (figure 3).

Data Sources and Availability

The statistics on U.S. R&D presented in this report are derived chiefly from integrating the data on R&D expenditures and funding collected from the major national surveys conducted by NSF's National Center for Science and Engineering Statistics to gather information on the organizations that perform most of the U.S. R&D. In some cases, the primary survey data are adjusted to enable consistent integration of the statistics from these separately conducted surveys. Further, preliminary or otherwise estimated

values may be used where final data from one or more of the surveys are not yet available and can reasonably be calculated.

The main R&D surveys include NSF's Business R&D and Innovation Survey (for 2008 through 2014; for 2007 and earlier years, data are from the preceding Survey of Industrial R&D), the Higher Education R&D Survey (for 2010 through 2015; for 2009 and earlier years, data are from the preceding Survey of R&D Expenditures at Universities and Colleges), the Survey of Federal Funds for R&D (FYs

2014–16 and earlier years), the FFRDC Research and Development Survey (FY 2015 and earlier years), and the Survey of State Government Research and Development (starting in FY 2006, through FY 2014–15). Amounts for the R&D performed by other nonprofit organizations with funding from the nonprofit sector and from business sources are estimated, based on parameters from the 1996–97 Survey of R&D Funding and Performance by Nonprofit Organizations.

Data on federally funded R&D discussed in this report were derived from surveys of organizations that perform R&D, such as companies, universities, and FFRDCs. These amounts can differ substantially from the R&D that federal agencies have reported funding. For example, in 2009, federal agencies reported obligating \$141 billion for R&D funding to all R&D performers (including \$53 billion to the business sector), compared with an estimated \$127 billion in federal funding reported by all performers of R&D that year (\$40 billion by businesses). In 2014, federal agencies reported obligating \$130 billion for R&D funding to all R&D performers (including \$50 billion to the business sector), compared with an estimated \$120 billion in federal funding reported by all performers of R&D that year (\$27 billion by businesses). Several investigations into the possible causes for these data disparities have produced insights but no conclusive explanation—for a further discussion see

Chapter 4 sidebar in *Science and Engineering Indicators 2016*.⁵

A full set of detailed statistical tables associated with the National Patterns data will be available in the report *National Patterns of R&D Resources: 2014–15 Data Update*, at <http://www.nsf.gov/statistics/natlpatterns/>. For further information on the National Patterns data and methodology, contact the author.

Notes

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2. NSF identifies the main categories of R&D performers as follows: businesses, federal agencies, federally funded research and development centers (administered by businesses, universities, or nonprofit organizations), nonfederal government agencies, higher education, and other nonprofit organizations. For R&D funding, the main categories are businesses, the federal government, nonfederal government, higher education, and other nonprofit organizations.

3. Due to sample variability in the data for the business R&D component, the reported totals and calculated R&D-to-GDP ratios for 2009 and 2010 are not significantly different from one another at a 90% confidence level.

4. The Department of Commerce's Bureau of Economic Analysis (BEA) introduced a comprehensive set of revisions to the National Income and Product Accounts in July 2013—including explicitly recognizing R&D as investment in the measure of U.S. gross domestic product. These changes resulted in modest revisions to the U.S. GDP time series back to 1929. Although based on NSF R&D data, BEA's R&D investment totals differ from the R&D expenditures totals reported here and by NSF more generally. Notably, NSF-reported R&D devoted to software applications is not reported as R&D in the BEA R&D investment totals; instead, software R&D is included in BEA's software investment totals. The U.S. R&D-to-GDP ratio reported in this InfoBrief reflect NSF's R&D data and BEA's revised GDP data, both in the present and the past, and differ somewhat from the data reported previously in the National Patterns series. For a fuller explanation of this development and its implications see NSF's recent InfoBrief on this topic: <http://www.nsf.gov/statistics/2015/nsf15315/>.

5. National Science Board. 2016. *Science and Engineering Indicators 2016*, Chapter 4, Tracking R&D Expenditures: Disparities in the Data Reported by Performers and Sources of Funding. <http://www.nsf.gov/statistics/2016/nsb20161/#!/sidebar/chapter-4/tracking-r-d-expenditures-disparities-in-the-data-reported-by-performers-and-sources-of-funding>.

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