



U.S. R&D Resumes Growth in 2011 and 2012, Ahead of the Pace of the Gross Domestic Product

by Mark Boroush¹

New survey data result in an upward revision of the previously published 2011 U.S. research and development performance total and imply a sizable further expansion in 2012. These new data puts U.S. R&D expenditures at \$428.2 billion in 2011,² an increase of \$20.5 billion over the 2010 level (table 1, figure 1). The preliminary estimate of the 2012 U.S. total for R&D is \$452.6 billion.

After adjustment for inflation, R&D grew at a faster rate than the gross domestic product (GDP) in 2011 (2.8% versus 1.8%) (table 2). Preliminary data for 2012 indicate similar findings (3.8% versus 2.2%). The growth in these two recent years stands in marked contrast to the data for 2009 and 2010, which showed essentially no growth in R&D, followed by R&D growth being outpaced by GDP growth. As is apparent from the relative contributions of the various R&D performers (figure 1), it is the renewed upward track of business R&D that had the most to do with these improved numbers for U.S. R&D in 2011 and 2012.

In 6 of the 8 years over 2000–08, U.S. total R&D grew at a faster rate than

GDP. In 2009, total R&D and GDP both declined, and in 2010, total R&D changed only a little, while GDP rebounded. The numbers reported here for 2011 and 2012, showing total R&D expanding ahead of the GDP for both years, suggest a return to the longer-term trend of sizable, year-to-year R&D expansion. (Data cited in the rest of this InfoBrief are in current dollars, unless stated otherwise.)

R&D Performers and Funders

The U.S. R&D system consists of a variety of performers and sources of funding, including businesses, the federal government, universities and colleges, other government (nonfederal) agencies, and nonprofit organizations.³ A mix of performing and funding roles exists across this diverse group of organizations. Organizations that perform R&D often receive significant levels of outside funding; those that fund R&D may also be significant performers.

R&D Performers

In 2011, the business sector continued to be the largest performer by far of U.S. R&D, conducting \$294.1 billion, or 68.7%, of the national total (table 1). For 2012, the preliminary business R&D figure is \$316.7 billion (70.0%

of the total) (figure 2). On the basis of these revised, final data for 2011, business R&D increased \$15.1 billion (5.4%) over the 2010 level. For 2012, the preliminary data indicate a further increase of \$22.6 billion (7.7%). By contrast, the level of business R&D performance exhibited essentially no change in both 2009 and 2010 (table 1, figure 1). The business sector's predominance in the composition of national R&D has long been the case, with its annual share ranging between 68% and 74% over the 20-year period 1991–2012 (figure 3).

Universities and colleges performed \$62.5 billion, or 14.6%, of U.S. R&D in 2011 (table 1). In 2012, it was \$62.7 billion (13.9%) (figure 2). The total of academic R&D performance increased some \$2 billion to \$3 billion annually in 2008 through 2011 but was virtually flat in 2012 (figure 1). Over the 20-year period 1991–2012, the academic sector's share in U.S. R&D has ranged between 11% and 15% annually.

The federal government conducted \$53.5 billion, or 12.5%, of U.S. R&D in 2011 (table 1). This includes \$35.8 billion of intramural R&D performed

TABLE 1. U.S. R&D expenditures, by performing sector and source of funding: 2007–12

Sector	2007	2008	2009	2010	2011	2012 ^a
	Current \$millions					
All performing sectors	379,681	406,610	404,731	407,703	428,163	452,556
Business	269,267	290,681	282,393	278,977	294,093	316,700
Federal government	44,133	45,649	47,363	49,692	53,493	55,020
Federal intramural ^b	29,859	29,839	30,560	31,970	35,775	37,574
FFRDCs	14,274	15,810	16,804	17,985	17,718	17,446
Industry administered	5,165	6,346	6,646	7,214	6,956	6,808
U&C administered	5,567	4,766	5,052	5,315	5,246	5,174
Nonprofit administered	3,543	4,698	5,106	5,457	5,516	5,464
Universities and colleges	51,149	53,917	56,972	60,369	62,457	62,723
Other nonprofit organizations ^c	15,132	16,363	18,002	18,401	18,120	18,113
All funding sectors	379,681	406,610	404,731	407,703	428,163	452,556
Business	246,741	258,691	247,270	249,188	267,306	285,040
Federal government	106,858	119,423	127,467	127,813	129,068	135,018
Universities and colleges	10,833	11,640	11,917	12,100	12,965	13,506
Nonfederal government	3,438	3,706	3,809	3,788	3,718	3,659
Other nonprofit organizations ^c	11,810	13,151	14,268	14,814	15,106	15,333
	Constant 2005 \$millions					
All performing sectors	357,426	374,472	369,517	367,326	377,706	392,206
Business	253,484	267,706	257,823	251,348	259,436	274,467
Federal government	41,546	42,041	43,242	45,008	47,189	47,683
Federal intramural ^b	28,109	27,480	27,901	28,804	31,559	32,563
FFRDCs	13,438	14,560	15,342	16,204	15,630	15,120
Industry administered	4,862	5,844	6,068	6,499	6,136	5,900
U&C administered	5,241	4,389	4,612	4,788	4,628	4,484
Nonprofit administered	3,335	4,327	4,662	4,916	4,866	4,735
Universities and colleges	48,151	49,656	52,015	54,391	55,097	54,359
Other nonprofit organizations ^c	14,245	15,070	16,436	16,579	15,985	15,697
All funding sectors	357,426	374,472	369,517	367,326	377,706	392,206
Business	232,278	238,244	225,756	224,510	235,805	247,029
Federal government	100,595	109,984	116,377	115,155	113,858	117,013
Universities and colleges	10,198	10,720	10,880	10,901	11,437	11,705
Nonfederal government	3,237	3,413	3,477	3,413	3,280	3,171
Other nonprofit organizations ^c	11,118	12,111	13,026	13,347	13,326	13,288

FFRDC = federally funded research and development center; U&C = universities and colleges.

^a R&D data for 2012 are preliminary and may later be revised.

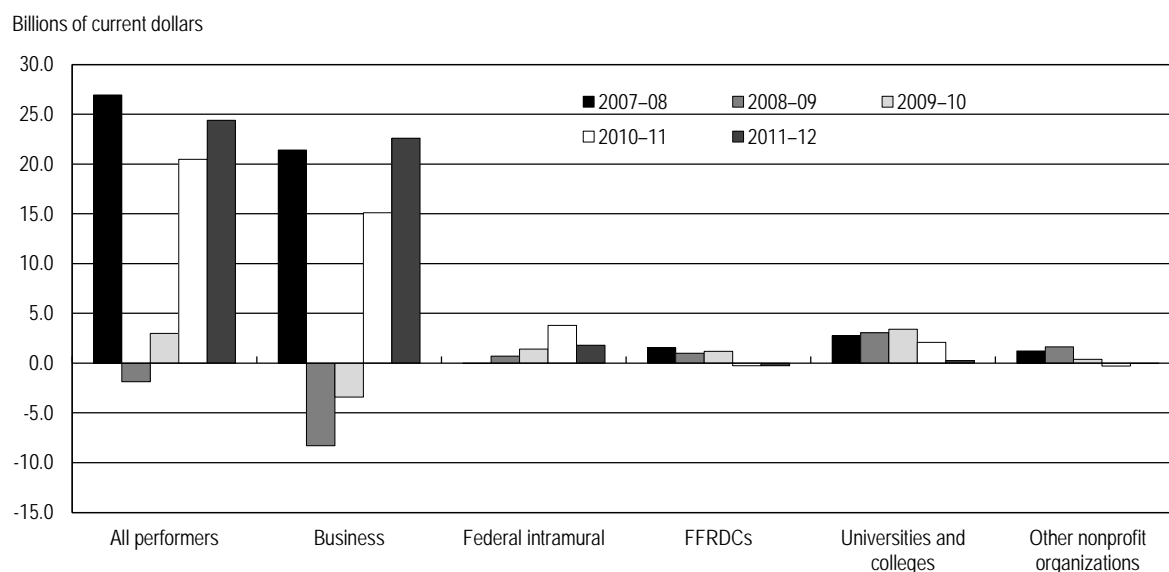
^b Includes expenditures of federal intramural R&D as well as costs associated with administering extramural R&D.

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

NOTES: Data are based on annual reports by performers, except for the nonprofit sector. Expenditure levels for academic and federal 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. Year-to-year changes in U.S. R&D expenditures, by performing sectors: 2007–12



FFRDC = federally funded research and development center.

NOTES: R&D data for 2012 are preliminary and may later be revised. Federal intramural includes expenditures of federal intramural R&D as well as costs associated with administering extramural R&D. Some components of the R&D performed by other nonprofit organizations are estimated 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 2. Annual rates of growth in U.S. R&D expenditures, by performing sectors: 1992–2012 (Percent)

Expenditures and gross domestic product	Longer-term trend ^a			Most recent years		
	1992–2012	2002–12	2007–12	2009–10	2010–11	2011–12 ^a
	Current \$					
Total R&D, all performers	5.2	4.9	3.6	0.7	5.0	5.7
Business	5.1	5.0	3.3	-1.2	5.4	7.7
Federal government	4.2	4.5	4.5	5.5	7.1	2.9
Federal intramural ^b	4.4	4.7	4.7	4.6	11.9	5.0
FFRDCs	3.7	4.1	4.1	7.0	-1.5	-1.5
Universities and colleges	6.0	5.2	4.2	6.0	3.5	0.4
Other nonprofit organizations ^c	6.7	4.1	3.7	2.2	-1.5	0.0
Gross domestic product	4.6	4.0	2.3	3.8	4.0	4.0
	Constant 2005 \$					
Total R&D, all performers	3.0	2.6	1.9	-0.6	2.8	3.8
Business	3.0	2.7	1.6	-2.5	3.2	5.8
Federal government	2.1	2.2	2.8	4.1	4.8	1.0
Federal intramural ^b	2.3	2.4	3.0	3.2	9.6	3.2
FFRDCs	1.6	1.8	2.4	5.6	-3.5	-3.3
Universities and colleges	3.9	2.8	2.5	4.6	1.3	-1.3
Other nonprofit organizations ^c	4.5	1.8	2.0	0.9	-3.6	-1.8
Gross domestic product	2.5	1.6	0.6	2.4	1.8	2.2

^a R&D data for 2012 are preliminary and may later be revised.

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

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

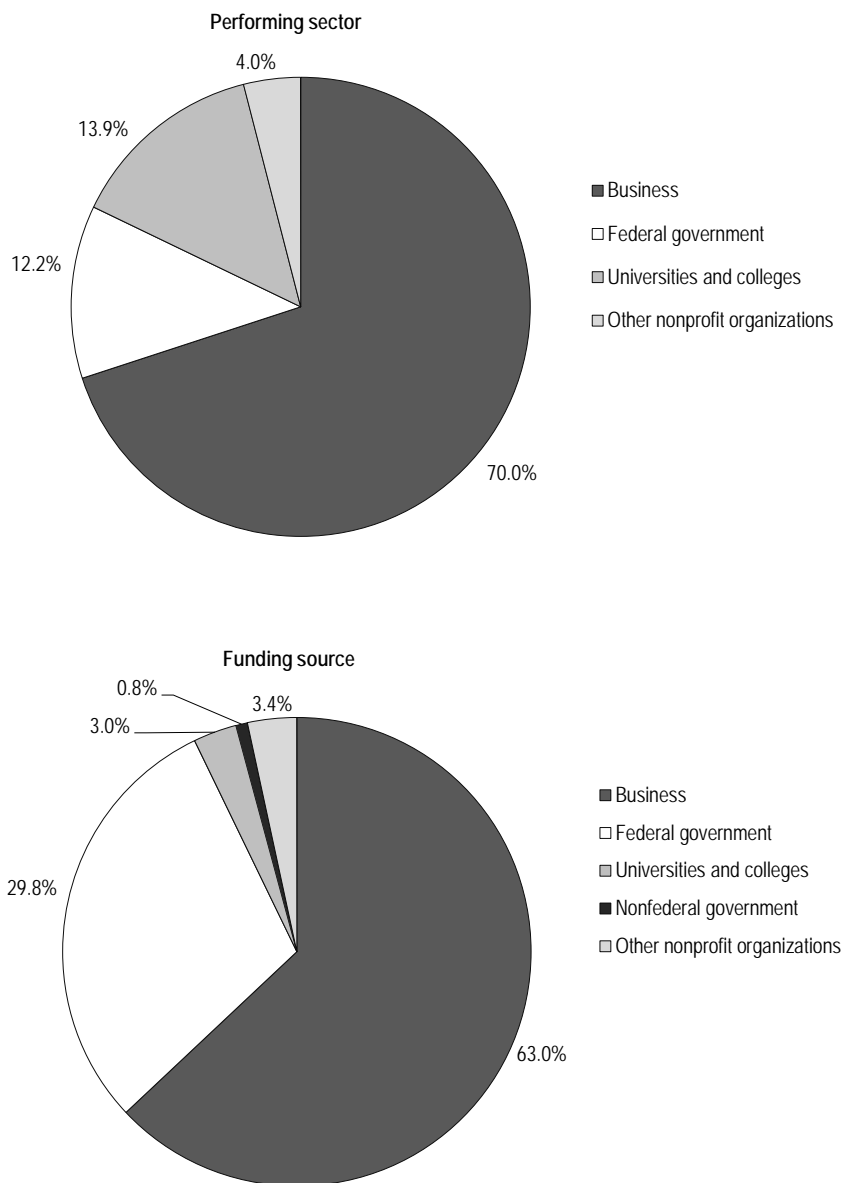
NOTE: Longer-term trend rates are calculated as compound annual growth rates.

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

by federal agencies in their own research facilities, as well as \$17.7 billion of R&D performed by the 39 federally funded research and development centers (FFRDCs). In 2012, it was \$55.0 billion (\$37.6 billion, intramural; \$17.4 billion, by 40 FFRDCs), or 12.2% of the U.S. total (figure 2). Federal intramural R&D performance expanded by over \$1 billion in 2010, nearly \$4 billion in 2011, and almost \$2 billion in 2012. The FFRDC performance total grew by \$1 billion in 2009 and 2010, but it declined a little in both 2011 and 2012. In 1991, the federal performance share of the U.S. total was 15%, but it gradually declined in the years since, ranging annually between 11% and 12% since 2007.

Other nonprofit organizations are estimated to have performed \$18.1 billion, or 4.2%, of U.S. R&D in 2011 (table 1). For 2012, the estimate is also \$18.1 billion (4.0%) (figure 2).

FIGURE 2. Shares of U.S. total R&D expenditures, by performing sector and funding source: 2012



NOTES: National R&D expenditures totaled \$452.6 billion in 2012. R&D data for 2012 are preliminary and may later be revised. The federal performing sector includes federal agencies and federally funded research and development centers (FFRDCs). State and local government support to business is included in business support for business performance.

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

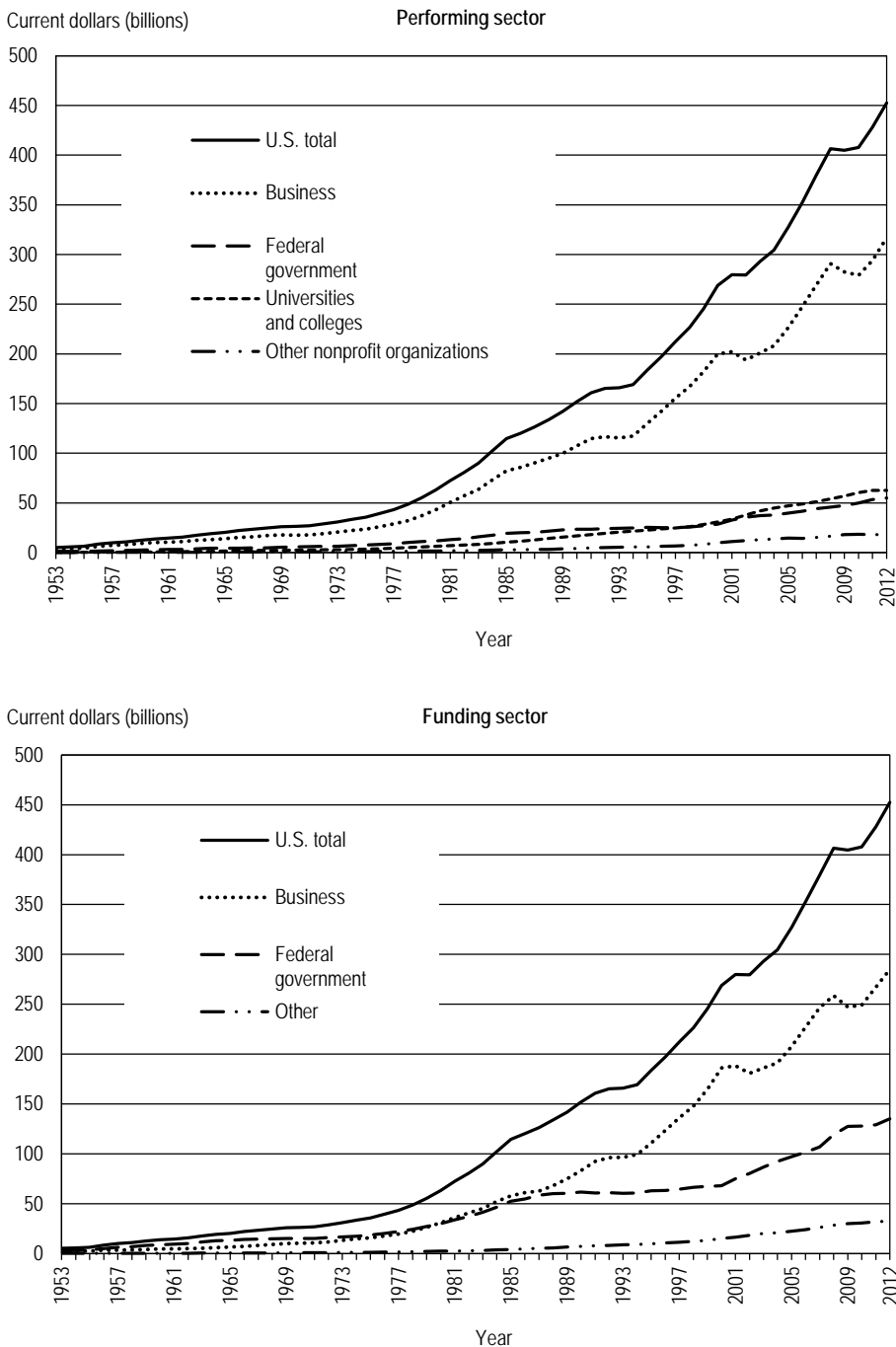
R&D Funders

The business sector continues to be the predominant source of funding for the R&D performed in the United States. In 2011, \$267.3 billion (62.4%) of the \$428.2 billion total U.S. R&D performance was supported by business sector funding (table 1). In the preliminary data for 2012, the business role in funding is \$285.0 billion (63.0%) of the \$452.6 billion total (figure 2). The vast majority of this business funding supports business-performed R&D. The balance supports R&D performed by universities and colleges and by other nonprofit organizations (table 3).

Funds for R&D from the federal government accounted for \$129.1 billion, or 30.1%, of the U.S. R&D total in 2011 (table 1). This was split primarily among performers in the federal, business, and academic sectors, but some funds went to other nonprofit organizations. The preliminary data for federal R&D funding in 2012 are \$135.0 billion, or 29.8%, of the R&D performance total that year (figure 2), with a similar split among performing sectors (table 3).

Funds from universities and colleges accounted for \$13.0 billion (3.0%) of the national R&D total in 2011 and \$13.5 billion (also 3.0%) in 2012 (table 1, figure 2). All of these funds remained within the academic sector (table 3). Funding from nonfederal government agencies and other nonprofit organizations accounted for the remainder of the U.S. R&D total (0.9% and 3.5%, respectively, in 2011, with similar values in 2012) (figure 2).

FIGURE 3. U.S. R&D, by performing and funding sectors: 1953–2012



NOTES: R&D data for 2012 are preliminary and may later be revised. Federal performers of R&D include federal agencies and federally funded research and development centers (FFRDCs). Other funding includes support from universities and colleges, nonfederal government, and nonprofit organizations. State and local government funding to businesses is included in business support for business R&D performance.

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

These funding shares for universities and colleges, other nonprofit organizations, and nonfederal government remained fairly stable over 2007–12 (figure 3). Over the same period, the business sector’s share was 65% in 2007, which then declined to 61% in 2009 and 2010, but has been increasing in the several years since. The federal government’s annual funding share was about 30%–31% during the 2009–12 period.

R&D by Character of Work

Basic research activities accounted for \$74.8 billion, or 16.5%, of the \$452.6 billion total of U.S. R&D expenditures in 2012 (table 3). Applied research was \$86.8 billion, or 19.2%; development was \$290.9 billion, or 64.3%.

Universities and colleges remain the predominant performers (53.5%) of the \$74.8 billion of basic research; the federal government provides the largest share (52.6%) of the funding for basic research (table 3). The business sector performed more than half (58.5%) of the \$86.8 billion of applied research and was also the largest funder (54.0%). The business sector was even more predominant in development, where it both performed the vast majority (86.6%) and provided the largest share of funding (76.4%) of the nation’s \$290.9 billion of development expenditures in 2012.

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. This metric is widely used internationally as a benchmark for comparing countries’ overall R&D systems.

With this report’s updated R&D data for 2011, U.S. expenditures on R&D

TABLE 3. U.S. R&D expenditures, by performing sector, source of funds, and character of work: 2012

Performing sector and character of work	Source of funds (\$millions)						Total expenditures (% distribution)
	Total	Business	Federal government	U&C	Nonfederal government	Other nonprofit organizations	
R&D	452,556	285,040	135,018	13,506	3,659	15,333	100.0
Business	316,700	280,400	36,300	*	*	*	70.0
Federal government	55,020	*	55,020	*	*	*	12.2
Federal intramural ^a	37,574	*	37,574	*	*	*	8.3
FFRDCs	17,446	*	17,446	*	*	*	3.9
Industry administered	6,808	*	6,808	*	*	*	1.5
U&C administered	5,174	*	5,174	*	*	*	1.1
Nonprofit administered	5,464	*	5,464	*	*	*	1.2
Universities and colleges	62,723	3,242	37,393	13,506	3,659	4,923	13.9
Other nonprofit organizations	18,113	1,398	6,305	*	*	10,410	4.0
Percent distribution by source	100.0	63.0	29.8	3.0	0.8	3.4	na
Basic research	74,849	15,962	39,372	8,398	2,275	8,841	100.0
Business	13,955	13,170	785	*	*	*	18.6
Federal government	11,225	*	11,225	*	*	*	15.0
Federal intramural ^a	5,086	*	5,086	*	*	*	6.8
FFRDCs	6,139	*	6,139	*	*	*	8.2
Industry administered	2,446	*	2,446	*	*	*	3.3
U&C administered	2,160	*	2,160	*	*	*	2.9
Nonprofit administered	1,533	*	1,533	*	*	*	2.0
Universities and colleges	40,045	2,016	24,295	8,398	2,275	3,061	53.5
Other nonprofit organizations	9,624	776	3,067	*	*	5,780	12.9
Percent distribution by source	100.0	21.3	52.6	11.2	3.0	11.8	na
Applied research	86,773	46,868	31,382	3,599	975	3,950	100.0
Business	50,756	45,650	5,106	*	*	*	58.5
Federal government	13,446	*	13,446	*	*	*	15.5
Federal intramural ^a	8,084	*	8,084	*	*	*	9.3
FFRDCs	5,361	*	5,361	*	*	*	6.2
Industry administered	2,387	*	2,387	*	*	*	2.8
U&C administered	1,386	*	1,386	*	*	*	1.6
Nonprofit administered	1,589	*	1,589	*	*	*	1.8
Universities and colleges	16,896	864	10,147	3,599	975	1,312	19.5
Other nonprofit organizations	5,675	354	2,682	*	*	2,638	6.5
Percent distribution by source	100.0	54.0	36.2	4.1	1.1	4.6	na
Development	290,935	222,210	64,264	1,510	409	2,542	100.0
Business	251,989	221,580	30,409	*	*	*	86.6
Federal government	30,349	*	30,349	*	*	*	10.4
Federal intramural ^a	24,404	*	24,404	*	*	*	8.4
FFRDCs	5,945	*	5,945	*	*	*	2.0
Industry administered	1,975	*	1,975	*	*	*	0.7
U&C administered	1,628	*	1,628	*	*	*	0.6
Nonprofit administered	2,342	*	2,342	*	*	*	0.8
Universities and colleges	5,783	362	2,951	1,510	409	550	2.0
Other nonprofit organizations	2,814	267	555	*	*	1,992	1.0
Percent distribution by source	100.0	76.4	22.1	0.5	0.1	0.9	na

* = small to negligible amount, included as part of the funding provided by other sectors.

FFRDC = federally funded research and development center; U&C = universities and colleges.

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

NOTES: R&D data for 2012 are preliminary and may later be revised. Data are based on annual reports by performers, except for the nonprofit sector. Expenditure levels for academic and federal government performers are calendar year approximations based on fiscal year data. Funding for FFRDC performance is chiefly federal, but any nonfederal support is included in the federal figures. State and local government support to business are included in business support for business performance.

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

totaled 2.84% of GDP that year (figure 4). The preliminary data for 2012 put the R&D/GDP ratio at 2.89% a year later. By comparison, the ratio stood at 2.63% in 2002 and 2.71% in 2007 (a period over which the U.S. business cycle was mainly expansionary).

The U.S. R&D/GDP ratio has, on balance, been increasing over the past decade, although there have been some ups and downs year to year (figure 4). The high-water mark for the ratio since the early 1950s is the 2.90% observed in 2009; the previous high was the 2.88% in 1964. The preliminary figure of 2.89% in 2012 is only slightly below the 2009 high, and as earlier described, 2012 reflects a year in which there were

sizable expansions in both R&D and the national economy. The 2.90% in 2009 takes more explanation, as both total R&D and GDP declined that year, but GDP declined at a larger rate.

As is evident from figure 4, most of the rise of the R&D/GDP ratio over the past several decades has come from the increase of nonfederal spending on R&D—particularly, that by the business sector. This reflects the growing role of business R&D in the national R&D system and, in turn, the growing prominence of R&D-derived goods and services in the national and global economies. By contrast, the ratio of federal R&D spending to GDP declined from the mid-1980s through 2000—

notably, from the continuing cuts in defense-related R&D. There was a gradual uptick, however, through 2009 as a result of increased federal spending on biomedical and national security R&D and the one-time incremental funding for R&D provided by the American Recovery and Reinvestment Act of 2009.

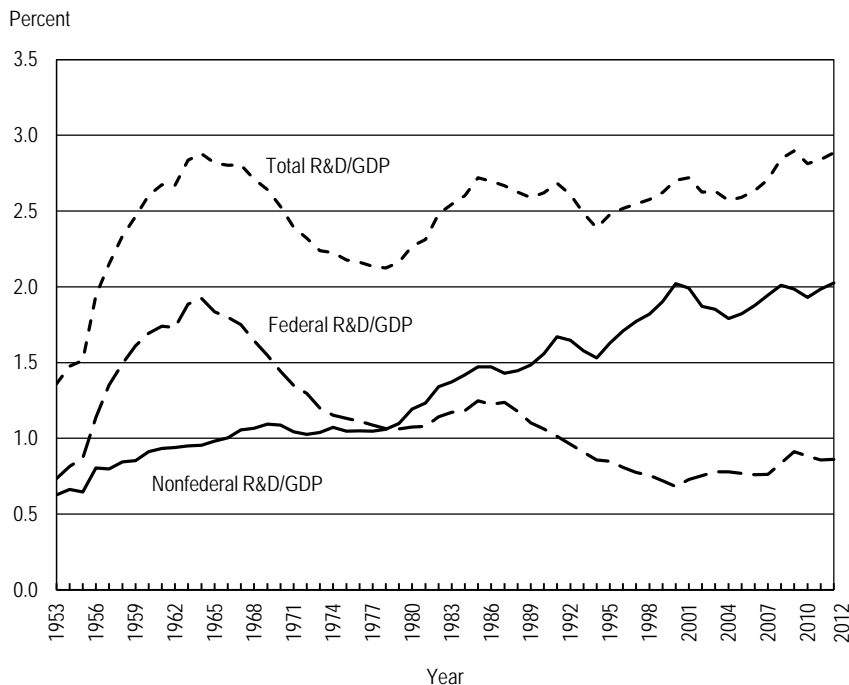
International Comparisons

Worldwide R&D expenditures totaled an estimated \$1.435 trillion in 2011.⁴ Five years earlier, in 2006, the estimate was \$1.051 trillion. In 2001, it was \$753 billion. By these numbers, growth in total global R&D (unadjusted for inflation) has averaged 6.4% annually over the past 5 years and 6.7% over the past 10 years.

Many countries conduct R&D, but global R&D performance is concentrated in a relatively small number of countries (table 4). Three countries account for more than half of global R&D. In 2011, the United States was by far the largest R&D performer (\$429 billion), accounting for just under 30% of the global total.⁵ China was the second-largest performer that year (\$208 billion), accounting for about 15% of the global total. Japan was third (\$147 billion), with 10%. The other established performers spend notably less: Germany (\$93 billion, 6%), South Korea (\$60 billion, 4%), France (\$52 billion, 4%), and the United Kingdom (\$40 billion, 3%). Taken together, these top seven countries account for about 72% of the global total. The Russian Federation, Taiwan, Brazil, Italy, Canada, India, Australia, and Spain make up the next tier of performers, with national R&D expenditures ranging from \$20 billion to \$35 billion.

With respect to R&D intensity, the U.S. R&D/GDP ratio was 2.85% in 2011 (table 4). At this level, the United States

FIGURE 4. Ratio of U.S. R&D to gross domestic product, roles of federal and nonfederal funding for R&D: 1953–2012



GDP = gross domestic product.

NOTES: R&D data for 2012 are preliminary and may later be revised. Federal R&D/GDP ratios represent the federal government as a funder of R&D by all performers; the nonfederal ratios reflect all other sources of R&D funding.

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

TABLE 4. International comparisons of gross domestic expenditures on R&D and R&D share of gross domestic product, by region and selected country or economy: 2011 or most recent year

Region, country, or economy	GERD (PPP \$millions)	GERD/GDP (%)	Region, country, or economy	GERD (PPP \$millions)	GERD/GDP (%)
North America			Middle East		
United States ^a	429,143.0	2.85	Turkey	10,826.9	0.86
Canada	24,289.3	1.74	Israel	9,822.7	4.38
Mexico	8,209.4	0.43	Iran (2008)	6,432.2	0.79
South America			Africa		
Brazil (2010)	25,340.2	1.16	South Africa (2009)	4,416.2	0.87
Argentina	4,640.6	0.65	Egypt	2,230.6	0.43
Chile (2010)	1,331.4	0.42	Morocco (2010)	1,115.6	0.73
Colombia (2010)	856.7	0.16	Tunisia (2009)	1,055.9	1.10
Europe			Central Asia		
Germany	93,055.5	2.88	Russian Federation	35,045.1	1.09
France	51,891.0	2.24	South Asia		
United Kingdom	39,627.1	1.77	India (2007)	24,305.9	0.76
Italy	24,812.1	1.25	Pakistan	1,618.5	0.33
Spain	19,763.1	1.33	East, Southeast Asia		
Netherlands	14,581.5	2.04	China	208,171.8	1.84
Sweden	13,216.2	3.37	Japan	146,537.3	3.39
Switzerland (2008)	10,525.2	2.87	South Korea	59,890.0	4.03
Austria	9,761.9	2.75	Taiwan	26,493.1	3.02
Belgium	8,719.4	2.04	Singapore	7,060.2	2.23
Finland	7,634.8	3.78	Malaysia	4,953.4	1.07
Denmark	7,052.4	3.09	Thailand (2009)	1,355.8	0.25
Poland	6,227.9	0.76	Indonesia (2009)	802.3	0.08
Czech Republic	5,086.5	1.85	Australia, Oceania		
Norway	5,006.7	1.66	Australia (2010)	20,578.1	2.20
Portugal	4,037.6	1.49	New Zealand	1,772.1	1.30
Ireland	3,223.0	1.70	Selected country groups		
Hungary	2,581.9	1.21	European Union	320,455.9	1.94
Ukraine	2,400.0	0.73	OECD	1,034,024.3	2.37
Greece (2007)	1,866.8	0.60			
Romania	1,648.5	0.50			
Slovenia	1,387.8	2.47			
Belarus	1,074.1	0.76			
Slovak Republic	882.3	0.68			
Luxembourg	656.2	1.43			
Croatia	642.9	0.75			
Serbia	633.9	0.73			
Bulgaria	632.6	0.57			

GDP = gross domestic product; GERD = gross expenditures (domestic) on R&D; OECD = Organisation for Economic Co-operation and Development; PPP = purchasing power parity.

^a Figures for the United States in this table may differ slightly from those cited elsewhere in this InfoBrief. Data here reflect international standards for calculating GERD, which vary slightly from National Science Foundation's protocol for tallying U.S. total R&D.

NOTES: Table includes countries with annual GERD of \$500 million or more. The National Science Foundation's estimate of total global GERD in 2011 is \$1.435 trillion. Year of data is listed in parentheses if it differs from 2011. Foreign currencies are converted to dollars through purchasing power parities. Countries are grouped according to the regions described by *The CIA World Factbook*, <https://www.cia.gov/library/publications/the-world-factbook/>. No countries in the Central America or Caribbean region had annual GERD of \$500 million or more. Data for Israel are civilian R&D only. See sources below for GERD statistics on additional countries.

SOURCES: Organisation for Economic Co-operation and Development, *Main Science and Technology Indicators* (Volume 2013, Issue 1); United Nations Educational, Scientific, and Cultural Organization, Institute for Statistics, http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx?IF_ActivePath=P,54&IF_Language=eng, table 25, accessed 2 August 2013.

is tenth among the economies tracked by the Organisation for Economic Co-operation and Development (OECD). Israel continues to have the highest ratio, at 4.38% (2011). South Korea is now second, at 4.03%. Finland is third at 3.78%; Japan is 3.39% and Sweden is 3.37%. Denmark is 3.09%; Taiwan, 3.02%. Germany and Switzerland are both slightly ahead of the United States, at 2.88% and 2.87%, respectively.

Data Sources and Availability

The statistics on U.S. R&D presented here are derived chiefly from integrating the data on R&D expenditures and funding collected from the National Science Foundation's (NSF's) major national surveys of the organizations that perform the vast majority of 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. 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 prepared.

The main R&D surveys utilized include NSF's Business R&D and Innovation Survey (for 2008 through 2011; for 2007 and earlier years, data from the Survey of Industrial R&D are used), the Higher Education R&D Survey (for 2010, 2011, and 2012; for 2009 and earlier years, the Survey of R&D Expenditures at Universities and Colleges), the Survey of Federal Funds for R&D (2011–13 and earlier years), and the Survey of R&D Expenditures at Federally Funded R&D Centers (FY 2012 and earlier years). Figures for R&D performed by other nonprofit organizations with funding from within the nonprofit sector and business sources are estimated, based on parameters from the Survey of R&D Funding and Performance by Nonprofit Organizations, 1996–97.

The 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. In FY 2009, federal agencies reported obligating \$133 billion for R&D funding to all R&D performers (including \$53 billion to the business sector), compared with an estimated \$124 billion in federal funding reported by all performers of R&D (\$40 billion by businesses). Although NSF has not found a definitive explanation for this divergence, the National Academies' Committee on National Statistics (CNSTAT) notes that comparing federal outlays (as opposed to obligations) for R&D to performer expenditures results in a smaller discrepancy.⁶ For FY 2009, federal agencies reported R&D outlays of \$127 billion to all R&D performers.

The full set of detailed statistical tables associated with the National Patterns data in this InfoBrief will be available in the report *National Patterns of R&D Resources: 2011–12 Data Update*, at <http://www.nsf.gov/statistics/natlpatterns/>. Individual detailed tables may be available in advance of the full report. For further information on the National Patterns data and methodology, contact the author.

Notes

1. Mark Boroush, Research and Development Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (mboroush@nsf.gov; 703-292-8726).
2. The previously published estimate for 2011 was \$414.0 billion. Most of the \$14.2 upward revision for 2011 stems from revised data for business R&D

that year. (Boroush M. 2013. *U.S. R&D Spending Resumes Growth in 2010 and 2011 but Still Lags Behind the Pace of Expansion of the National Economy*. InfoBrief NSF 13-313. Arlington, VA: National Science Foundation, National Center for Science and Engineering Statistics. Available at <http://www.nsf.gov/statistics/infbrief/nsf13313/>)

3. The National Science Foundation identifies the main categories of R&D performers as follows: businesses, federal agency intramural R&D facilities, federally funded research and development centers (administered by businesses, universities and colleges, or nonprofit organizations), universities and colleges, and other nonprofit organizations. For R&D funding, the categories are businesses, the federal government, nonfederal government agencies, universities and colleges, and other nonprofit organizations.

4. The figures cited here for total global R&D in 2001, 2006, and 2011 are National Science Foundation (NSF) estimates. R&D expenditures by all countries are denominated in U.S. dollars, based on purchasing power parities. These estimates are based on data from the Organisation for Economic Co-operation and Development (OECD), *Main Science and Technology Indicators* (Volume 2013, Issue 1) and from R&D statistics for additional countries assembled by the United Nations Educational, Scientific and Cultural Organization (UNESCO), Institute for Statistics (as of early August 2013). At present, there is no database on R&D spending that is comprehensive and consistent for all nations performing R&D. The OECD and UNESCO databases together provide R&D performance statistics for 214 countries, although the data are not current or complete for all. NSF's estimate of total global R&D reflects 91

countries, with reported annual R&D expenditures of \$50 million or more, and that account for most all of current global R&D.

5. The \$429 billion cited here for U.S. R&D spending in 2011 reflects the Organisation for Economic Co-operation and Development (OECD) statistical conventions for calculating total national R&D (minor

differences with the approach used by the National Science Foundation [NSF]) and results in a slightly higher figure than listed earlier in this report. For international comparisons and to ensure consistency, NSF reports the statistics for all countries based on the OECD conventions.

6. National Research Council.
2005. *Measuring Research and*

Development Expenditures in the U.S. Economy. Panel on Research and Development Statistics at the National Science Foundation; Brown LD, Plewes TJ, Gerstein MA, editors. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academies Press.

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