

SLOWING R&D GROWTH EXPECTED IN 2002

by Brandon Shackelford

Preliminary data indicate that national research and development (R&D) expenditures will continue to rise in 2002 although at a slower rate than experienced in recent years. Total 2002 R&D performance in the United States is estimated to be \$291.7 billion, up from an estimated \$281.8 billion in 2001 and \$264.6 billion in 2000. In “real terms” (adjusting for inflation), total R&D in constant 1996 dollars is estimated to be \$263.6 billion in 2002, \$257.5 billion for 2001, and \$247.6 billion for 2000. The period from 1994 to 2000 was one of sharply rising R&D investment, with an average annual real growth rate of 5.8 percent in total R&D. Real growth slowed to an estimated 4.0 percent between 2000 and 2001 and is expected to slow further to 2.4 percent between 2001 and 2002 (figure 1). Despite this slowdown, total R&D for the nation is expected to keep pace with growth in the economy as a whole through 2002 based on gross domestic product (GDP) estimates from the U.S. Office of Management and Budget.¹

R&D/GDP Ratios

It is estimated that the United States will spend 2.79 percent of its GDP on R&D in 2002. Since 1953, the first year that national R&D data are available, the United States has spent a minimum of 1.36 percent (in 1953) and a maximum of 2.88 percent (in 1964) of its GDP on R&D (figure 2). Disaggregating the total R&D/GDP ratio into a federally financed R&D/GDP

ratio and a nonfederally² financed R&D/GDP ratio reveals that most of the growth over time in the R&D/GDP ratio series can be attributed to steady increases in non-Federal R&D spending. Nonfederally financed R&D, the majority of which is company financed, has increased with little variability from 0.63 percent of GDP in 1953 to an estimated 2.02 percent of GDP in

The recent slowdown in industry-financed R&D coincides with the sluggish economy of the past two years.

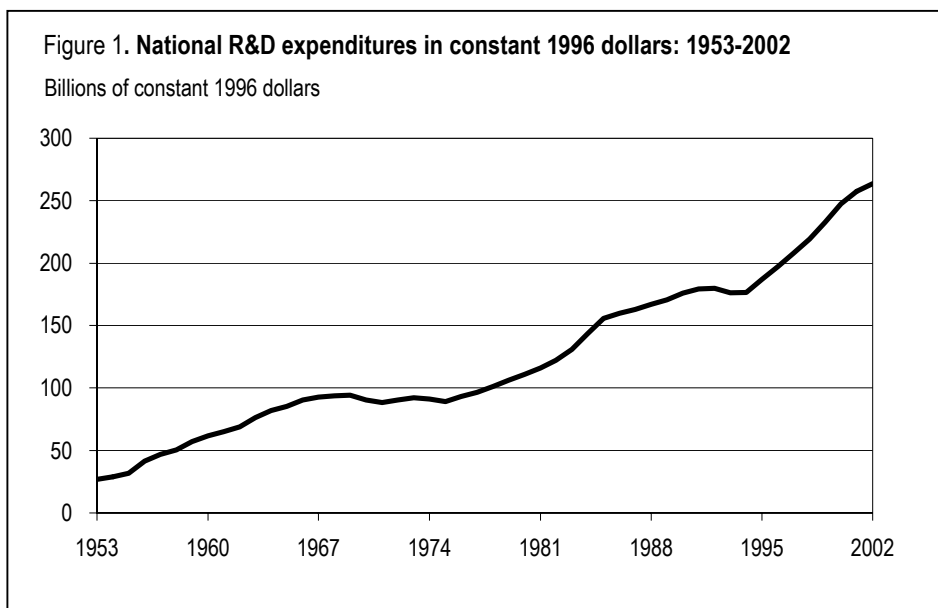
2002. The steady increase in nonfederally financed R&D as a percent of GDP as illustrated in figure 2 corresponds with a trend toward more R&D-intensive activities in the United States economy. The estimated nonfederally financed R&D/GDP ratio was 2.07 percent in 2001. Most of the variability over time in the ratio of total R&D to GDP can be attributed to changing priorities in Federal R&D spending.

The recent slowdown in R&D investment is most evident in industry-financed R&D and coincides with the economic downturn of the past two years. However, federally financed R&D, which had been declining as a share of GDP for 13 years from 1987 to 2000, is expected to grow at a faster pace than GDP for 2001 and 2002. Federal R&D investment, the dominant factor in U.S. R&D growth from 2000 to 2002, is expected to increase particularly in the areas of defense and health.

¹The estimated U.S. GDP for 2000, 2001, and 2002 in constant 1996 dollars is \$9,191 billion, \$9,215 billion, and \$9,437 billion, respectively. Source: U.S. Office of Management and Budget.

²Non-Federal sources of R&D tracked by the National Science Foundation include industrial firms, universities and colleges, nonprofit institutions, and state and local governments.

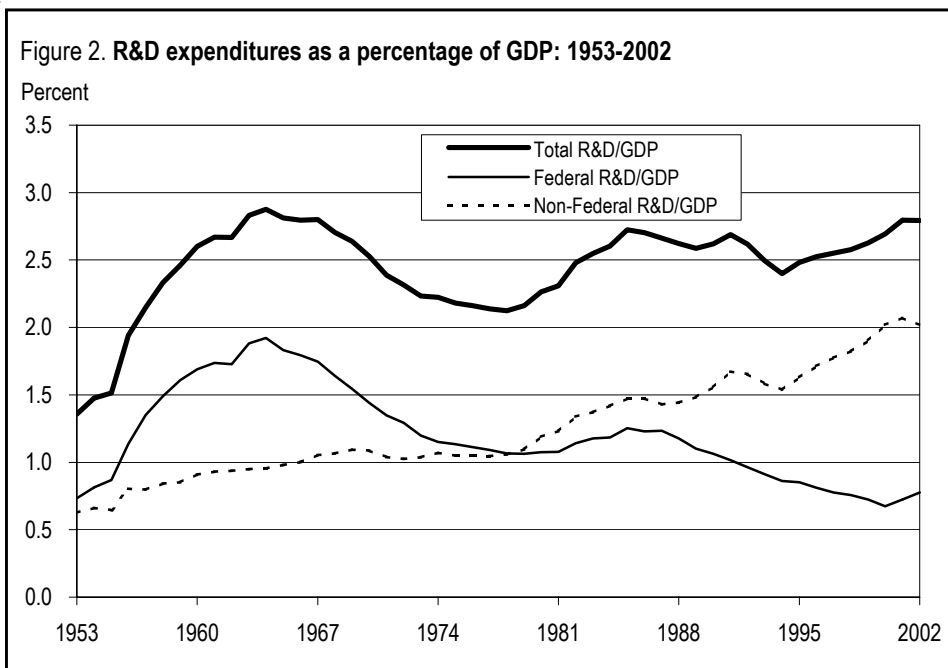




KEY: R&D = research and development.

NOTES: These data are based on reports from R&D performers. Data for 2001 and 2002 are preliminary.

SOURCE: National Science Foundation/Division of Science Resources Statistics. These data were assembled from four NSF surveys: Survey of Industrial R&D, Survey of R&D Expenditures at Universities and Colleges, Survey of Federal Funds for R&D, and Survey of R&D Funding and Performance by Nonprofit Organizations.



KEY: R&D = research and development; GDP = gross domestic product.

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The ratio of R&D to GDP is also a useful indicator for international comparisons of R&D performance. Due to the size of its economy, the United States spends more on R&D than any other country, though it spends less on R&D as a proportion of its economy than do some other countries. For example, in 2000, the most recent year for which comparable international data are available, the United States spent 2.69 percent of its GDP on R&D, compared to 2.98 percent spent by Japan and 3.37 percent spent by Finland. It exceeded, however, the shares of 2.15 percent by France, 2.48 percent by Germany, 1.86 percent by the United Kingdom, and 1.84 percent by Canada. The European Union as a whole, which is more comparable to the United States in terms of economic size, spent 1.88 percent of its GDP on R&D in 2000.

R&D Performance Patterns

Industry—excluding industry-administered federally funded research and development centers

(FFRDCs)³—is expected to perform 72.3 percent of the Nation’s total R&D in 2002 (table 1). The estimated \$210.8 billion in R&D performance by industry represents a 1.5-percent average annual increase in real terms over the 2000 level. (Figure 3 displays this change in terms of constant 1996 dollars.) Of the industrial R&D performance in 2002, 90.1 percent will be supported by industry’s own funds; Federal funding will account for the remaining 9.9 percent. The Federal share of industry’s performance total (excluding industry FFRDCs) has fallen considerably from a high of 31.9 percent in 1987.

Universities and colleges, excluding academically administered FFRDCs, are expected to account for 12.9 percent (\$37.5 billion) of national R&D performance in 2002; an average annual increase of 8.1 percent in real terms since 2000.⁴ The Federal Government is expected to perform 7.4 percent (\$21.6 billion) of U.S. R&D in 2002, an average annual increase in real terms

Table 1. Estimated national expenditures for research and development, by performing sector and source of funds: 2002

Performers	Total	Source of funds				Percent distribution, by performer
		Industry	Federal Government	Universities and colleges ¹	Other nonprofit institutions	
(millions of current dollars)						
Total.....	291,663	193,420	81,004	9,932	7,308	100.0
Industry.....	210,848	189,915	20,933	--	--	72.3
Industry-administered FFRDCs.....	2,268	--	2,268	--	--	0.8
Federal Government.....	21,566	--	21,566	--	--	7.4
Universities and colleges.....	37,491	2,342	22,531	9,932	2,686	12.9
U&C-administered FFRDCs.....	6,059	--	6,059	--	--	2.1
Other nonprofit institutions.....	11,310	1,163	5,525	--	4,622	3.9
Nonprofit-administered FFRDCs.....	2,121	--	2,121	--	--	0.7
Percent distribution by sources.....	100.0	66.3	27.8	3.4	2.5	--

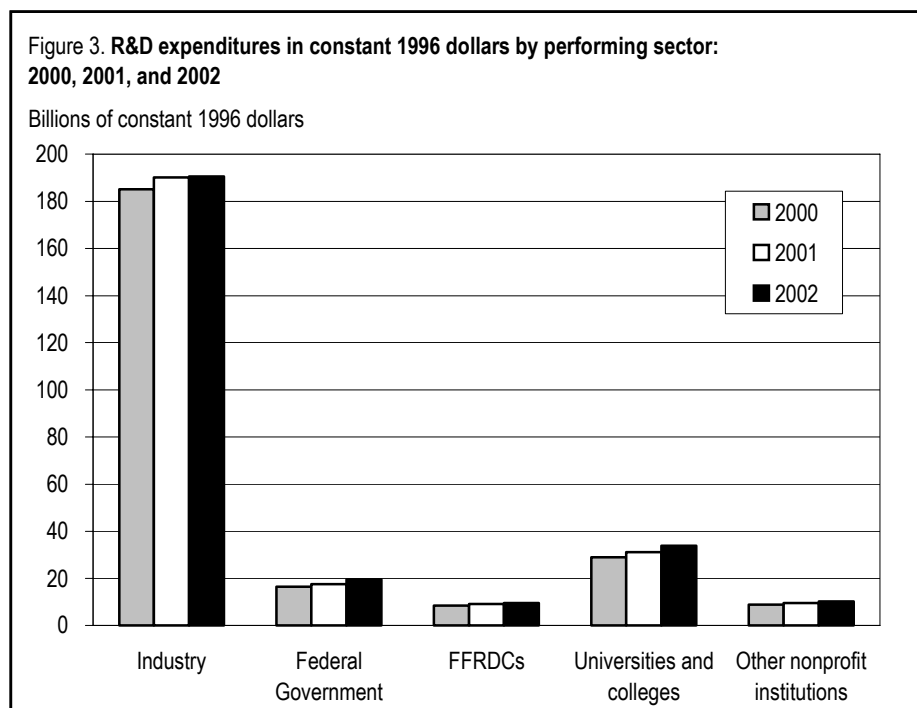
¹ Includes state and local government support. In 2002 state and local government support to U&Cs is projected to be \$2,473 million.

KEY: FFRDC = federally funded research and development center; U&C=universities and colleges
 -- = Not applicable or assumed negligible

SOURCE: National Science Foundation/Division of Science Resources Statistics. These data were assembled from four NSF surveys: Survey of Industrial R&D, Survey of R&D Expenditures at Universities and Colleges, Survey of Federal Funds for R&D, and Survey of R&D Funding and Performance by Nonprofit Organizations.

³FFRDCs are R&D-performing organizations that are exclusively or substantially financed by the Federal Government and are supported by the Federal Government either to meet a particular R&D objective or, in some instances, to provide major facilities at universities for research and associated training purposes. Each FFRDC is administered either by an industrial firm, a university, or a nonprofit institution.

⁴Recent methodological improvements have resulted in revisions from the amounts previously reported for (i) total academic R&D expenditures and (ii) the proportion of basic research for the academic sector. Details will be available in a forthcoming methodology report.



KEY: R&D = research and development; FFRDC = federally funded research and development center.

NOTES: These data are based on reports from R&D performers. Data for 2001 and 2002 are preliminary.

SOURCE: National Science Foundation/Division of Science Resources Statistics.

of 9.2 percent over the 2000-2002 period. All FFRDCs combined will perform an estimated \$10.4 billion of R&D in 2002, or 3.6 percent of the U.S. total. The nonprofit sector is expected to perform \$11.3 billion in 2002, or 3.9 percent of the U.S. total.

R&D Funding Patterns

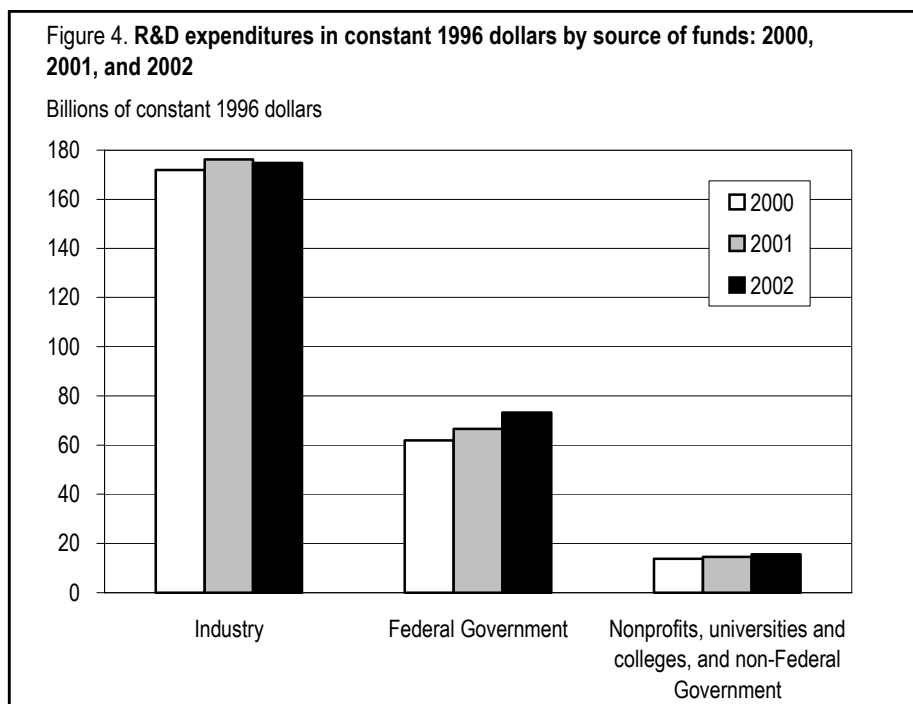
The amount of R&D funded by a sector can differ greatly from the amount of R&D performed by the same sector. Since 1980, industry has provided the largest share of financial support for R&D, which is estimated to reach \$193.4 billion in 2002, or 66.3 percent of the total. This funding represents a 0.9-percent average increase per year in real terms between 2000 and 2002. (Figure 4 displays this change in terms of constant 1996 dollars.) Of these funds, nearly all (\$189.9 billion in current dollars) will be devoted to R&D performed by industry itself in 2002, with the remainder directed toward academic R&D (\$2.3 billion) and R&D performed by other nonprofit institutions (\$1.2 billion).

Federal R&D support in 2002 is expected to be \$81.0 billion, reflecting an 8.7-percent average real increase per year since 2000. The Federal share of support for the Nation's R&D is expected to rise to 27.8 percent for 2002. The Federal share first fell below 50 percent in 1979, and it remained between 45 and 48 percent until 1988. The share then fell steadily, dropping from 45.1 percent in 1988 to 25.0 percent in 2000 (the lowest it has ever been since the start of the time series in 1953).

Universities and colleges, state and local governments, and other nonprofit institutions will provide other R&D funds. These funds, in combination, are expected to reach \$17.2 billion in 2002, reflecting a 6.5-percent average real increase per year over their combined 2000 funding level.

User Notes

U.S. R&D expenditures data were assembled from the National Science Foundation's surveys: Survey of



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SOURCE: National Science Foundation/Division of Science Resources Statistics.

Industrial R&D, Survey of R&D Expenditures at Universities and Colleges, Survey of Federal Funds for R&D, and Survey of R&D Funding & Performance by Nonprofit Organizations. Foreign R&D expenditure data are derived from national and international sources. Preliminary estimates for 2001 and 2002 were based in part on time-series modeling and econometric techniques.

R&D expenditure levels from Federal sources, presented here based on performer-reported surveys, differ from Federal R&D funding totals reported by the Federal agencies that provide those funds. The difference in the Federal R&D totals appears to be

concentrated in the funding of industry R&D by the Department of Defense. See *National Patterns of R&D Resources: 1998* for detailed discussion and documentation of these differences.

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