Division of Science Resources Studies

DATA BRIEF

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R&D as a Percentage of GDP Continues Upward Climb

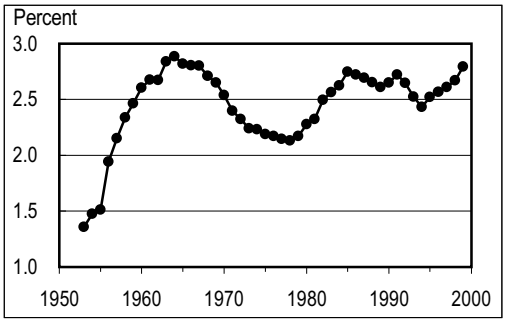
by Steven Payson

R&D as a proportion of the gross domestic product has risen sharply since 1994.

By current projections, total annual research and development (R&D) expenditures in the United States will be $247.0 billion in 1999—an 8.8-percent increase over the $227.0 billion estimated for 1998. In turn, the 1998 estimate represents a 7.3-percent increase over 1997, and the 1997 level a 7.7-percent increase over 1996. In inflation-adjusted terms, R&D annual increases are 7.2 percent for 1999, 6.2 percent for 1998, and 5.7 percent for 1997.

The entire economy of the United States, as measured by gross domestic product (GDP), adjusted for inflation, increased an estimated 2.4 percent in 1999, 3.9 percent in 1998, and 3.9 percent in 1997. Consequently, R&D as a share of GDP will reach 2.79 percent in 1999, up from 2.67 percent in 1998, and 2.61 percent in 1997. This 1999 forecast of R&D as a share of GDP is the highest since 1967's 2.80 percent, and reflects a continuation of a general upturn that began in 1994 after a three-year decline from 1991-94 (figure 1). Despite this recent increase, the R&D share is still below levels reached in the 1960s. The historic high since 1953 for the Nation's R&D/GDP ratio was reached in 1964 at 2.87 percent; the lowest ratio since then was 2.12 percent in 1978.

Figure 1. U.S. R&D as a percent of GDP: 1953-99



NOTES: These data are based on reports from R&D performers. Data for 1998 and 1999 are preliminary.

SOURCE: National Science Foundation/Division of Science Resources Studies. These data were derived from data collected in three SRS surveys: Survey of Industrial Research and Development, Survey of Research and Development Expenditures at Universities and Colleges, and Survey of Federal Funds for Research and Development.

Of the projected $247.0 billion spent on R&D in 1999, $40.2 billion (or 16.3 percent) is expected to be for basic research, $56.5 billion (22.9 percent) for applied research, and $150.3 billion (60.9 percent) for development. In comparison with 1998, R&D performance in 1999 reflects a 5.1-percent "real" (adjusted for inflation) increase in basic research, a 7.5-percent real increase in applied research, and a 7.6-percent real increase in development.

Funding Patterns

Since 1980, industry has provided the largest share of financial support for R&D, projected to reach $169.3 billion in 1999, or 68.5 percent of the total (table 1). This funding represents a 10.3-percent increase in real terms over the preliminary 1998 level. Of these funds, nearly all ($166.0 billion) will be devoted to R&D performed by industry itself, with the remainder directed toward academic R&D ($2.2 billion) and R&D performed by other nonprofit organizations ($1.2 billion).

Federal R&D support in 1999 is expected to be $65.9 billion, virtually unchanged in real terms from 1998. The Federal share of support for the Nation's R&D first fell below 50 percent in 1979, and it remained between 45 and 50 percent until 1988. It then fell steadily, dropping from 44.9 percent in 1988 to 26.7 percent projected for 1999 (the lowest it has ever been since the start of the time series in 1953).

Other R&D funds will be provided by universities and colleges, state and local governments, and other nonprofit institutions. These funds, in combination, are expected to reach $11.8 billion in 1999, reflecting a 5.7 percent real increase over their 1998 level.

Electronic Dissemination

SRS data are available through the World Wide Web (http://www.nsf.gov/sbe/srs/). For more information about obtaining reports, contact pubs@nsf.gov or call (301) 947-2722. For NSF's Telephonic Device for the Deaf, dial (703) 306-0090.

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Table 1. Preliminary national expenditures for research and development, by performing sector and source of funds: 1999

Performers	Total	Sources of funds: Industry	Federal Government	Universities and colleges	Other nonprofit institutions	Percent distribution, by performer
	All R&D: Basic Research, Applied Research and Development (millions of current dollars)					
Total	247,000	169,312	65,853	7,923	3,913	100.0
Industry	185,892	165,955	19,937	--	--	75.3
Industry-administered FFRDCs	2,166	--	2,166	--	--	0.9
Federal Government	17,362	--	17,362	--	--	7.0
Universities and colleges	28,256	2,163	16,137	7,923	2,032	11.4
U&C-administered FFRDCs	6,169	--	6,169	--	--	2.5
Other nonprofit institutions	6,319	1,194	3,246	--	1,880	2.6
Nonprofit-administered FFRDCs	836	--	836	--	--	0.3
Percent distribution by sources	100.0	68.5	26.7	3.2	1.6	
	Basic Research Only (millions of current dollars)					
Total	40,224	12,689	21,020	4,586	1,929	100.0
Industry	11,778	10,888	890	--	--	29.3
Industry-administered FFRDCs	601	--	601	--	--	1.5
Federal Government	3,100	--	3,100	--	--	7.7
Universities and colleges	18,758	1,252	11,743	4,586	1,176	46.6
U&C-administered FFRDCs	3,086	--	3,086	--	--	7.7
Other nonprofit institutions	2,795	549	1,494	--	752	6.9
Nonprofit-administered FFRDCs	107	--	107	--	--	0.3
Percent distribution by sources	100.0	31.5	52.3	11.4	4.8	

KEY: FFRDC = Federally funded research and development center; U&C = Universities and colleges

NOTES: State and local government support to industry is included in industry support for industry performance. State and local government support to U&Cs is included in U&C support for U&C performance.

SOURCE: National Science Foundation/Division of Science Resources Studies. These data were derived from data collected in three SRS surveys: Survey of Industrial Research and Development, Survey of Research and Development Expenditures at Universities and Colleges, and Survey of Federal Funds for Research and Development.

R&D Performance Patterns

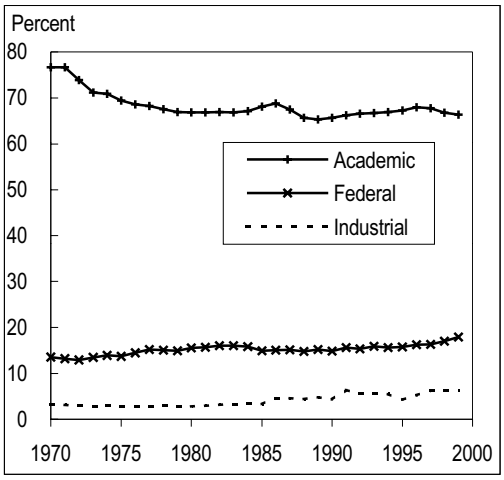
Industry—excluding industry-administered Federally Funded Research and Development Centers (FFRDCs)—is expected to perform 75.3 percent of the Nation's total R&D in 1999. The projected $185.9 billion in R&D performance by industry represents an 8.8-percent increase in real terms over the preliminary 1998 level. Of this industrial R&D performance in 1999, 89.3 percent will be supported by industry's own funds; Federal funding will account for the remaining 10.7 percent. The Federal share of industry's performance total (excluding industry FFRDCs) has fallen considerably from a high of 32 percent in 1987.

Universities and colleges, excluding academically administered FFRDCs, are expected to account for 11.4 percent ($28.3 billion) of national R&D performance in 1999; this is a moderate real increase (4.3 percent) over 1998. The Federal Government is expected to perform $17.4 billion of R&D in 1999, a decline in real terms of 0.5 percent from 1998. Federal agencies are estimated to account for 7.0 percent of national R&D performance in 1999, reflecting, again, a continual decline in the Federal performance share which began in the mid-1970s. All FFRDCs combined will perform an estimated $9.2 billion of R&D, or 3.7 percent of the U.S. total.

Basic Research Patterns

The amount of basic research conducted as a proportion of R&D varies enormously by sector. From 1970-99, basic research was between 65 and 77 percent of all university and college R&D (excluding university and college administered FFRDCs) (figure 2). For industry R&D (excluding industry-administered FFRDCs) it has ranged between only 3 and 6 percent, and for Federal intramural R&D it has ranged between 13 and 18 percent. This maximum of 18 percent for basic research as a percentage of Federal R&D is expected for 1999, reflecting an upward trend that began in 1990.

Figure 2. Basic research of academic, Federal and industrial performers (excluding FFRDCs) as a percent of the R&D that each performs: 1970-99



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Industry is expected to account for 29.3 percent ($11.8 billion) of the Nation's basic research performance in 1999. Universities and colleges are expected to account for 46.6 percent ($18.8 billion), and their FFRDCs for another 7.7 percent ($3.1 billion). The remaining basic research performance will be carried out by the Federal Government, comprising 7.7 percent ($3.1 billion) of the total, industry-administered FFRDCs—1.5 percent ($0.6 billion), other nonprofit organizations—6.9 percent ($2.8 billion), and nonprofit-affiliated FFRDCs—0.3 percent ($0.1 billion). While Federal Government performance of all R&D is expected to decline slightly in real terms (as described above), Federal performance of basic research is expected to rise 4.5 percent.

The 1990s has seen relative declines, worldwide, in defense-related R&D as a proportion of GDP.

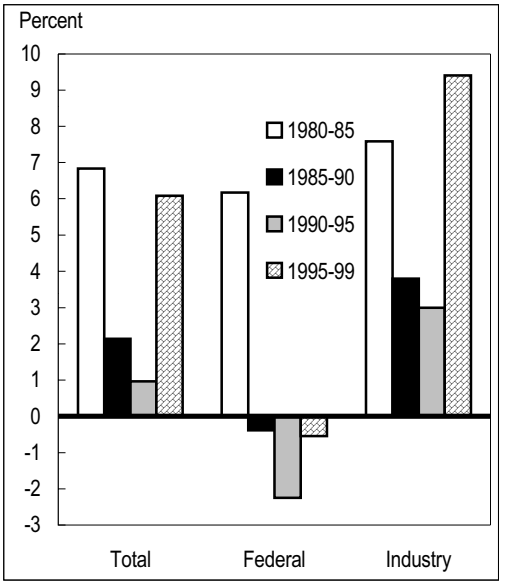
U.S. R&D Expenditure Trends

Growth in total U.S. R&D expenditures was relatively slow in the early 1990s, but is now accelerating. In the past, annual R&D growth had been much higher—e.g., from 1980-85 it averaged 6.8 percent in real terms. That rate then slowed to 2.1 percent in 1985-90, and to 1.0 percent in 1990-95. Annual real R&D growth in 1995-99, however, is expected to average 6.1 percent (figure 3). Almost all of the recent growth in national R&D expenditures is the result of a resurgence of industrial R&D.

International R&D Spending

Due to the size of its economy, the United States spends more on R&D than any other country, though it does not spend as high a proportion of its economy on R&D as some other countries. For example, in 1997, the most recent year for which comparable international data are available, the United States spent 2.60 percent of its GDP on R&D, compared to 2.92 percent spent by Japan. It exceeded, however, the shares of 2.23 percent by France, 2.31 by Germany, 1.87 by the United Kingdom, 1.60 by Canada, and 1.08 by Italy. Nondefense R&D as a percent of GDP was 2.16 for the United

Figure 3. Average annual rates of change in U.S. R&D support, based on inflation-adjusted dollars



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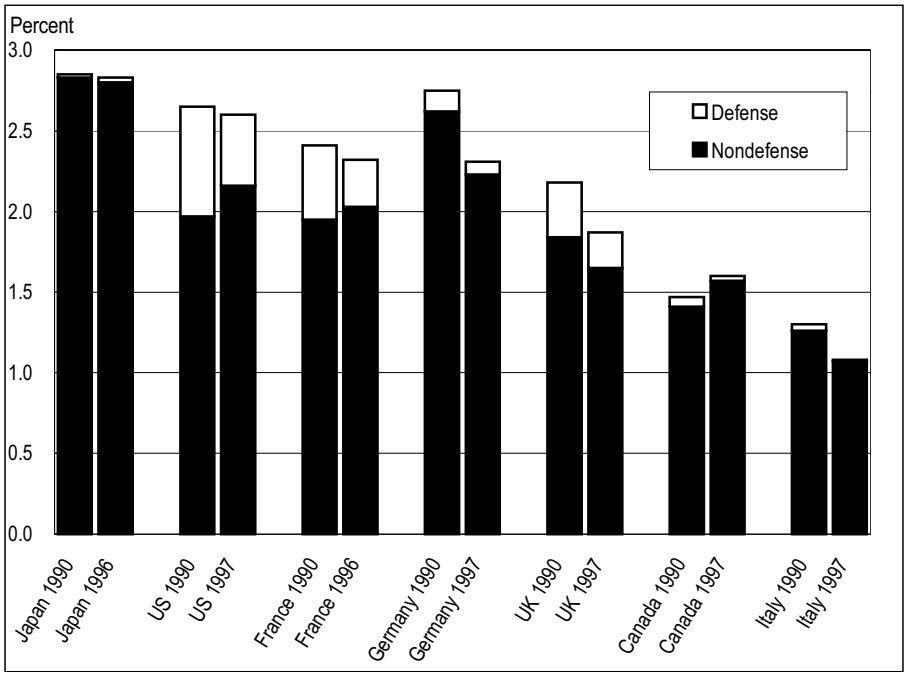
States in 1997, which was lower than for Germany (2.23), and Japan (2.80 in 1996, the most recent year available); but higher than for France (2.03 in 1996), the United Kingdom (1.65), Canada (1.57), and Italy 1.07 (figure 4). As indicated in figure 4, in the 1990s the proportion of R&D devoted to defense-related activities has declined for nearly all of the group of seven countries, with the exception of Japan (though, for Japan, the proportion of R&D that is defense-related has continued to remain relatively small).

Figure 4. R&D/GDP ratios for the "Group of Seven" countries: 1990 and 1997 (or most current year)



SOURCES: Organisation for Economic Co-operation and Development, Main Science and Technology Indicators database, and National Science Foundation/Division of Science Resources Studies

User Notes

U.S. R&D expenditures data were assembled from the National Science Foundation's surveys: Survey of Industrial Research and Development, Survey of Research and Development Expenditures at Universities and Colleges, and Survey of Federal Funds for Research and Development. Projections for 1999 and preliminary tabulations for 1998 were based in part on time-series modeling techniques. Foreign R&D expenditure data are derived from national and international sources.

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. During the past several years, these differences have widened. 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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