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Six States Account for Half the Nation's R&D

by
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In 1995,—California, Michigan, New York, Massachusetts, New Jersey, and Texas—the six states with the highest levels of R&D expenditures accounted for approximately one-half of the national R&D effort.

The National Science Foundation's (NSF) Division of Science Resources Studies (SRS) collects and analyzes statistics on the geographic distribution of research and development (R&D) expenditures in the United States among the 50 states, the District of Columbia and Puerto Rico. The data are categorized by type of performer [industry, Federal Government, academia, Federally Funded Research and Development Centers (FFRDCs), and other nonprofit organizations] and by source of funds (industry, Federal Government, and academia).[1] Data pertaining to federally-funded R&D are further classified by the Federal agencies that provide the funding.

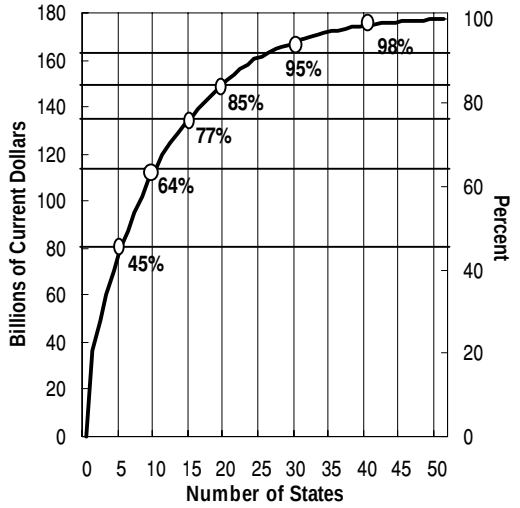
The most recent R&D data available on a state-by-state basis are for 1995.[2] In that year, total R&D expenditures in the United States were $183 billion, of which $177 billion could be attributed to expenditures within individual states, with the remainder falling under an undistributed, "other/unknown" category. The statistics and discussion below refer to state R&D levels in relation to the distributed total of $177 billion.

State Distribution of R&D

R&D is substantially concentrated in a small number of states. In 1995, California had the highest level of R&D expenditures—over $36 billion—representing approximately one-fifth of the $177 billion U.S. total. The six states with the highest levels of R&D expenditures—California, Michigan, New York, Massachusetts, New Jersey, and Texas (in decreasing order of magnitude)—accounted for approximately one-half of the entire national effort. The top ten states—adding, in descending order, Illinois, Pennsylvania, Maryland, and Ohio—accounted for nearly two-thirds of the national effort (chart 1 and table 1). Among these top ten states, California's R&D effort exceeded, by nearly a factor of three, the next-highest state, Michigan, with $13 billion in R&D expenditures. After Michigan, R&D levels declined relatively smoothly to approximately $5 billion for Ohio. The 20 highest-ranking states in R&D expenditures accounted for about 85 percent of the U.S. total; the lowest 20 states accounted for only 5 percent.

States that are national leaders in total R&D performance are usually ranked among the leading sites in industrial and academic R&D performance (table 1). For industrial R&D,

Chart 1. Cumulative distribution of U.S. R&D performance, by state: 1995



NOTE: Includes R&D expenditures for the District of Columbia but excludes R&D that cannot be distributed by state.

SOURCE: NSF/SRS, *National Patterns of R&D Resources*, annual series.

[1]Data on industry R&D—and therefore total R&D—performance are not available for Puerto Rico.

[2]Data on the state location of industry-performed R&D are collected only for odd-numbered years. Data on the state location of Federal and academic R&D performance are collected annually aspart of the Federal Funds for Research and Development survey and the survey of R&D Expenditures at Universities and Colleges.

Electronic Dissemination

SRS data are available through the World Wide Web (http://www.nsf.gov/sbe/srs/stats.htm). 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.

Table 1. Leading states in total R&D performance, R&D by sector, and as a percentage of gross state product (GSP): 1995

	Top 10 states in total R&D performance		Top 10 states in size of R&D, by type of performer			Top 10 states in R&D intensity (states having the highest R&D/GSP ratio)		
Rank	Total R&D (millions of 1995 dollars)	Top 10 states[1]	Industry[2]	Universities & Colleges[3]	Federal Government	Top 10 states	R&D/GSP (percent)	GSP (preliminary, in billions of 1995 dollars)
1	36,133	California	California	California	Maryland	New Mexico	8.1	40.5
2	13,275	Michigan	Michigan	New York	District of Columbia	District of Columbia	6.4	48.7
3	10,954	New York	New York	Illinois	California	Michigan	5.2	255.0
4	9,969	Massachusetts	New Jersey	Massachusetts	Virginia	Massachusetts	5.1	197.2
5	9,128	New Jersey	Massachusetts	Texas	Alabama	Maryland	4.7	138.0
6	8,385	Texas	Texas	New Mexico	Ohio	Delaware	4.0	28.5
7	7,487	Illinois	Illinois	Pennsylvania	Florida	California	3.9	914.8
8	6,919	Pennsylvania	Pennsylvania	Maryland	Texas	Connecticut	3.7	115.6
9	6,519	Maryland	Washington	Michigan	New Mexico	Rhode Island	3.6	24.9
10	5,314	Ohio	Florida	North Carolina	Hawaii	Idaho	3.5	25.8

[1]Includes in-state R&D performance of industry, universities, associated Federally Funded Research and Development Centers (FFRDCs), and Federal agencies and FFRDCs administered by nonprofit institutions. For the tabulations, states include DC.
[2]Includes R&D activities of industry-administered FFRDCs located within these states.
[3]Includes R&D activities of university-administered FFRDCs located within these states.
SOURCE: National Science Foundation/SRS, *National Patterns of R&D Resources,* annual series.

eight of the top ten States were among the top ten for total R&D, with Washington and Florida of the top industrial R&D states replacing Maryland and Ohio of the top total R&D states. For academic R&D, in comparison to total R&D, New Mexico and North Carolina likewise replaced New Jersey and Ohio.

For Federal intramural research, there was less commonality with the top ten for total R&D. Only four states were found in both top-ten lists: Maryland, California, Ohio, and Texas. The six additions to the Federal intramural list, in descending order of Federal R&D performance, were Alabama, the District of Columbia, Florida, Hawaii, New Mexico, and Virginia. Maryland ranked first among Federal R&D performers, followed by the District of Columbia, California, and Virginia. The placement of Maryland, the District of Columbia, and Virginia among the top four in Federal R&D performance reflects the concentration of Federal facilities and administrative offices within the national-capital area. Alabama, Florida, and New Mexico rank among the highest in Federal R&D because of their relatively high shares of Federal space- and defense-related R&D.

Ratio of R&D to Gross State Product

States vary widely in the size of their economies, owing to differences in population, land area, infrastructure, natural resources, and history. Consequently, variation in the R&D expenditure levels of states may simply reflect differences in economic size or the nature of their R&D efforts. A simple way of controlling for the size effect is to measure each state's R&D level as a proportion of its gross state product (GSP). That proportion is referred to as R&D "intensity" or "concentration." Overall, the Nation's total R&D to gross domestic product ratio was 2.5 percent in 1995. The top 10 rankings for R&D intensity in 1995 were, in descending order, New Mexico (8.1 percent), the District of Columbia, Michigan, Massachusetts, Maryland, Delaware, California, Connecticut, Rhode Island, and Idaho (the latter with an intensity of 3.5 percent). New Mexico's R&D intensity is largely attributable to Federal support to FFRDCs in the state, provided by the Department of Energy.

Chart 2 juxtaposes state R&D performance with GSP, with the 50 states and the District of Columbia ranked in descending order of

R&D. R&D expenditures are displayed as a dark bar, measured on the upper axis; GSP is displayed as a wider gray bar measured on the lower axis; both are measured in billions. The two highest-ranked states in total R&D—California and Michigan—clearly show R&D levels that are relatively high in relation to their GSPs, which is confirmed by their presence in the top 10 list for R&D intensity (see table 1).

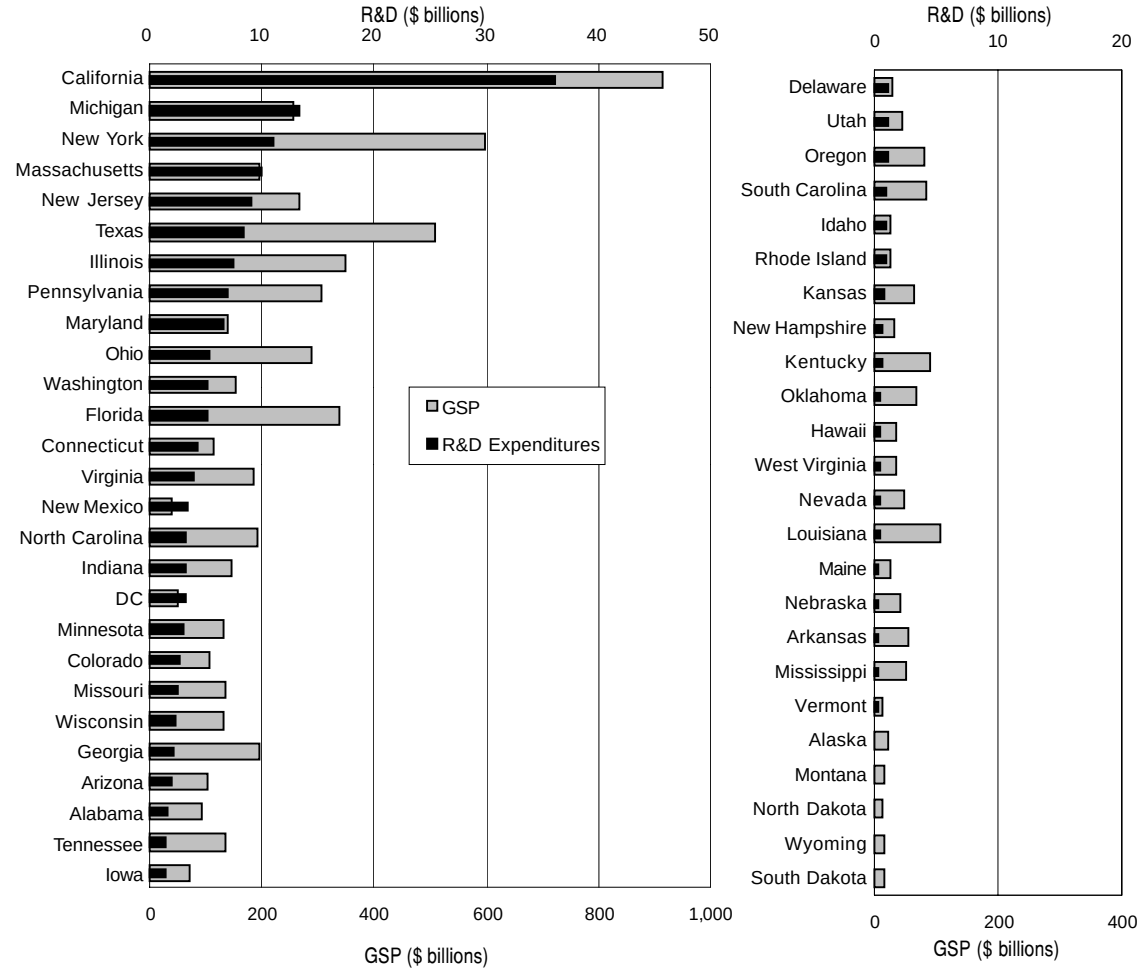
New York ranked third in R&D performance, but had a relatively low (1.8 percent) R&D intensity. Thus, its third-place position in total R&D performance may be more closely associated with its economic size. The same may be said of Texas, Illinois, Pennsylvania, Ohio, and Florida. In contrast, Massachusetts, New Jersey, and Maryland are more like California and Michigan, with high R&D levels in relation to economic size. As can also be seen in Chart 2, states with relatively low levels of total R&D tend, on average, to have low R&D intensity, with the exceptions of Delaware, Idaho, and Rhode Island. South Dakota, with the lowest total R&D level, also had the lowest R&D intensity (0.3 percent).

States vary greatly in terms of "R&D intensity"—the proportion of their economies devoted to R&D activities.

Federal Support for R&D

As reported by Federal agencies that fund R&D, the Department of Defense (DOD) and the Department of Health and Human Services (HHS) together provided 68 percent of the $67 billion in total Federal support for R&D to all types of performers in fiscal year 1995. California and Maryland were the two largest recipients of Federal R&D funds (table 2). Performers in California, primarily

Chart 2. Relationship between R&D performed in a state and its Gross State Product (GSP): 1995



NOTE: Includes R&D expenditures for the District of Columbia (DC) but excludes R&D that cannot be distributed by state. States are ranked by total R&D expenditures.

SOURCE: National Science Founation/SRS, *National Patterns of R&D Resources*, annual series.

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industrial firms, received 21 percent of DOD's R&D support. Maryland received 20 percent of HHS's funding, largely supporting intramural activities undertaken at biomedical research facilities at the National Institutes of Health (NIH). California received more R&D funds from both National Aeronautics and Space Administration (NASA) and NSF than any other state. The main recipients in California of NASA R&D funding were industrial firms and FFRDCs, while the main recipients of NSF funding were universities and colleges. Maryland had the largest share of any one Federal agency's total R&D support, with one-third of the Department of Commerce's (DOC) R&D funds. Intramural research activities accounted for most of this funding, associated primarily with DOC's National Institute of Standards and Technology (NIST).

Science & Engineering Profiles

In addition to the state R&D statistics summarized above, SRS collects state-specific data in its surveys of science and engineering (S&E) personnel and institutions. These data and those assembled from non-SRS sources (e.g. , data on population, patents and gross state product) are included in a set of 52 one-page S&E profiles available in hard copy or from the World Wide Web. In these profiles, state rankings and totals are provided for the 50 states, the District of Columbia, and Puerto Rico.

User Notes:

R&D expenditure levels from Federal sources based on performer-reported surveys differ from the Federal R&D funding totals reported by the Federal agencies that provide those funds. The differences in the Federal R&D totals appear to be concentrated in the funding of industry by the Department of Defense. See *Science & Engineering State Profiles: Fall 1996* (NSF 97-306) or the forthcoming version of the state profiles for detailed discussion and documentation of these differences.

Data on U.S. and state R&D expenditures were assembled from ongoing NSF surveys. For information about, and copies of, *Science & Engineering State Profiles*, please contact:

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Table 2. Federal R&D obligations, by agency and state: 1995

Agency	Total R&D (millions of 1995 dollars)	Largest recipient	Percent of Total Received	Second-largest recipient	Percent of Total Received
Total for the ten agencies listed	67,080	California	18.9	Maryland	10.5
Department of Agriculture	1,368	District of Columbia	10.4	Maryland	9.9
Department of Commerce	1,134	Maryland	32.6	California	7.6
Department of Defense	34,207	California	21.3	Georgia	11.4
Department of Energy	6,118	New Mexico	17.4	California	17.3
Department of Health and Human Resources	11,411	Maryland	19.6	California	11.4
Department of the Interior	460	Virginia	11.1	Colorado	9.9
Department of Transportation	727	District of Columbia	24.4	New Jersey	11.2
Environmental Protection Agency	548	North Carolina	21.2	District of Columbia	11.0
National Aeronautics and Space Administration	8,964	California	27.9	Texas	21.8
National Science Foundation	2,144	California	13.8	New York	9.3

SOURCE: NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997.*

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