

# R&D PERFORMANCE BY STATE

The latest data available on the state distribution of R&D performance are for 2001. R&D, like other economic activities, is concentrated in a handful of states. Patterns of R&D activities vary considerably among these top R&D-performing locations. In 2001 total U.S. R&D expenditures were \$274 billion, of which \$256 billion could be attributed to expenditures within individual states, with the remainder falling under an undistributed “other/unknown” category (appendix table B-17). These totals include R&D performed by industry, universities, Federal agencies, and nonprofit organizations.

accounted for only 5 percent. The five states with the highest levels of R&D expenditures (in decreasing order of magnitude) were California, Michigan, Massachusetts, New York, and Texas, and they accounted for over 40 percent of the entire national effort. The top 10 states, which included New Jersey, Maryland, Pennsylvania, Illinois, and Washington (ranked 6th through 10th), accounted for almost two-thirds of U.S. R&D expenditures in 2001 (table 12). California alone accounted for one-fifth of the \$256 billion U.S. R&D total, exceeding the next highest state by over a factor of three.<sup>26</sup>

## DISTRIBUTION OF R&D EXPENDITURES AMONG STATES

In 2001 the 20 highest-ranking states in R&D expenditures accounted for 85 percent of U.S. R&D expenditures, whereas the 20 lowest ranking states

<sup>26</sup>Reliability of the estimates of industrial R&D varies by state because the NSF Survey of Industrial Research and Development was not designed to produce estimates at that level of geographic detail in 2001. Rankings do not take into account the margin of error of estimates from sample surveys.

TABLE 12. Top 10 states in research and development performance, research and development by sector, and research and development as percentage of gross state product: 2001

Rank	State	Total R&D <sup>a</sup> (millions of current dollars)	States with highest R&D performance, by sector			R&D intensity (highest R&D/GSP ratio)		
			Industry <sup>b</sup>	U&C <sup>c</sup>	Federal Government and FFRDCs <sup>d</sup>	State	R&D/GSP (percent)	GSP (billions of current dollars)
1	California	50,959	California	California	Maryland	New Mexico	7.12	55.4
2	Michigan	15,533	Michigan	New York	California	Maryland	5.84	195.0
3	Massachusetts	14,665	Massachusetts	Texas	New Mexico	Massachusetts	5.10	287.8
4	New York	14,422	New York	Pennsylvania	Virginia	Michigan	4.85	320.5
5	Texas	12,722	New Jersey	Maryland	District of Columbia	Washington	4.65	223.0
6	New Jersey	11,392	Texas	Massachusetts	Ohio	Oregon	4.54	120.1
7	Maryland	11,379	Pennsylvania	Illinois	Alabama	Rhode Island	4.28	36.9
8	Pennsylvania	11,156	Washington	North Carolina	Illinois	District of Columbia	3.94	64.5
9	Illinois	10,472	Illinois	Michigan	Florida	California	3.75	1,359.3
10	Washington	10,372	Ohio	Florida	Massachusetts	Idaho	3.41	36.9

FFRDC federally funded research and development center; GSP gross state product; R&D research and development; U&C universities and colleges

<sup>a</sup> Includes in-state total R&D performance of industry, universities, Federal agencies, FFRDCs, and federally financed nonprofit R&D.

<sup>b</sup> Excludes R&D activities of industry-administered FFRDCs located within these states.

<sup>c</sup> Excludes R&D activities of university-administered FFRDCs located within these states.

<sup>d</sup> Includes costs associated with administration of intramural and extramural programs by Federal personnel and actual intramural performance.

NOTES: Reliability of estimates of industry R&D varies by state because the survey was not designed to make estimates based on geography. Rankings do not take into account margin of error of estimates from sample surveys.

SOURCES: National Science Foundation, Division of Science Resources Statistics, *National Patterns of R&D Resources* (Arlington, VA, annual series); and U.S. Bureau of Economic Analysis, U.S. Department of Commerce, <http://www.bea.gov/bea/newsrel/gspnewsrelease.htm>, 2003. See table B-17.

## RATIO OF R&D TO GROSS STATE PRODUCT

States vary significantly in the size of their economies because of differences in geographic location, population, land area, infrastructure, natural resources, and history. Consequently, state variations in R&D expenditure levels may simply reflect differences in economic size or the nature of their R&D efforts. One way to control for the size of each state's economy is to measure each state's R&D level as a percentage of its gross state product (GSP).<sup>27</sup> Like the ratio of industrial R&D to net sales, the proportion of a state's GSP devoted to R&D is an indicator of R&D intensity. New Mexico, one of the smaller states in terms of GSP, had the highest R&D/GSP of any state in 2001 (table 12), attributable to the activities of Los Alamos National Laboratory and Sandia National Laboratory, which together accounted for approximately three-fourths of the state's R&D. A list of states and corresponding R&D intensities can be found in appendix table B-17.

## SECTOR DISTRIBUTION OF R&D PERFORMANCE BY STATE

Although leading states in total R&D tend to be well represented in each of the major R&D-performing sectors, the proportion of R&D performed in each of these sectors varies across states. States that are national leaders in total R&D performance are usually leaders in R&D performance by industrial sector, which is not surprising because industry-performed R&D accounts for 74 percent of the distributed U.S. total. University-performed R&D accounts for only 13 percent of the distributed U.S. total and is highly correlated with the total R&D performance in a state.

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<sup>27</sup>Gross state product (GSP) is often considered the state counterpart of the nation's GDP. GSP is estimated by summing the *value added* of each industry in a state. Value added for an industry is equivalent to its gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (consumption of goods and services purchased from other U.S. industries or imported). U.S. Bureau of Economic Analysis, *Gross State Product by Industry for 2001: U.S. Economic Slowdown was Widespread* (Washington, DC, 2003). (See <http://www.bea.gov/bea/newsrel/gspnewsrelease.htm>.)

Federally performed and FFRDC R&D has less of a correlation with total R&D performance in a state.<sup>28</sup> Only 4 of the top 10 states ranked by Federal intramural and FFRDC R&D are among the top 10 states by total R&D: Maryland, California, Illinois, and Massachusetts. Maryland ranked first in Federal intramural and FFRDC R&D performance, followed by California, New Mexico, Virginia, and the District of Columbia. The inclusion of Maryland, Virginia, and the District of Columbia in the top five ranking 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 intramural and FFRDC R&D because of their relatively high shares of Federal space- and defense-related R&D.

## INDUSTRIAL R&D IN TOP STATES

The types of companies performing R&D vary considerably among the 10 leading states in industrial R&D (table 13). This reflects regional specialization or clusters of industrial activity. For example, in Michigan manufacturing industries accounted for 93 percent of industrial R&D in 2001. This reflects a high concentration of transportation equipment manufacturers, which accounted for 78 percent of Michigan's industrial R&D in 2001, whereas this industry accounted for only 13 percent of the nation's total industrial R&D. Washington, having a high concentration of software R&D, has less of its industrial R&D concentrated in manufacturing industries than the nation as a whole. Over half the nation's software industry R&D is carried out by companies in California and Washington.

The computer and electronic products industry accounts for 24 percent of the nation's total industrial R&D but accounts for a larger share of the industrial R&D in Massachusetts (42 percent) and Texas (42 percent). These two states along with California perform over 40 percent of the nation's computer and electronic products R&D. These three states have clearly defined regional centers of high-technology research and manufacturing: Silicon Valley in California, Route 128 in Massachusetts, and the Silicon Hills of Austin in Texas.

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<sup>28</sup>Federally performed R&D includes costs associated with the administration of intramural and extramural programs by Federal personnel as well as actual intramural performance.

In addition, New York, New Jersey, and Pennsylvania, each home to robust chemical, including pharmaceutical, manufacturing industries, show much higher concentrations of R&D in these industries than the nation as a whole. Of course, other factors besides the location of industrial production also play a role in the location of industrial R&D activities. For example,

industries tend to perform research near universities that conduct the same type of research, enabling them to benefit from local academic resources. This may explain why California and Massachusetts together account for over half of the nation's R&D in the scientific R&D services industry.

TABLE 13. Top 10 states in industry-performed research and development and share of research and development, by selected industries: 2001

State	Industry-performed R&D (millions of current dollars)	Share of state's industry-performed R&D (percent)				
		Manufacturing industries plus trade	Nonmanufacturing industries less trade	Computer and electronic products	Chemicals	Scientific R&D services
Total	198,505	73.1	26.9	23.7	9.0	7.2
California	40,430	63.6	36.4	25.9	3.5	15.6
Michigan	14,283	93.3	6.7	2.6	3.9	1.6
Massachusetts	11,240	68.9	31.1	41.5	7.1	13.8
New York	10,884	72.8	27.2	22.6	19.0	4.2
New Jersey	10,164	70.1	29.9	19.3	29.9	3.8
Texas	9,839	76.7	23.3	41.6	6.0	3.0
Pennsylvania	8,967	86.5	13.5	22.4	19.2	4.5
Washington	8,691	31.1	68.9	5.0	2.1	10.8
Illinois	8,232	89.0	11.0	38.2	16.3	1.0
Ohio	6,694	72.7	27.3	10.2	6.0	14.8
All other states	69,080	76.8	23.2	24.3	8.4	3.8

R&D research and development

NOTES: Reliability of estimates of industry R&D varies by state because the survey was not designed to make estimates based on geography. Rankings do not take into account margin of error of estimates from sample surveys. Details will not add to total because not all industries are shown.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Industrial Research and Development, 2001.