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Directorate for Social, Behavioral, and Economic Sciences

HOW HAS THE FIELD MIX OF FEDERAL RESEARCH FUNDING CHANGED OVER THE PAST THREE DECADES?

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Between 1970 and 1997, the life sciences' share of Federal research rose by about 14 percentage points, while engineering's share fell 12 percentage points.

Many Federal agencies support science and engineering (S&E) research[1] to further their missions. Changes in the budgets for these agencies often raise concern in the scientific community about potential effects on Federal research support to particular S&E fields and the balance among disciplines. For example, a declining Department of Defense budget in the post-Cold War period led to fears of declining support for engineering and the physical sciences; recent increases in the budgets of the National Institutes of Health have stirred anxiety about funding imbalances between the life sciences and other fields.

An earlier Issue Brief examined changes in R&D field emphasis in the academic sector.[2] This Issue Brief examines how the overall research emphasis of the Federal Government, regardless of performer type, has changed between 1970 and 1997. It describes shifts in S&E field shares of total Federal research obligations and changes in the contributions of key funding agencies to the Federal research effort.

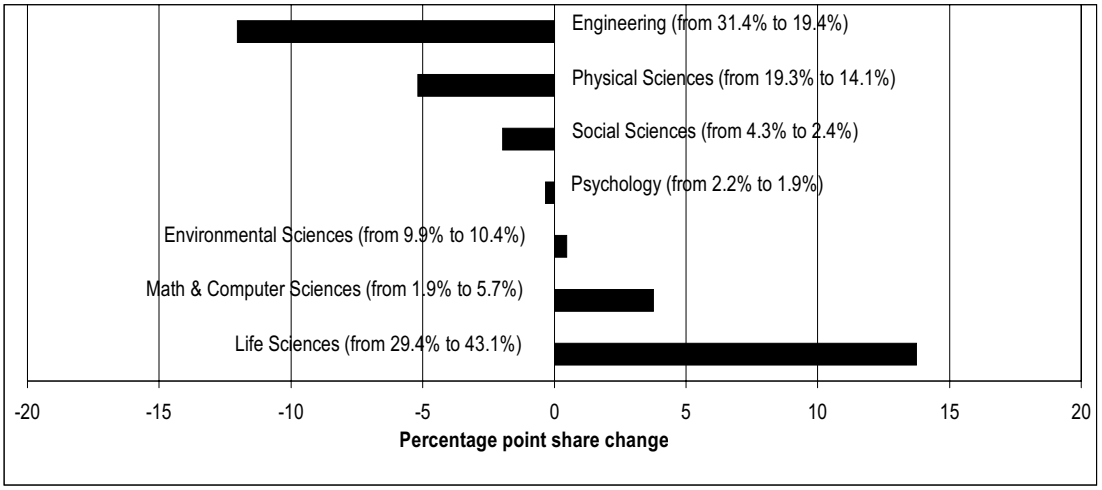
Changes in S&E Field Shares in Federal Research

From 1970-97, differential growth of Federal research dollars in different agencies and fields has resulted in:

- increased shares for the life sciences and for mathematical and computer sciences (primarily the computer sciences);
- roughly constant shares for the environmental sciences[3] and psychology; and
- declining shares for the social sciences, physical sciences, and engineering.

The life sciences' share of Federal research increased significantly, by almost 14 percentage points, between 1970 and 1997, rising from 29.4 to 43.1 percent of total Federal research. The combined share for the mathematical and computer sciences[4] also increased during this period by about 4 percentage points, rising from 1.9 to 5.7 percent of total Federal research (figure 1). The share of both of these broad field groups has risen in each of the three decades.

Figure 1. Changes in field shares of total Federal research funding: 1970-97



NOTE: Other sciences not classified within one of the broad fields listed above are excluded.

SOURCE: National Science Foundation, Division of Science Resouces Studies, Survey of Federal Funds for Research and Development.

[1] This analysis deals with Federal funds that support basic and applied research, but not development.

[2] See "How Has the Field Mix of Academic R&D Changed?" National Science Foundation, Division of Science Resources Studies, NSF 99-309.

[3] In a number of surveys and reports the designation earth, atmospheric, and oceanographic sciences is used in lieu of environmental sciences.

[4] These two fields were reported together through 1975.

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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In the life sciences, shares for the medical and biological sciences[5] increased, while that of the agricultural sciences declined.[6] The medical sciences' share rose in each of the three decades, while the biological sciences' share increased in the 1980s but declined slightly thereafter. The increase for the mathematical and computer sciences combination is due to a rise in the computer sciences' share; the mathematical sciences' share essentially remained stable (table 1).

The increase of approximately 18 percentage points in these two broad fields was balanced by decreased shares for other fields. There was a steep decrease in the share of engineering research, which lost 12.0 percentage points between 1970 and 1997. Losses were also registered for the physical sciences (-5.2 percentage points) and social sciences (-2.0 percentage points). The patterns of these declines differed slightly. Most of engineering's share decline had occurred by the end of the 1980s, while the physical sciences experienced the bulk of theirs during the 1990s. The largest drop in the social sciences' share occurred during the 1980s.

In constant dollars, Federal research dollars for engineering were essentially the same in 1997 as in 1970.

In the social sciences, the Federal research shares for each of its component fields—anthropology, economics, sociology, and political science—declined over the entire period, with the largest declines in economics and sociology. Similarly, each of the three component physical sciences fields—physics, chemistry, and astronomy—had a declining share between 1970 and 1997; physics experienced the largest drop. All engineering fields except metallurgy and materials had declining shares, with the largest losses in electrical and mechanical engineering (table 1).

Federal Research Dollars and Share Changes[7]

With increasing resources, a rising field share implies growing funding to that field, but a declining *share* does not necessarily mean it has received falling dollar amounts. For example, in current dollars, 1997 Federal research dollars for engineering were almost four times greater than what they had been in 1970. However, when an adjustment is made for the general level of inflation, Federal research support for engineering was essentially identical in 1997 to what it

Table 1. Changes in the share of Federal research funds in S&E fields: 1970-97

Fields	percentage point share changes			
	1970-80	1980-90	1990-97	1970-97
Engineering	-7.0	-4.9	-0.2	-12.0
Aeronautical	-0.7	-1.8	0.3	-2.2
Astronautical	-1.0	0.1	-0.7	-1.6
Chemical	-1.4	0.3	-0.3	-1.4
Civil	-0.1	0.1	-0.5	-0.5
Electrical	-1.3	-1.5	-0.8	-3.7
Mechanical	-1.8	-0.6	-0.4	-2.8
Metallurgy & materials	-0.7	0.5	0.4	0.1
Physical Sciences	-2.1	0.4	-3.5	-5.2
Astronomy	-0.3	0.3	-0.1	-0.1
Chemistry	-0.7	-0.4	-0.6	-1.8
Physics	-1.1	0.2	-3.4	-4.3
Environmental Sciences	1.0	-0.8	0.3	0.5
Atmospheric	-1.2	0.0	0.4	-0.8
Geological	0.3	-0.4	-0.7	-0.8
Oceanography	0.6	0.1	-0.4	0.4
Math & Computer Sciences	0.1	1.8	1.8	3.8
Mathematics/1	NA	0.3	-0.1	0.1
Computer Sciences/1	NA	1.5	1.7	3.3
Life Sciences	6.8	4.7	2.3	13.7
Biological & Agricultural	4.0	2.3	-1.7	4.6
Biological/2	NA	3.0	-0.7	2.7
Agricultural/2	NA	-0.7	-1.0	-1.5
Medical	2.2	2.4	3.2	7.8
Psychology	-0.5	0.4	-0.2	-0.3
Social Sciences	0.2	-1.6	-0.5	-2.0
Anthropology	0.0	-0.1	0.0	-0.1
Economics	0.1	-0.8	-0.2	-0.9
Political Science	-0.1	0.0	0.0	-0.1
Sociology	-0.2	-0.1	-0.4	-0.7
Other Sciences	1.5	0.1	0.0	1.6

1/ For both mathematics and computer sciences, the overall percentage point change is from 1976-97.
2/ For both biological and agricultural sciences, the overall percentage point change is from 1978-97. Biological sciences also includes environmental biology.
NA=not available

SOURCE: National Science Foundation, Division of Science Resources Studies, Survey of Federal Funds for Research and Development.

[5] The biological sciences include environmental biology.

[6] Share changes for the biological and agricultural sciences are calculated from 1978, the first year they were separately reported.

[7] Data on Federal funds for research by science and engineering field and by agency are available on the NSF's Division of Science Resources Studies' (SRS) web site http://www.nsf.gov/sbe/srs/stats.htm under Publications & Data, Statistical Reports on R&D Funding and Performance. Data from 1970 -96 are available in Federal Funds Survey, Detailed Historical Tables, Fiscal Years 1951-98; final 1997 data for major S&E fields are available in Federal Funds for R&D, Fiscal Years 1997, 1998, and 1999 [Early Release Tables] and final 1997 data for components are from unpublished tabulations.

was in 1970.[8] In contrast, Federal constant research dollars for the physical sciences were up 16 percent, and for the social sciences, down 13 percent.

Key Funding Agencies in Federal Research

Six agencies—the Department of Health and Human Services (HHS),[9] the Department of Defense (DoD), the National Aeronautics and Space Administration (NASA), the Department of Energy (DOE), the National Science Foundation (NSF), and the Department of Agriculture (USDA)—provide the bulk of Federal funds (90 percent in fiscal year (FY) 1997) for S&E research in the United States. Each of these agencies provided more than 1 billion dollars for Federal research in FY 1997.

In constant dollars, DoD research obligations in 1997 were only 76 percent of those in 1970.

However, measured by their share of Federal S&E research obligations, there has been a major shift in the role of some of these agencies between 1970 and 1997 (figure 2). Three of these agencies experienced increased shares—HHS by 17 percentage points, DOE by 3, and NSF by 2. The other three saw decreases in their shares—DoD by 14 percentage points, NASA by 7, and USDA by 1. These share changes reflect the differential growth in these agencies' research funding over the period. While overall Federal research funding grew about six-fold (in current dollars), DoD funding rose by a factor of three, as HHS funding grew more than thirteen-fold. DoD was the only one among these six agencies whose research funding was lower (in constant dollars) in FY 1997 than it had been in FY 1970.

These agencies' differential growth and resulting *agency* share changes over the past three decades have in turn substantially contributed to the observed *field* share changes. This is particularly true for the shift away from engineering towards the life sciences. In both 1970 and 1997, just over half of DoD's research funding supported engineering; in 1970, the agency provided 44 percent of total Federal engineering research funds, and in 1997, 34 percent. In both years, about 85 percent of HHS's research budget supported the life sciences; the agency provided about 60 percent of total research funding for the life sciences in 1970 and just over 75 percent by 1997.

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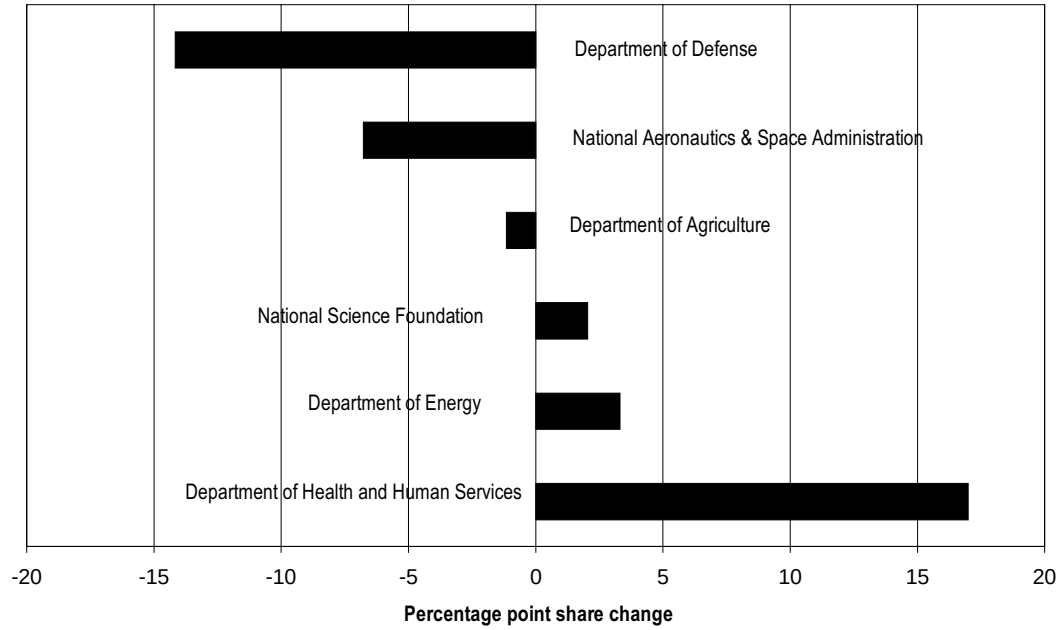
[8] Current dollars were adjusted for inflation by using the Gross Domestic Product (GDP) fiscal year price deflator (FY 1992=100). Fiscal year deflators are from the Office of Management and Budget, FY 1999 Budget of the United States Government, Historical Tables, Table 10.1, pp. 169-70.

[9] The National Institutes of Health (NIH) comprised almost 94 percent of the HHS research budget in 1997.

Figure 2. Changes in agency shares of Federal research funding: 1970-97



SOURCE: National Science Foundation, Division of Science Resouces Studies, Survey of Federal Funds for Research and Development.

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