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Collaboration in Academic R&D: A Decade of Growth in Pass-Through Funding

by Katherine Hale[1]

Research collaboration involving multiple institutions is a growing trend. Contributing to this growth are federal initiatives as well as practical considerations, such as technological advances that facilitate communication and opportunities for division of labor, risk sharing, and increased research credibility.[2] One measure of this research collaboration is the amount of total expenditures for research and development that universities pass through to others, including both academic institutions and other entities.[3]

These pass-through funds represented 7% of total academic R&D expenditures in FY 2009, compared with 5% in FY 2000, according to the National Science Foundation's (NSF's) annual Survey of R&D Expenditures at Universities and Colleges (Academic R&D Expenditures Survey).[4] Between FY 2000 and FY 2009 the federal government provided about 60% of the nation's total academic R&D funds and a substantially higher percentage (about 85%) of the academic R&D funds that universities passed through to others. The nation's major research universities spent the large majority of pass-through funds throughout the decade.

Growth in Pass-Through Funding

During the period covering FY 2000–09, R&D funds passed through universities to others for collaborative projects grew more rapidly (although from a lower base) than the decade's growth in overall academic R&D expenditures. In FY 2000 total academic R&D expenditures stood at $30.1 billion; this grew to $54.9 billion in FY 2009 (table 1). (Except where stated otherwise, expenditures throughout this InfoBrief are in current-year dollars.[5]) After adjusting for inflation, total expenditures for academic R&D grew by 47%. Over the same period, R&D funds passed through universities to others grew from $1.4 billion in FY 2000 to $3.8 billion in FY 2009, an amount that more than doubled in current dollars and when adjusted for inflation (figure 1).[6] In FY 2000 universities provided about $700 million to other schools and about $482 million to other entities; in FY 2009 they provided $1.9 billion to other schools and $1.4 billion to other entities.[7] Similarly, as the decade progressed, more universities started providing pass-through funds: in FY 2000 about one-half of them did; this increased to about two-thirds in FY 2009.

R&D funds for joint projects that were received by universities from others also grew at a faster rate than the decade's growth in overall academic R&D expenditures. Trends in pass-through funds received by universities from schools or from other entities were broadly similar to the trends in pass-through funds universities provided (figure 1).

Public and Private Institutions

Collaborative R&D Projects

Over the period FY 2000–09 private universities increased the percentage of their total academic R&D expenditures that they provided to others from 6% to 9% of their total R&D expenditures. In FY 2000 private universities provided $595.5 million in pass-through funds to others. This increased to $1.6 billion in 2009. The corresponding pass-through percentage for public universities was lower and increased at a slower pace: from 4% to 6%. In FY 2000 public universities provided $827.3 million in pass-through funds to others. This increased to $2.2 billion in 2009 (table 1).

Public universities received a smaller percentage of their total academic R&D

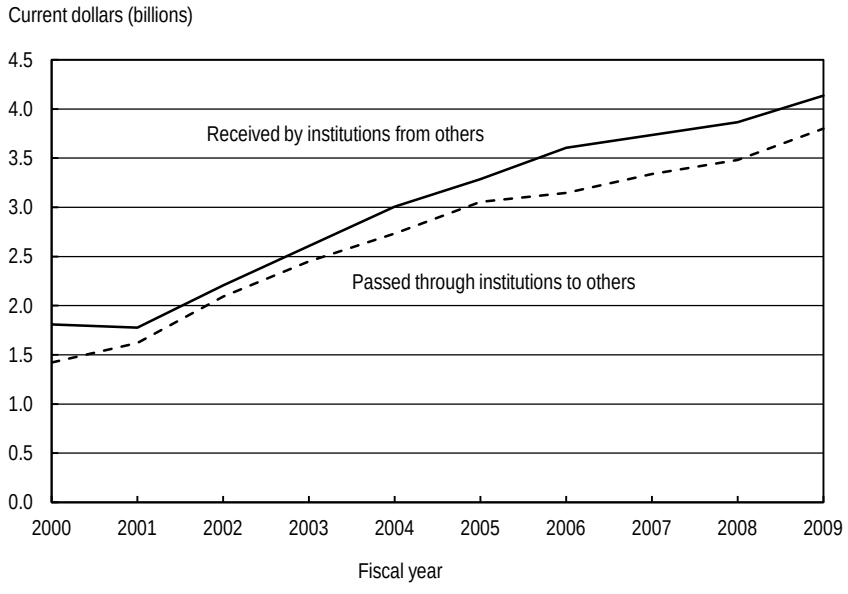
TABLE 1. Academic R&D expenditures passed through to others and received as pass-through funds, by institutional control of academic institution: FY 2000–09

Fiscal year	All R&D expenditures		Funds passed through to others		Pass-through funds received		% of R&D expenditures passed through		% of R&D expenditures received as pass-through funds	
	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public
	Current dollars in thousands									
2000	9,563,640	20,520,508	595,485	827,302	771,011	1,037,062	6.2	4.0	8.1	5.1
2001	10,399,714	22,424,223	680,303	940,005	635,076	1,140,888	6.5	4.2	6.1	5.1
2002	11,511,149	24,894,071	933,132	1,158,318	802,947	1,402,589	8.1	4.7	7.0	5.6
2003	12,738,590	27,361,734	1,075,710	1,373,340	941,552	1,664,278	8.4	5.0	7.4	6.1
2004	13,961,163	29,296,752	1,164,723	1,567,084	1,131,479	1,875,725	8.3	5.3	8.1	6.4
2005	14,929,947	30,868,997	1,324,720	1,730,595	1,272,676	2,013,862	8.9	5.6	8.5	6.5
2006	15,413,951	32,336,641	1,373,459	1,774,445	1,383,727	2,221,577	8.9	5.5	9.0	6.9
2007	15,905,763	33,587,575	1,425,425	1,914,416	1,407,368	2,327,871	9.0	5.7	8.8	6.9
2008	16,624,101	35,310,032	1,511,979	1,969,825	1,458,433	2,407,761	9.1	5.6	8.8	6.8
2009	17,413,046	37,522,411	1,622,695	2,178,108	1,467,449	2,667,833	9.3	5.8	8.4	7.1
	Constant 2005 dollars in thousands									
2000	10,758,961	23,085,283	669,912	930,703	867,377	1,166,680	6.2	4.0	8.1	5.1
2001	11,429,513	24,644,712	747,668	1,033,086	697,962	1,253,861	6.5	4.2	6.1	5.1
2002	12,445,831	26,915,419	1,008,900	1,252,371	868,145	1,516,476	8.1	4.7	7.0	5.6
2003	13,491,411	28,978,748	1,139,282	1,454,501	997,196	1,762,633	8.4	5.0	7.4	6.1
2004	14,416,732	30,252,739	1,202,729	1,618,220	1,168,400	1,936,932	8.3	5.3	8.1	6.4
2005	14,929,947	30,868,997	1,324,720	1,730,595	1,272,676	2,013,862	8.9	5.6	8.5	6.5
2006	14,904,226	31,267,299	1,328,040	1,715,766	1,337,968	2,148,112	8.9	5.5	9.0	6.9
2007	14,929,381	31,525,788	1,337,925	1,796,899	1,320,976	2,184,974	9.0	5.7	8.8	6.9
2008	15,254,268	32,400,470	1,387,391	1,807,511	1,338,257	2,209,360	9.1	5.6	8.8	6.8
2009	15,768,402	33,978,458	1,469,433	1,972,388	1,328,850	2,415,859	9.3	5.8	8.4	7.1

NOTE: Gross domestic product implicit price deflators were used to convert current to constant dollars.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of R&D Expenditures at Universities and Colleges.

FIGURE 1. Academic R&D pass-through funds provided and received by institutions, by origin of funds: FY 2000–09



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of R&D Expenditures at Universities and Colleges.

expenditures as pass-through funds than private universities did. Private universities reported in FY 2000 and in FY 2009 a similar percentage (about 8%) of their total academic R&D expenditures as pass-through funds received from others. For public universities, pass-through funds received from others as a percentage of total academic R&D grew more rapidly (although from a lower base). In FY 2000, public universities received 5% of their total academic R&D expenditures as pass-through funds provided by others; this grew to 7% by FY 2009.

Recipients of Pass-Through Funding

Throughout the 2000 decade the dominant form of collaboration was between academic institutions. However, as the decade progressed, private universities

provided nonacademic institutions with a growing share of the academic R&D funds they passed through (table 2).

Major Research Universities and Others

Pass-through funding arrangements are heavily concentrated in the most research-intensive universities. This has shifted somewhat as less research-intensive universities have started sharing research funds with other academic and nonacademic institutions. Throughout the last decade, the nation's major research universities both provided and received the large majority of pass-through funds. Universities with very high research activity dominated.

In FY 2000 universities with very high research activity provided 75% of total academic R&D expenditures passed through to others ($1.07 billion). By FY 2009 this percentage had dropped to 72% ($2.7 billion). At the beginning of the decade, universities with high research activity provided 14% of total academic R&D passed through to others ($196.9 million). In FY 2009 these universities continued to provide 14% of total academic pass-through funds universities provided to others ($542 million).

Meanwhile, doctoral universities increased their share of total pass-through funds provided to others from 0.5% in FY 2000 ($6.9 million) to 2% ($74.9 million) in FY 2009. Finally, a fourth group of schools—here termed "Other institutions," which includes baccalaureate colleges, master's colleges and universities, and special focus schools, such as free-standing medical and engineering schools—provided between 10% and 12% of total academic R&D expenditures passed through to others over the period FY 2000–09 (figure 2).

TABLE 2. Academic R&D expenditures passed through to others, by recipient of funds and institutional control of academic institution: FY 2000–09

(Current dollars in thousands)

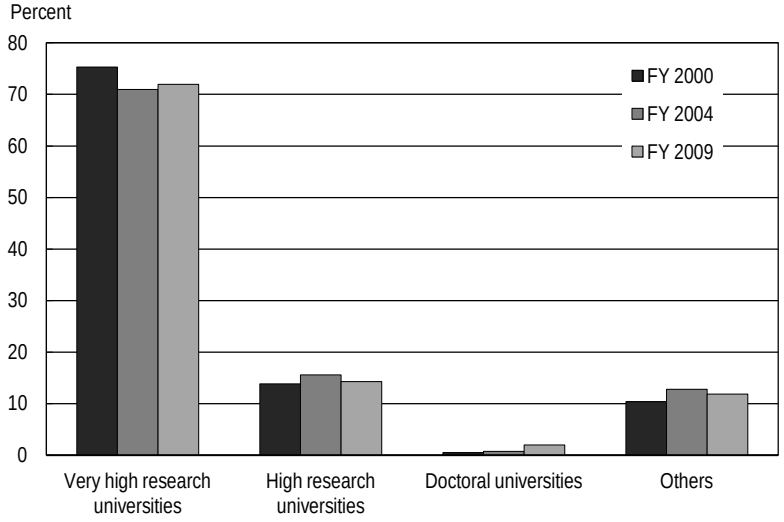
Fiscal year	Funds passed through to others		% of funds passed through to higher education		% of funds passed through to nonacademic institutions	
	Private	Public	Private	Public	Private	Public
2000	595,485	827,302	52.0	47.0	27.9	38.2
2001	680,303	940,005	50.4	47.4	28.6	38.0
2002	933,132	1,158,318	45.9	46.5	26.2	36.1
2003	1,075,710	1,373,340	42.5	48.7	27.5	35.6
2004	1,164,723	1,567,084	42.9	48.0	36.3	35.9
2005	1,324,720	1,730,595	50.6	50.7	33.6	33.6
2006	1,373,459	1,774,445	49.2	53.4	33.4	38.3
2007	1,425,425	1,914,416	49.1	52.9	33.0	38.1
2008	1,511,979	1,969,825	46.5	50.4	34.3	39.4
2009	1,622,695	2,178,108	46.2	51.6	35.7	39.1

NOTE: Percentages do not add to 100 because universities were not always able to break out by recipient the total amount of pass-through funds they provided.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of R&D Expenditures at Universities and Colleges.

Doctoral institutions experienced the greatest growth in the percentage of academic institutions' total R&D expenditures that were passed through to others over the 2000 decade. From FY 2000 to FY 2009 these less research-intensive universities almost tripled the percentage of total academic R&D provided as pass-through funds to others; major research universities increased this percentage by lesser amounts (figure 3).

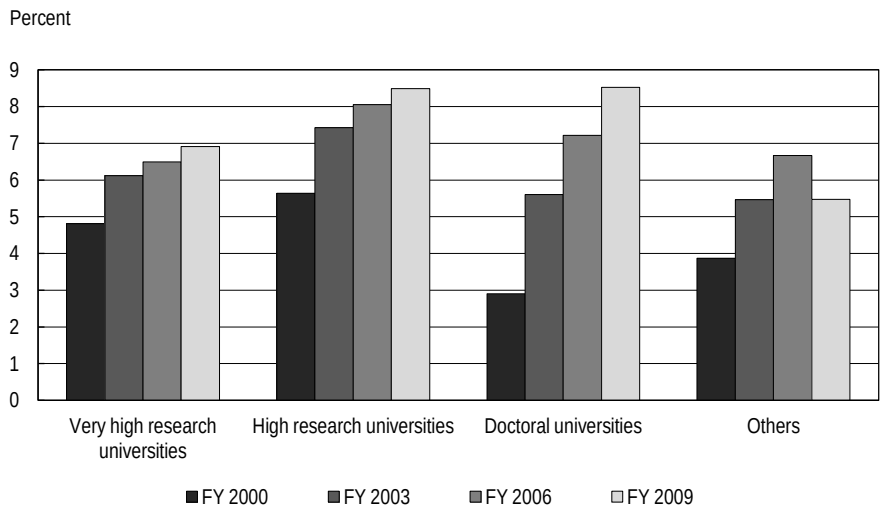
FIGURE 2. Academic R&D pass-through funds provided by institutions, by Carnegie classification: FY 2000, 2004, and 2009



NOTE: "Others" includes baccalaureate colleges, master's colleges and universities, and special focus schools, such as free-standing medical and engineering schools.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of R&D Expenditures at Universities and Colleges.

FIGURE 3. Pass-through funds provided by institutions as a percentage of total academic R&D expenditures, by Carnegie classification: FY 2000, 2003, 2006, and 2009



NOTES: "Others" includes baccalaureate colleges, master's colleges and universities, and some special focus schools. Excludes free-standing medical and engineering schools because these special focus schools are generally research intensive and thus more likely than other special focus schools to collaborate with others by providing pass-through funds.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of R&D Expenditures at Universities and Colleges.

Collaboration, as evidenced by the total dollar value of pass-through funds provided, is concentrated among a small set of major research universities. Over FY 2000–09 fewer than 40 major research universities—equally split between private and public schools—were among the top 25 providers of pass-through funds in any given year. Similarly, a small set of major universities, both public and private, received the bulk of the pass through funds over this period. Fewer than 40 major research universities constituted the top 25 recipients of pass-through funds in any given year over FY 2000–09.

A very different picture of research collaboration emerges when one focuses on pass-through funding activity as a percentage of schools' overall academic R&D expenditures. From FY 2000 to FY 2009 a relatively large number of schools (n = 190) were among the top 50 institutions in any given year in terms of the percentage of academic R&D expenditures they passed through to all entities. These schools varied greatly and consisted of a mixture of public and private institutions, including research universities and others, such as baccalaureate, master's, and specialized institutions. A wide range of their academic R&D funds (between 12% and 100%) was passed to other institutions. An even larger number (n = 222) of equally diverse schools was among the top 50 in any given year in terms of the percentage of their total academic R&D expenditures received as pass-through funds from others. Between 20% and 100% of their academic R&D funds was received as pass-through funds.

Sources of Pass-Through Funds

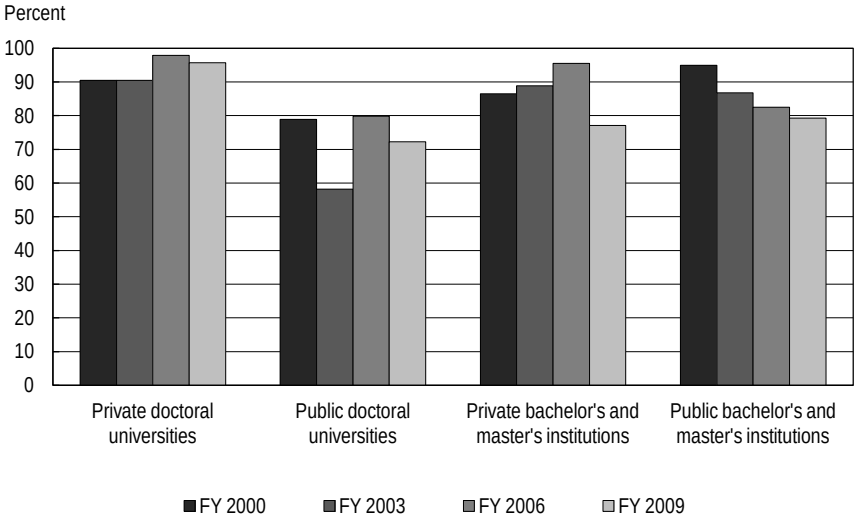
Approximately 85% of all pass-through amounts universities provided came from federal funds during the 2000 decade. For the most research-intensive universities as a group (public and private very high research and high research universities), this percentage ranged from 79% to 89%. At private doctoral institutions, the federal government provided 91% of the funds these schools passed through to others in FY 2000; this increased to 96% in FY 2009. By contrast, federal funds constituted 79% of public doctoral institutions' pass-through funds in FY 2000 but a smaller percentage (73%) in FY 2009 (figure 4). At both private and public bachelor's and master's institutions as a group, federal funds constituted a larger percentage of the pass-through funds they provided in FY 2000 than they did in FY 2009.

In general, the federally funded share of pass-through funds that private universities received grew as the 2000 decade progressed; public universities' federally funded share of pass-through funds received generally remained more stable. At the beginning of the decade 65% of the pass-through funds that private schools received from others were federal funds; this increased to 78% by FY 2009. At public universities, the federal share of pass-through funds received remained about the same in FY 2000 (86%) and in FY 2009 (85%).

Data Sources and Limitations

For the period covering FY 2000–09, this study examined the pass-through data available from NSF's annual Survey of R&D Expenditures at Universities and Colleges (Academic R&D Expenditures Survey). Specifically, it reported on the responses provided to (1) a request for total and federally financed current fund expenditures for separately budgeted science and engineering R&D passed through

FIGURE 4. Federal funding for academic R&D pass-through funds, by Carnegie classification: FY 2000, 2003, 2006, and 2009



NOTE: Results for bachelor's and master's institutions were averaged across both groups of schools.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Survey of R&D Expenditures at Universities and Colleges.

by the school to others (including both academic institutions and other entities) and (2) a request for total and federally financed current fund expenditures for separately budgeted science and engineering R&D expenditures received by the school from others (including both academic institutions and other entities). The survey defines current fund expenditures as operating funds actually spent by a school during its fiscal year, which for universities, typically runs from 1 July through 30 June. Separately budgeted R&D expenditures are all funds expended for activities specifically organized to produce research outcomes. These activities are either commissioned by an agency external to the school or are separately budgeted by an organizational unit within the school.

The survey is a census of academic institutions that, since FY 2004, has included all schools that grant a bachelor's degree or higher in S&E fields and reported at least $150,000 in separately budgeted science and engineering R&D expenditures in the previous fiscal year. The survey's response rate has ranged from 93% to 98%. In FY 2000, 89% of total respondents answered the question about pass-through funds provided; in FY 2009, 96% answered this question.

This study examined the pass-through funding arrangements of four mutually exclusive groups of universities categorized by the 2005 Carnegie Classification of Institutions of Higher Education. In FY 2009 these schools included the following:

- Ninety-six universities with very high research activity (major research universities that are the most research-intensive)
- One hundred universities with high research activity (major research universities)
- Fifty-four doctoral universities with less research activity (doctoral universities)
- All other schools, including 138 baccalaureate colleges, 240 master's colleges and universities, and 56 special focus schools

This study was not able to provide information on the pass-through funding arrangements of two categories of research participants of interest when exploring collaborative research partnerships: the nation's historically black colleges and universities and the nation's high-Hispanic-enrollment institutions. Although these schools play an important role in improving access to higher education and degree attainment, differences in the set of responding institutions over the years, as well as low response rates for some years, prevented an accurate portrayal of trends over the 2000 decade in pass-through funding.

Survey results likely underestimate university pass-through funding arrangements because 7 of the nation's top 20 universities in terms of total academic R&D expenditures—all public universities with very high research activity—did not provide information about their pass-through funding arrangements. Together these universities reported spending almost $5.6 billion in academic R&D expenditures in FY 2009, over 10% of the nation's total expenditures for academic R&D in that year.

Study results for FY 2009 generally do not reflect expenditures resulting from the American Recovery and Reinvestment Act of 2009 because the Act was passed in February 2009, just 4 months before the end of the universities' fiscal year, and it would have taken some months for universities to receive and spend the additional funds.

Notes

1. Katherine Hale, Science and Engineering Indicators Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (khale@nsf.gov; 703-292-7786).

2. Clark B. 2010. The effects of government, academic, and industrial policy on cross-university collaboration. Science and Public Policy 37: 314–30. Cummings J, Kiesler S. 2007. Coordination costs and project outcomes in multi-university collaborations. Research Policy 36:1620–34.

3. For purposes of this analysis, the terms "academic institutions," "universities," and "schools" are interchangeable and apply to any higher education (postsecondary) institution, including colleges and specialized schools, such as schools of medicine or engineering. "Other entities," and "nonacademic institutions" are institutions that are not part of higher education, including industry, nonprofits, and others.

4. Fiscal years in this report refer to the fiscal year of the academic institution.

5. Gross domestic product implicit price deflators were used to convert current to constant dollars.

6. To determine whether overall increases in pass-through funds provided and received were a result of improved response rates to NSF's annual Survey of R&D Expenditures at Universities and Colleges, NSF first analyzed the data of only those schools which reported pass-through data for the period FY 2000–09. The file included new schools added to the population between FY 2000 and FY 2009 but excluded those which were surveyed each year since FY 2000 and did not report totals for pass-through funds provided or received in all years. Based on this, NSF has determined that, in the aggregate, better reporting over time did not have a significant effect on growth trends.

7. These subtotals do not add to the total pass-through funds provided for each year because universities were not always able to break out by recipient the total amount of pass-through funds they provided.

NSF 12-325