The Top American Research Universities

2014 Annual Report

The Center for Measuring University Performance

John V. Lombardi
Elizabeth D. Capaldi Phillips
Craig W. Abbey
Diane D. Craig

INTRODUCTION

The Top American Research Universities annual report for 2014 returns to the full format we have used in the past. While the smaller publication for the 2013 report had some virtues (primarily economy), a number of our colleagues commented on the missing materials previously available in the printed format. Even though all the data displayed in past reports remained available on The Center for Measuring University Performance (MUP) website at http://mup.asu.edu some of us still appreciated the traditional full physical publication. Thanks to the generous support of the University Libraries of the University of Massachusetts Amherst, we are able to return the physical publication of the annual report to its previous format as is evident in the list of items in the Table of Contents. As always the full data set is online at the MUP website with tables that can be analyzed and sorted on line through Tableau.

The work of the MUP Center, along with the annual report, has been fortunate to enjoy continuing sponsorship beginning with our first benefactor Mr. Lewis M. Schott whose gift launched this project and sustained it for many years. Over the years, multiple institutions have contributed to the MUP Center's projects at various times. Currently the MUP Center has significant support from Arizona State University (Betty Phillips, MUP Center Director) and the University of Massachusetts Amherst (John Lombardi, MUP Center Director) that jointly provide the MUP Center's home and its publication. In addition, the MUP Center receives additional assistance from the University at Buffalo and the University of Florida. The MUP Center continues to rely on the advice and expertise of our Advisory Board and the exceptional expertise of our staff, listed at the back of this publication. Without these continued institutional and personal commitments, the MUP Center could not have sustained its work.

John V. Lombardi, Director
(University of Massachusetts Amherst)

Elizabeth D. Capaldi Phillips, Director
(University of Arizona)

Tracking Academic Research Funding: The Competitive Context for the Last Ten Years

by Diane D. Craig and John V. Lombardi

In the intense competition for national and international prestige, universities seek funds from multiple sources to improve their research productivity and performance. As we have demonstrated elsewhere in the work of The Center for Measuring University Performance (MUP Center), the essential element for academic research success is money. While it is possible for a rich university to perform poorly in the research competition, poor institutions are unable to provide the resources needed for their faculty and staff to deliver significant amounts of high quality research. The cost is high because almost everything research requires is expensive. This is especially so in the most important domains of science and engineering, the primary benchmarks for academic institutional prestige.

Not only do science and engineering (S&E) projects require expensive space, elaborate equipment, and significant staff support, but faculty and other expert science and engineering personnel command high salaries and are often tempted by offers from competing institutions. Faculty mobility and the replacement of retiring colleagues generate additional costs as each new S&E faculty member comes with a requirement for extensive startup costs in equipment and laboratories along with salaries for new highly specialized non-faculty technicians, post-docs, and stipends for graduate students. Frequently, as well, a new distinguished hire will bring along additional tenure level faculty colleagues in allied fields who will have their own startup costs.

Universities seek money for research from every possible source. Internal budgets from tuition and fees (and in public universities from state appropriations) provide core academic support and subsidize research expenses. In addition, donors, competitive federal grants, foundation grants, state government grants and contracts, local government projects, corporate contracts, and other grants or contracts from public or private agencies (domestic and international) all serve to sustain an institution's research mission.

This search for funding is particularly critical because few S&E or other research projects sponsored by outside agencies pay the full cost of producing the work. The difference between the sponsors' funding and what the work costs to deliver must be covered from some other source, usually internal university funds from tuition and fees, state appropriations, earnings on endowment, and

annual giving. While it may appear that increasing amounts of sponsored research is a good thing, generating more dollars to spend on research productivity and quality, the more sponsored research a university does the more internal funding is required to make up the difference between the sponsors' funds and the full cost of the work.

Increased scale in a university research enterprise, especially in S&E disciplines, however, does provide a significant benefit because the more research activity the university generates the more cost sharing is possible for administrative and especially regulatory support, infrastructure, and some equipment technicians. While many of these expenses are included in the indirect cost charged to grants, these payments generally cover only around 25% of the full cost.

Distribution of Research Funding

In the MUP Center's work on the top American research universities we have focused on campus-based institutions with over $40M in federal research support. In most of our prior work we have excluded medically-related and special-purpose institutions and analyzed a relatively homogeneous group of campus-based universities. However, in this essay, we have included all academic institutions reporting research funding to the NSF, although we maintain the dividing line between the major competitors with over $40M in federal research expenditures and the less powerful institutions with less than $40M. The difference between the two approaches reflects the slightly different purpose of the analysis.

Moreover, when looking at trends among institutions above and below the $40M federal research cutoff we do not make adjustments for single campus as we typically do in our MUP reports. Since 2010 NSF has made significant improvements at collecting data at the single campus level and we now adjust only five campuses in our over $40 million group—Cornell, Penn State, Connecticut, Kansas and Oklahoma—and report separately their main campus and medical campus. This year (and in most years) both the main and medical campuses of these five institutions are in the over $40M group so breaking them out is unnecessary for this comparative analysis which focuses on the total academic research marketplace.

The competitive marketplace for all academic research funding reported to NSF, includes specialized institutions, medical-only institutions, and other research centers. In the MUP annual reports focused on university campuses, we sought to identify characteristics of institutional competitiveness among campus-based academic institutions with undergraduate programs and major research establishments. This current work explores the structure of the total marketplace instead, and reviews changes in the amount of funding available in major disciplinary and subject categories over the past five to ten years.

Within this total marketplace, more than 900 institutions report data to the NSF, although some institutions at the bottom of the list do not always appear with data throughout the entire ten-year period. Of the 924 that reported in 2012, 165 report over $40M in federal research expenditures. These 18% represent the top competitors in the American academic research marketplace controlling about 89% of the total research support reported. Even removing the smallest players in this market, those with less than one million in federal research expenditures per year, the top group maintains its dominant market share.

The dollar amounts of funding spent by institutions below the top group of 165 may appear small, especially recognizing the large number of academic organizations receiving some portion of the remaining 11% of funding. But, for individual institutions, the competition for external support is clearly significant, as the institutional publicity about the constant rearrangement of the research hierarchy below the top group demonstrates. For a university with a research portfolio of $800 million in expenditures, an improvement or decline of $5 million may not change their relative position among the top competitors, but for those institutions with $5 to $20 million in research expenditures, a change of $5 million can move an institution's place many positions up or down on the list.

Within this marketplace for academic research funding (viewed over five and ten-year periods) this essay explores the following topics:

- Funding sources (federal or non-federal)
- Distribution of funding among the major categories of science and engineering (S&E) funding
- Distribution of funding among the major categories of non-science and engineering (non-S&E)
- Distribution of funding among subfields within the larger disciplinary categories.

The composition and distribution of funded research has become increasingly of interest as the general support for higher education from public and private sources has been in flux over the past decade, and improved reporting to the NSF by institutions permits a better understanding of the composition of academic research funding.

Major Categories of Funding

To begin this conversation, we divide the research expenditure data provided by institutions to the NSF into two major categories, Science and Engineering (S&E) and all other fields (non-S&E). Within each of these major categories, we look at two subcategories based upon the source of funding: federal or non-federal.

In the Top American Research Universities data on the MUP Center website [http://MUP.asu.edu] we only include S&E expenditures in the Federal Research and Total Research measures. The NSF federal S&E research number is the measure used by many observers as a key variable for ranking academic research quality and productivity. The preference for this indicator reflects the very large proportion of federal research support allocated to science and engineering and the peer-review competitive process used to allocate most of the dollars included in this category. As mentioned above, throughout this essay, when we speak of "research funding" or "funding" we refer to the expenditure data reported to the NSF.

Research Market by Category and Source

2013 Academic R&D Expenditures	*Expenditures (in 000s)*	*% of Total*
Science		
Federal	$ 31,801,289	47.4%
Non-Federal	$ 20,864,673	31.1%
Engineering		
Federal	$ 6,493,109	9.7%
Non-Federal	$ 4,235,576	5.3%
Non-S&E		
Federal	$ 1,175,759	1.8%
Non-Federal	$ 2,470,748	3.7%
Total Science	**$ 52,665,962**	**78.6%**
Total Engineering	**$ 10,728,685**	**16.0%**
Total Non-S&E	**$ 3,646,507**	**5.4%**
Total 2013 Expenditures	**$ 67,041,154**	**100.0%**

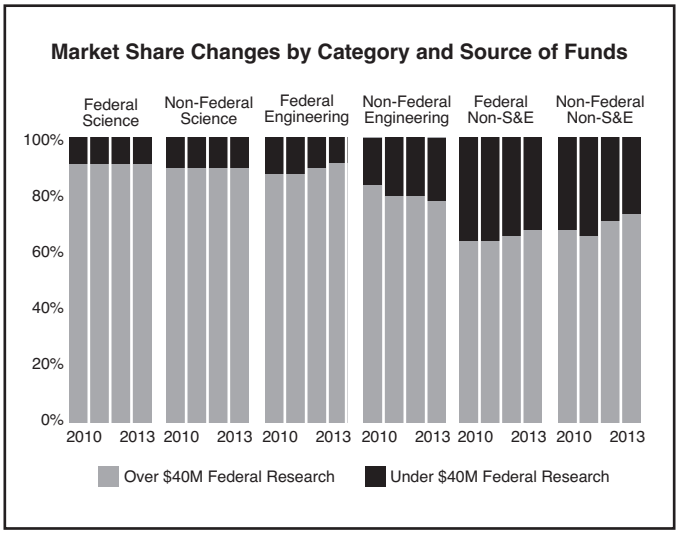
The distribution of research funding in the categories outlined above demonstrate clearly the importance of science and engineering. The largest amount of research expenditures from federal and non-federal sources combined is in the science category at about 79%, which, with the addition of engineering at about 16%, gives these S&E categories about 95% of all academic research support. The remaining approximately 5% of the funding falls to the non-S&E fields. This result comes as no surprise to those engaged in this marketplace, but the overwhelming dominance of S&E may surprise some observers.

Research Profile by Type of Institution

2013 Academic R&D Expenditures	*Over $40M (in 000s)*	*% of Total*	*Under $40M (in 000s)*	*% of Total*
Science				
Federal	$ 29,358,516	49%	$ 2,442,773	35%
Non-Federal	$ 18,845,155	31%	$ 2,019,518	29%
Engineering				
Federal	$ 5,840,238	10%	$ 652,871	9%
Non-Federal	$ 3,291,710	5%	$ 943,866	13%
Non-S&E				
Federal	$ 841,773	1%	$ 333,986	5%
Non-Federal	$ 1,820,905	3%	$ 649,843	9%
Total Science	**$ 48,203,671**	**80%**	**$ 4,462,291**	**63%**
Total Engineering	**$ 9,131,948**	**15%**	**$ 1,596,737**	**23%**
Total Non-S&E	**$ 2,662,678**	**4%**	**$ 983,829**	**14%**
Total 2013 Expenditures	**$ 59,998,297**	**100.0%**	**7,042,857**	**100%**

The distribution of funding among the various categories at the top of the institutional hierarchy among the over $40M institutions (those with over $40M in federal research expenditures) is different from the distribution among institutions below the $40M line. The below $40M institutions have a lower concentration of funding in science from both federal and non-federal sources, and a lower concentration in engineering from federal sources. Thus, the below $40M institutions do not fare well in the competition for federal dollars in science and engineering. But they have higher concentrations of funding from non-federal sources in engineering and from both federal and non-federal sources in those fields that are non-science-and-engineering. Non-federal sources include corporate, local, and institutional funding, thus the below $40M group does well in competing for support from these sources for engineering, and non-science and engineering

A partial explanation of this result may reflect the much greater resources required to compete successfully for grants in the science fields from all sources and from federal sources in engineering fields, and the smaller resource base needed to effectively compete in fields not focused on science, and to a lesser degree, engineering. Engineering funding may include substantially more corporate projects and local or state-funded projects for which geographic location and land-grant or public university status can enhance competitiveness or provide access to sources of funds only available to institutions with these characteristics.

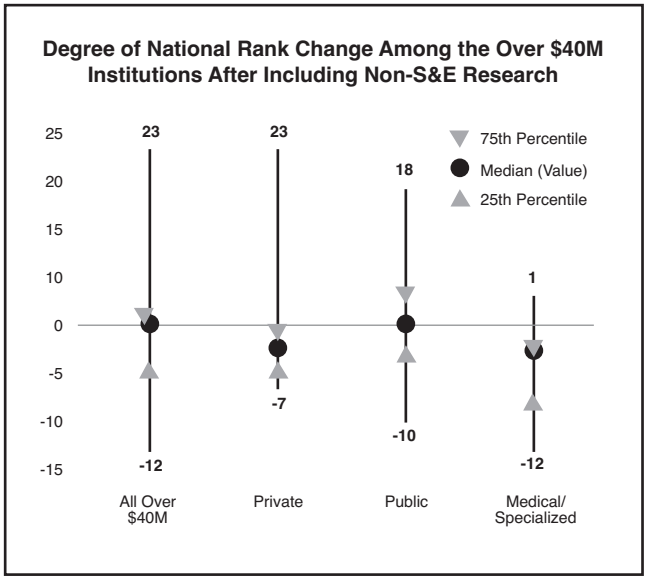


The chart above offers a visual display of these differences over the past four years. The institutions below the $40M line improve their capture of non-federal engineering dollars but lose some market share from both federal and non-federal sources in the non-S&E category. A review of the past ten years shows a steady decline in the under $40M institutions' share of federal non-S&E dollars over that period, while their increase in non-federal engineering began more recently in 2011. It may be that the increasing competition for research funding has encouraged the major research universities in the over $40M group to intensify their pursuit of grants in the non-S&E categories taking market share away from the under $40M group.

The Impact of Non-S&E on Research Rankings

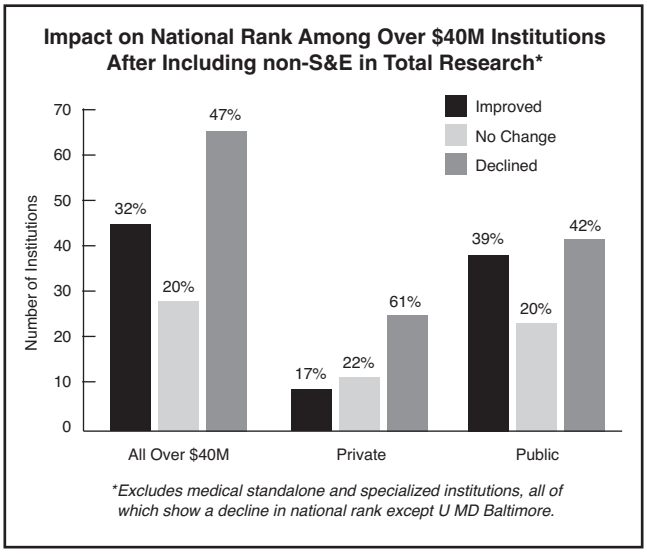
In the following analysis of the impact of including non-S&E expenditures on an institution's rank, we use the 2012 total and federal research measures as reported in the Top American Research Universities tables and then credit the main campus with all the non-S&E expenditures based on the assumption that their medical campuses conduct minimal amounts of non-S&E research.

Although the percentage of federal research support in fields other than science and engineering is a relatively small proportion of the total funding, the inclusion of these sources in academic research results has an impact on the rank order of individual institutions. The chart below shows that the range of movement in rank of the over $40 million research universities is quite large for a few institutions, with some improving as much as 23 ranks nationally or declining by as much as 12. Much of the ranking impact, however, is quite modest with most institutions moving up and down by one to four positions or staying the same. Looking at the width between the 25th and 75th percentiles, we can see that with non-S&E funding included, public universities change national rank more significantly than private universities. In contrast, the typical private institution experiences no change or a slight decline in national rank. Only one medical or specialized institution shows an improvement in rank (University of Maryland–Baltimore) with most, not surprisingly, showing a decline in rank.

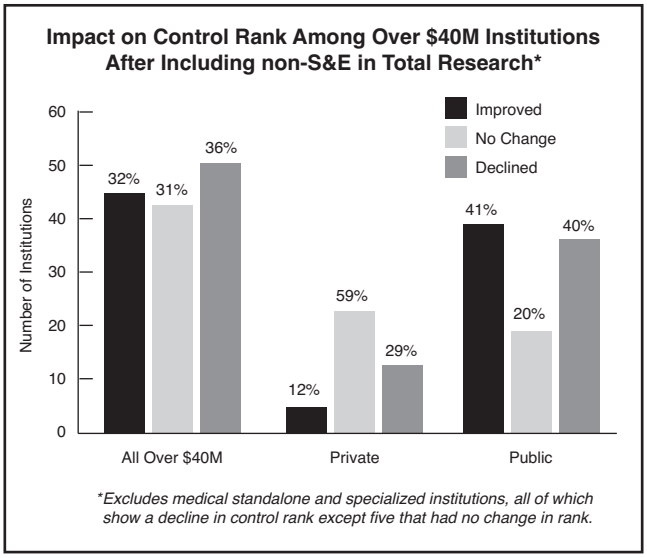


This effect most likely reflects the wider range of fields beyond science and engineering included among many public universities. Public universities may also have a greater engagement in research associated with engineering and non-science, related perhaps to the land-grant missions of many and a greater concentration on non-science fields such as education and business relative to the more expensive S&E fields.

Nonetheless, the number of institutions whose rank position changes with the inclusion of non-S&E funding is significant, with both public and private institutions rising and falling in position as shown in the next two charts.



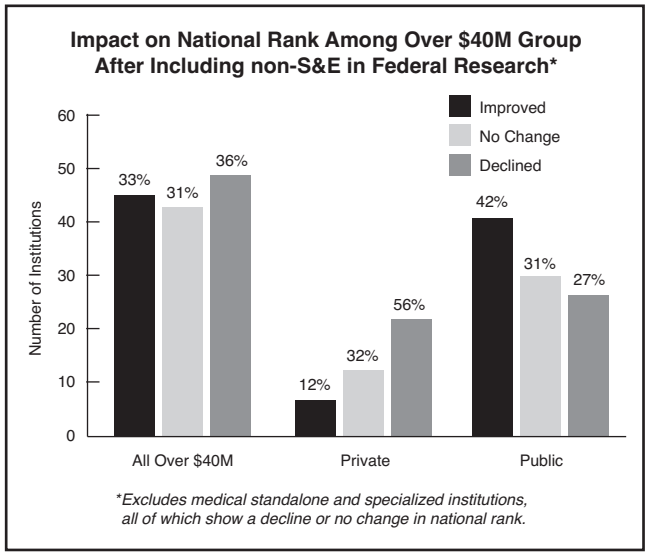
The chart above has the changes in national rank with non-S&E funding included using the total research number that captures both federal and non-federal sources. We excluded the specialized and medical standalone institutions in this analysis since, as shown in the previous chart, they skew heavily toward a decline in rank. Inclusion of the non-S&E funds clearly makes a difference with only 20% of the 137 institutions unchanged in rank. Nearly one-half of these institutions declined (N=65) while a third improved (44) with the inclusion of non-S&E funding. Among privates, institutions are three times more likely to decline (N=25) than improve (7) in their national ranking. Public institutions are nearly equally divided between improvement (N=37) and decline (40) in rank.



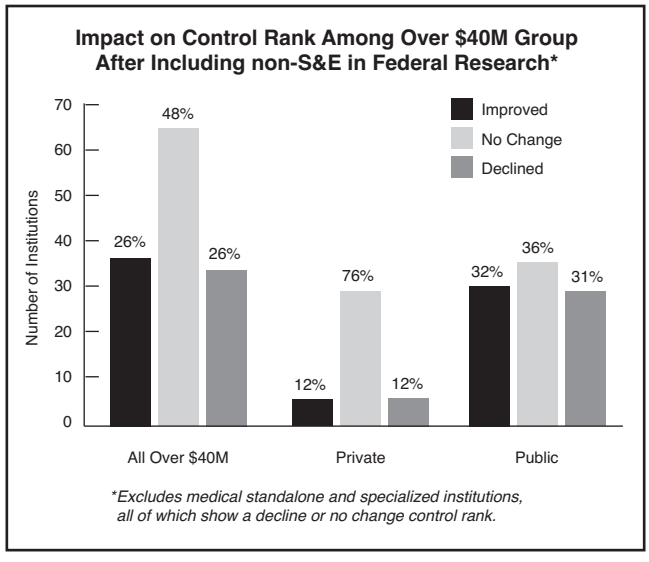
The second chart looks at changes in rank separately by institutional control (public vs. private). Private institutions are far more likely than public institutions to show no change in rank in this much smaller sample. The over $40 million private institutions are a very stable group and dominate the research market among all privates.

The next two charts show the changes in the federal research ranking with non-S&E funding included. Given that most federal research is in the S&E fields, it is not surprising that we find less change in rank taking place.

Among the entire group it is fairly evenly divided between those institutions that declined, improved, or remained the same. The ratio of declining (N=23) to improving (5) among privates at nearly five to one, however, is even greater than we found with total research rankings. Among the public institutions, about 42% (N=40) improve their national ranking while 27% (26) decline and about one-third remain unchanged (30).



In the chart below, looking at performance within the private or public ownership groups, private institutions are much less likely to show a change in rank among other private universities. However, within the over $40 million



public group about as many institutions fall, remain the same, or gain in rank. Public institutions clearly compete among their public counterparts for federal research funding in non-S&E fields with some more successful than others. As observed above, much of the non-S&E funding requires fewer institutional resources for successful competition and public institutions perhaps less well-funded for science fields may compete intensively in the non-S&E fields. As we saw in the chart on page 5, however, over the last few years the competition for non-S&E funding has clearly increased with the group of over $40M institutions gaining a greater share of the funds available in this category.

While most changes in overall national rank that appear by including the non-S&E funds are relatively small, there are some 20 institutions with an improvement in national total research ranking greater than 3, all but three being public universities. As shown in the table below, Brown, Florida International University, and Clemson all improve by at least 15 positions nationally. Note that some of Brown's (and Emory's) change in rank may be due to a reporting anomaly; they classify nearly one-third of their institutionally funded R&D as "Other non-S&E" compared to a national average of 12%. Three universities improve their standing relative to our own rankings of total research (which excluded non-S&E) with the inclusion of non-S&E: University of Florida would move into the top 25 (with Yale dropping out) and University of South Florida (edging out the University of Chicago) moving into the top 50.

As we have pointed out many times in the annual *Top American Research Universities* reports, the institutions at the top are solidly positioned. In the following table, the movement among the top 15 institutions nationally on total research is merely a reshuffling within that group of a position or two or no change for all institutions except one. The University of Wisconsin–Madison improves by three positions due to its relatively large proportion of non-S&E research funding. Universities with large non-S&E research funding, such as Michigan ($75M) and MIT ($54M), however, do not change their national rank because in the total of their large volume of research funding this is a relatively small amount.

Greatest Improvement in Rank Among Over $40M Institutions with Inclusion of Non-S&E Fields in Total Research

Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	Net Change in Natl Rank	Non-S&E Research Expenditures	Non-S&E Portion of All Research Expenditures
Brown U	$234,906	86	$365,120	63	23	$130.2M	36%
Florida International U	$83,639	154	$118,058	136	18	$34.4M	29%
Clemson U	$110,493	137	$142,096	122	15	$31.6M	22%
San Diego State U	$75,670	165	$92,867	151	14	$17.2M	19%
U of Alaska - Fairbanks	$121,640	130	$160,407	116	14	$38.8M	24%
Indiana U - Bloomington	$151,240	117	$184,486	104	13	$33.2M	18%
U of South Florida - Tampa	$394,694	54	$443,206	43	11	$48.5M	11%
U of Louisville	$165,319	109	$196,842	100	9	$31.5M	16%
U of Oklahoma - Norman	$115,529	132	$139,326	125	7	$23.8M	17%
New York U	$425,043	45	$458,645	39	6	$33.6M	7%
U of Kansas - Lawrence	$172,615	104	$202,567	98	6	$30.0M	15%
U of Oregon	$87,656	150	$105,030	144	6	$17.3M	17%
U of South Carolina - Columbia	$186,559	99	$214,901	93	6	$28.3M	13%
Washington State U - Pullman	$288,693	74	$335,930	68	6	$47.2M	14%
Arizona State U	$344,611	62	$385,959	58	4	$41.3M	11%
Colorado State U - Fort Collins	$335,336	65	$375,919	61	4	$40.6M	11%
Emory U	$474,537	37	$565,766	33	4	$91.2M	16%
George Mason U	$79,913	160	$90,198	156	4	$10.3M	11%
U of Cincinnati - Cincinnati	$408,294	50	$433,668	46	4	$25.4M	6%
U of Florida	$649,988	26	$696,985	22	4	$47.0M	7%

Change in Rank Among the Top 15 Research Universities with Inclusion of Non-S&E Fields in Total Research

Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	Net Change in Natl Rank	Non-S&E Research Expenditures	Non-S&E Portion of All Research Expenditures
Johns Hopkins U	$2,092,999	1	$2,106,185	1	0	$13.2M	1%
U of Michigan - Ann Arbor	$1,247,680	2	$1,322,711	2	0	$75.0M	6%
U of Washington - Seattle	$1,065,414	3	$1,109,008	4	-1	$43.6M	4%
U of California - San Diego	$1,065,306	4	$1,073,864	5	-1	$8.6M	1%
U of California - San Francisco	$1,032,673	5	$1,032,673	6	-1	$0.0M	0%
U of Wisconsin - Madison	$1,030,605	6	$1,169,779	3	3	$139.2M	12%
Duke U	$1,004,759	7	$1,009,911	7	0	$5.2M	1%
U of California - Los Angeles	$969,682	8	$1,003,375	8	0	$33.7M	3%
U of North Carolina - Chapel Hill	$864,748	9	$884,791	11	-2	$20.0M	2%
Stanford U	$854,580	10	$903,238	9	1	$48.7M	5%
Columbia U	$847,809	11	$889,487	10	1	$41.7M	5%
U of Pittsburgh - Pittsburgh	$839,793	12	$866,638	12	0	$26.8M	3%
U of Pennsylvania	$813,210	13	$847,077	13	0	$33.9M	4%
U of Minnesota - Twin Cities	$806,832	14	$826,173	14	0	$19.3M	2%
Massachusetts Inst of Tech	$770,367	15	$824,130	15	0	$53.8M	7%

In any event, small changes in rank are of relatively little significance since any movement up or down is often a function of how far apart adjacent institution totals stand. If institutions are close together in their totals, then a small increase or decrease either in their own or in adjacent institution totals will change rankings. More significant is a view of the number of dollars the inclusion of non-S&E funding represents and its relative size compared to the S&E funding normally reported.

Among the over $40M institutions in our list (Appendix A), the median increase in total research from the inclusion of the non-S&E funding is about $10M and the median percentage increase is 4%. But the dollar range is very large from an amount of $139M for the University of Wisconsin-Madison to $128,000 at the University of Vermont. Three institutions show zero, but this may well be a reporting issue. The importance of this additional funding as a percentage increase over the regularly reported S&E dollars also varies substantially from 41% for Florida International to about one-tenth of one percent for the University of Vermont. In comparison, among the group we identified in Table 7 as making big gains in rankings due to the inclusion of non-S&E research, the median dollar increase is $33M and the median percentage increase is 18%. Note that in calculating these figures we exclude the medical and specialized institutions that do not participate significantly in the competition for non-S&E funding.

Due to the relatively small amount of federal funding for non-S&E research it is not surprising that the inclusion of these dollars has little impact on federal research national rankings (Appendix B). As with total research, there is little movement in or out of the top 50 rankings. The median increase in federal research dollars is about $3M and the median percentage increase is 2%.

By inspecting the tables in the appendices, we might imagine that we could provide some systematic description of the types of institutions with different levels of non-S&E funding. This is not easily accomplished without more detailed analysis of particular universities. While public universities may have an advantage in capturing non-S&E funding from state and local sources, not all public universities are particularly successful, although non-S&E funding appears to be somewhat more significant for public than for private institutions. The principal value of this discussion is to recognize the complexity of the funding profiles of individual institutions as well as the overall significance of non-S&E funding within the external research support of many research universities.

Distribution of Academic Research Funding by Field

Another way to approach these data is to look more closely at the distribution of research funding by individual subfields (or disciplines). The NSF data provide information on the following subfields within the general categories of science, engineering, and non-S&E, separately for both federal and non-federal research support.

The Science category includes (some with subfields):

- Computer sciences
- Environmental sciences (atmospheric sciences, earth sciences, oceanography, and other smaller disciplines
- Life sciences (agricultural sciences, biological sciences, medical sciences, and other smaller disciplines)
- Mathematical sciences
- Physical sciences (astronomy, chemistry, physics, and other smaller disciplines)
- Psychology
- Social sciences (economics, political sciences, sociology, and other smaller disciplines
- Other unclassified sciences

The engineering and non-S&E subfields are without separately identified disciplines.

The Engineering category is comprised of:

- Aeronautical and astronautical
- Bioengineering and biomedical
- Chemical
- Civil
- Electrical
- Mechanical
- Metallurgical and materials
- Other unclassified engineering disciplines

Non-Science and Engineering category includes:

- Business and management
- Communication
- Journalism and library science
- Education
- Humanities
- Law
- Social work
- Visual and performing arts
- Other unclassified non-S&E fields.

If we look at these subfields in terms of the market share of research funding captured by institutions with over $40M compared to the totals for all institutions receiving funding in a category, we can see the continued dominance of the top 165 universities. Among the federal funds flowing to science fields, the market share captured by this top group varies by field. As the following table shows, the concentration of federal funding in the top institutions is greater in some fields than in others with the highest concentration in the life sciences at 94% and a lower concentration in psychology at 84%.

Science: Over $40M Institutions Market Share by Field

Current Dollars (000s)	2012 Total Research All Institutions (000s)	2012 Federal All Institutions (000s)	2012 Federal Over $40M (000s)	Over $40M Share of Federal Market	2012 Non-Federal All Institutions (000s)	2012 Non-Federal Over $40M (000s)	Over $40M Share of Non-Federal Market
Life sciences	$37,187,306	$22,743,797	$21,375,922	94%	14,443,509	13,440,359	93%
Physical sciences	$4,724,222	$3,487,939	$2,991,860	86%	1,236,283	991,171	80%
Environmental sciences	$3,179,113	$2,203,663	$1,890,048	86%	975,450	734,199	75%
Social sciences	$2,053,548	$917,708	$792,814	86%	1,135,840	935,479	82%
Computer sciences	$1,820,430	$1,358,563	$1,231,442	91%	461,867	383,511	83%
Psychology	$1,188,397	$867,195	$727,131	84%	321,202	258,515	80%
Other sciences	$1,102,375	$439,163	$395,585	90%	663,212	563,311	85%
Mathematical sciences	$674,200	$490,438	$426,343	87%	183,762	152,209	83%

Within the same group of science subfields, the market share controlled by the top institutions from non-federal sources shows a similar but not identical distribution. In every case the concentration of non-federal funds in the over $40M institutions is a few percentage points less than the federal funds concentration. It is no surprise to see that the largest field for science funding is in the life sciences. In that field the over $40M institutions capture the highest percentage of both federal and non-federal funds. The widest distribution of funding (with the lowest concentration in the over $40M group) is in the non-federal dollars within the field of environmental sciences. This might also indicate the wide participation of many institutions in the under $40M group in the competition for environmental funds. Grants in this field may include significant amounts from state, local, and corporate sources for which smaller and less research intensive public universities can successfully compete.

The distribution of federal funding for engineering fields follows a pattern similar to what appears for science as the following table illustrates. The concentration of federal funding among the over $40M institutions for engineering fields ranges from 95% in bioengineering and biomedical to 87% in civil-mechanical and metallurgical-materials. Interestingly, the second largest category of federal engineering research expenditures reported to NSF is the unclassified or "Other" category suggesting problems with the coding or reporting mechanisms. This may also indicate institutions with significant portfolios of interdisciplinary research on topics such as energy or sustainability that are not captured by the current definitions.

However, while these concentrations of federal engineering funding follow closely the patterns in the science fields, the non-federal funding for engineering is significantly less concentrated among the165 top institutions. The highest concentration of non-federal funding among the over $40M group is in bioengineering at 86% but the concentration of federal funding in this category is 95%. The lowest concentration among the top institutions for non-federal funding is 66% for aeronautical and astronautical engineering compared to the federal funding concentration for this field at 90%.

These differences in competitive success in the different marketplaces of federal and non-federal funding again most likely illustrate universities' differential competitive advantages in accessing the highly structured national federal marketplace and the wider range of sources characteristic of the more geographically focused non-federal marketplace. Many institutions below the top 165 compete in the non-federal markets with much greater competitive success than they do in the federal marketplace.

When we look at the non-S&E fields, education research clearly dominates this arena and again we see a significant amount of expenditures not reported under a listed discipline but rather as "other." The non-S&E funding patterns are similar in some ways to the S&E marketplace. In the case of federal funding, the over $40M institutions continue to dominate the competition but with a much wider spread showing a high concentration in the field of communications, journalism, and library sciences at 91% and a much lower concentration in the field of law at 31%. This spread likely reflects the wide distribution of law schools among many institutions that are not otherwise heavily invested in research activity. Similar characteristics likely apply to education, business and management, and visual and performing arts, all fields well represented among institutions that otherwise do not fit into the definition of top American research universities. These fields also require much less institutional infrastructure investment to sustain competitive performance compared to the federal science and engineering competition.

Engineering: Over $40M Institutions Market Share by Field

Current Dollars (000s)	2012 Total Research All Institutions (000s)	2012 Federal All Institutions (000s)	2012 Federal Over $40M (000s)	Over $40M Share of Federal Market	2012 Non-Federal All Institutions (000s)	2012 Non-Federal Over $40M (000s)	Over $40M Share of Non-Federal Market
Electrical	$2,314,629	$1,604,176	$1,467,664	91%	710,453	555,015	78%
Other engineering	$1,993,106	$1,212,662	$1,067,282	88%	780,444	624,931	80%
Mechanical	$1,551,399	$1,036,428	$899,980	87%	514,971	397,445	77%
Civil	$1,233,834	$570,958	$497,684	87%	662,876	541,946	82%
Chemical	$908,094	$505,734	$447,489	88%	402,360	304,125	76%
Bioengineering & biomedical	$871,367	$551,880	$522,334	95%	319,487	274,693	86%
Metallurgical & materials	$757,136	$461,739	$400,886	87%	295,397	225,359	76%
Aeronautical & astronautical	$662,449	$501,724	$453,934	90%	160,725	106,704	66%

Non-Science and Engineering: Over $40M Institutions Market Share by Field

Current Dollars (000s)	2012 Total Research All Institutions (000s)	2012 Federal All Institutions (000s)	2012 Federal Over $40M (000s)	Over $40M Share of Federal Market	2012 Non-Federal All Institutions (000s)	2012 Non-Federal Over $40M (000s)	Over $40M Share of Non-Federal Market
Education	$1,231,793	$687,642	$469,363	68%	544,151	355,785	65%
Other non-S&E	$933,860	$147,517	$92,086	62%	786,343	590,436	75%
Business & management	$442,629	$96,743	$59,603	62%	345,886	245,116	71%
Humanities	$339,405	$67,737	$53,936	80%	271,668	212,652	78%
Social work	$199,359	$109,273	$83,312	76%	90,086	65,416	73%
Comm., journ., & library sci.	$159,724	$53,308	$48,488	91%	106,416	72,778	68%
Law	$131,506	$24,595	$7,698	31%	106,911	69,759	65%
Visual & performing arts	$84,373	$10,429	$5,244	50%	73,944	54,656	74%

Finally, when we look at non-federal funding for these non-S&E fields, the patterns identified above are even clearer. In competing for funding from non-federal sources for projects that are non-S&E, the top 165 institutions capture 78% of humanities funding and only 65% of law funding. Again, the competitive marketplace for non-federal dollars is much more varied and less structured than the federal marketplace. Foundations, state and local agencies, and other sources provide grants but follow criteria that vary by funding source and project, rendering the marketplace complex and highly dependent on institutional variables related to mission, ownership, and geography.

Reviewing these tables that decompose the federal and non-federal funding we can make some observations, although clearly more research will be required to tease out a full understanding of these data. The first observation, which comes as no surprise to those who follow the competition for research funding among American universities, is that the top American research universities continue to dominate the research marketplace. As we have discussed elsewhere in the MUP center reports, the stability of the research university hierarchy in America is remarkable, and reflects more than anything else the high cost of assembling the institutional capacity to compete, especially in science and engineering.

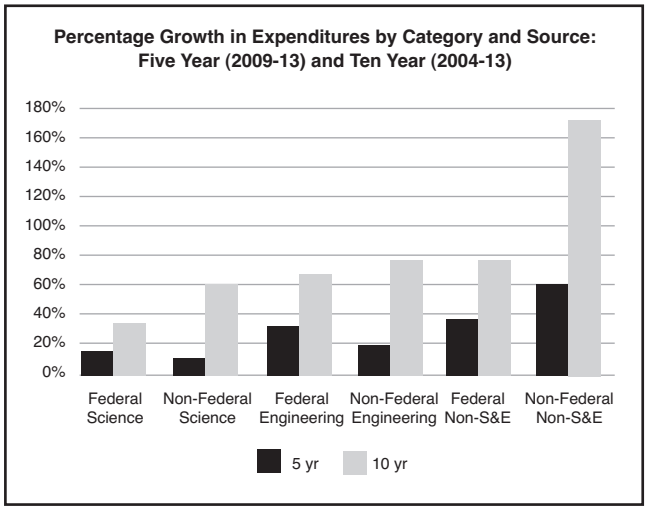
This institutional investment, usually the result of decades of commitment by institutional management, faculty, donors, and for public institutions, state appropriations for university operations, creates a barrier difficult for newer entrants into the research marketplace to overcome. Some public institutions moved into the top category by virtue of state investments in research capacity over many years, sometimes focused primarily on flagship institutions but in other cases more widely distributed among many universities within the state. In addition, public institutions in some areas of the country have benefited from rapid population growth that allowed them to grow their undergraduate and graduate populations. This increased scale supported an increase in the number of faculty and provided revenue to subsidize an expanding resource base capable of sustaining competitive research performance.

Patterns of Research Funding Over Time

Although the economic circumstances of many states and the nation at large have been difficult at times over the last decade, especially since the Great Recession of 2008, the institutional commitments to research and federal and non-federal funding have nonetheless continued. This reflects the long-term nature of research capability where the assets of research faculty, staff, facilities, and support respond only slowly to external economic circumstances and funding entities sustain their recognition of the importance of university-based research. A decade is a long time in the cycle of undergraduate life, but a relatively short time in the cycle of research enterprises. The sources of funding continue over time, and when they plateau or decline they do so slowly. In addition, research-capable institutions continue to expand their financial base by investing heavily in their capacity to raise private dollars. Long a staple of private university revenue generation, public institutions also pursue significant large scale fund raising with some campaigns that rival all but the most ambitious of private universities.

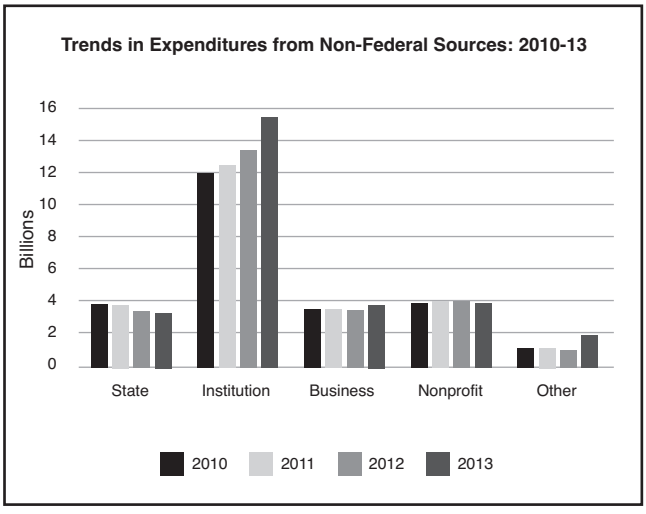
Nonetheless, it is useful to look at some trends in research expenditures within the categories described above. Such a view provides some insight into the opportunities available within the competition for sponsored research from both federal and non-federal sources and may provide some perspective on the pace of change in these marketplaces.

In terms of general funding for science and engineering, as well as non-S&E fields, the last decade has seen constant, if variable, growth in the total dollars available from both federal and non-federal sources. While the increases are all positive over both the five and ten year periods, the non-federal funding for all categories grew more in percentage terms than the federal in the ten year view but in the more recent five-year view, non-federal grew less in all categories except the non-S&E fields.



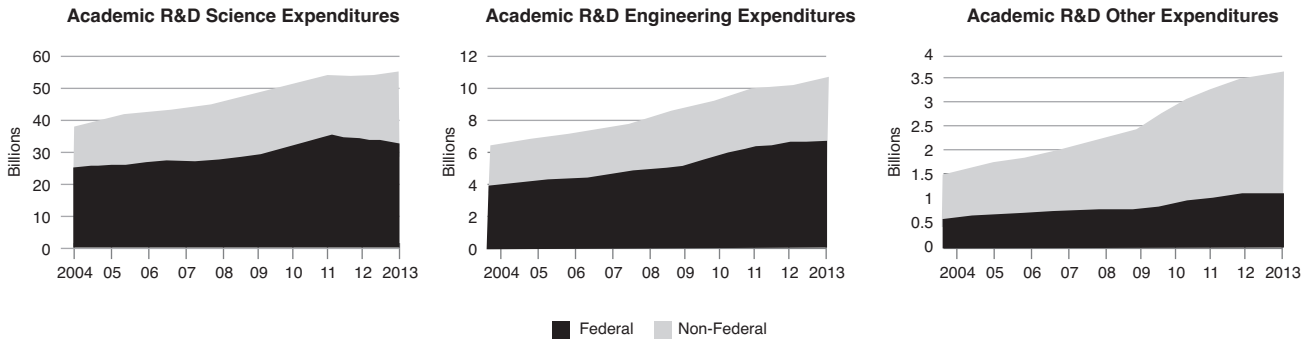
Much of this is due to American Recovery and Reinvestment Act of 2009 (ARRA) funding in support of federal research, a temporary economic development initiative. According to a recent NSF InfoBrief (Feb. 2015), ARRA funding began in 2010 with $2.7B or 7% of all federal academic R&D and peaked in 2011 at $4.2B (10%). Expenditure of ARRA funds the past two years have tapered off with 2013 showing a new low at $1.5B or 4% of all federal funding. This outcome may also come from the significant decline in state funding available after the 2008 recession which likely reduced the size of the marketplace for non-federal research support in many areas. Research expenditures from state funded grants and contracts peaked in 2009 and have steadily declined in recent years. The chart on the right, based on data from the same NSF report, illustrates this recent decline in state funding. However, this is offset by some growth in funding from businesses and nonprofit entities.

Of particular note, the universities and colleges themselves have increasingly outspent all other non-federal entities combined in each of the past four years. The widest gap is in the most recent reporting year of 2013 as these academic institutions spent nearly $15B compared to $12.6B total for state government, businesses, nonprofit organizations and others. The growth in the non-S&E non-federal category is likely due largely to this increase in institutionally-sponsored research. These large investments by institutions highlight the importance of universities committing substantial institutional resources to support the research enterprise in all fields.



The three charts on the next page offer a visual display of the growth of federal and non-federal research funding over this period, illustrating both the growth over the ten-years, the peaking of federal S&E funds from ARRA in 2011, and the flattening of the trends in the most recent period.

For engineering the display is very similar to science punding although the growth curve for non-federal support continues the upward trend significantly even in the last five years. The third category of non-S&E funding shows a somewhat different profile as mentioned above, with the non-federal funds awarded growing more rapidly than the federal funds, especially in the last five years. This chart also illustrates clearly the preponderance of non-federal funding for those fields not in science or engineering.



The marketplaces for the various fields within these larger categories illustrate some differences in growth and clearly display the different scale of funding available for each field. The chart on the bottom right shows the life sciences, both federal and non-federal, which are too large to accompany the other illustrations. Here the significant increases in federal funding followed by a down turn in the final two years of the period are clearly visible, contrasted with the steady rise of non-federal life science funding.

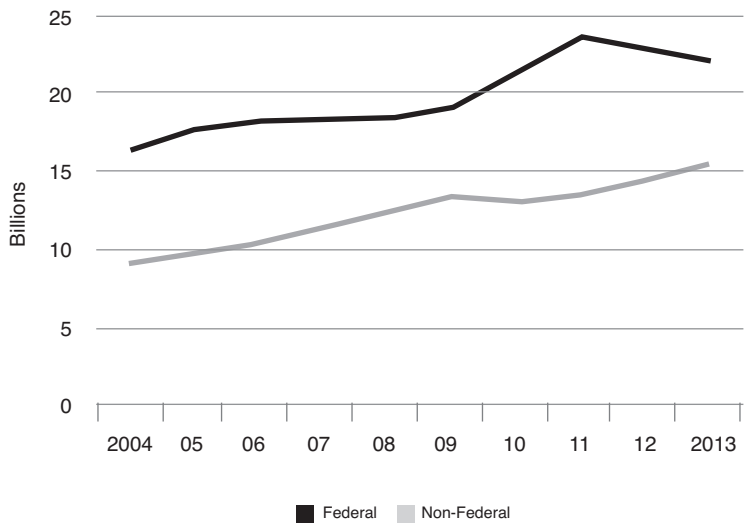
The rest of the science fields (shown on the next page) follow a similar pattern for federal expenditures although the decline in the final years is more dramatic in the physical sciences than in the other fields. Non-federal funding of science fields (other than the life sciences) follows the increasing patterns seen in the chart for the life sciences non-federal funding with somewhat different generally upward trajectories for the different fields.

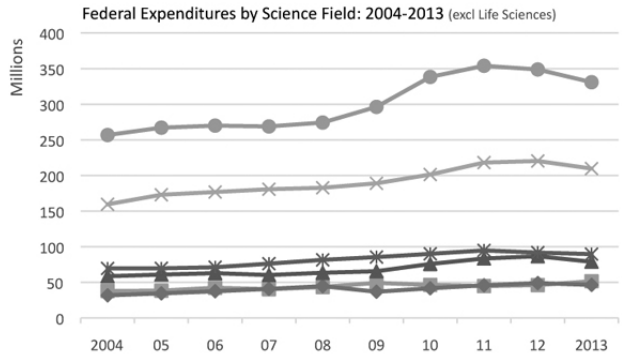
The patterns for engineering, however, show constant growth or at least reasonable stability of both federal and non-federal funding in most fields. The two charts below, make this clearly visible and also illustrate the significantly different levels of funding for the various engineering fields and the different rates of growth by field over the ten years.

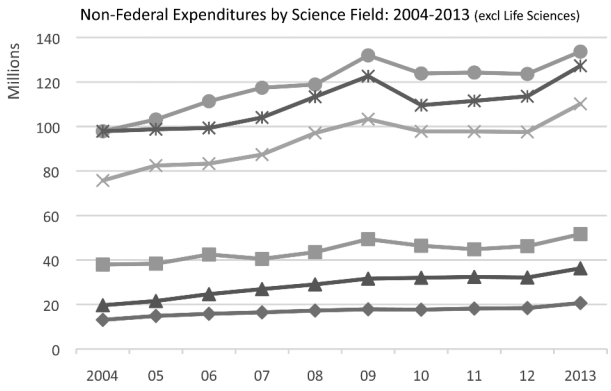
Federal and non-federal funding for those fields and subfields that are non-S&E follow a generally upward trend over the last ten and five year periods. The changes are best viewed through the following two charts. First, we have the federal funding for the non-S&E fields. Clearly education has the largest federal commitment of research funds and shows significant growth of 60% over the ten year period. Business and management along with humanities also show significant growth, but at a lower level of support. Other fields stay mostly stable with a slight upward trend.

Non-federal funding for the non-S&E fields also shows increases in education and business-management, although the rest of the fields have small increases or stay almost flat throughout the decade.

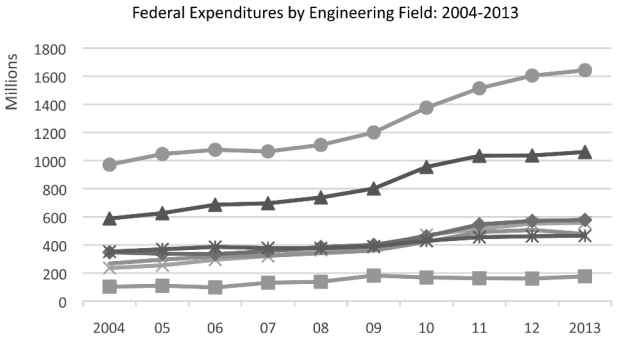
Life Sciences Expenditures 2004-13

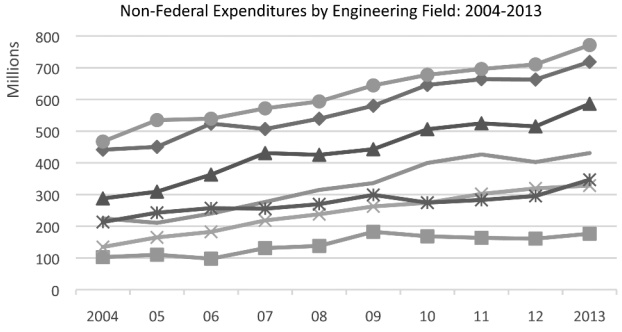



Federal Expenditures by Science Field: 2004-2013 (excl Life Sciences)
Millions
400
350
300
250
200
150
100
50
0
2004 05 06 07 08 09 10 11 12 2013

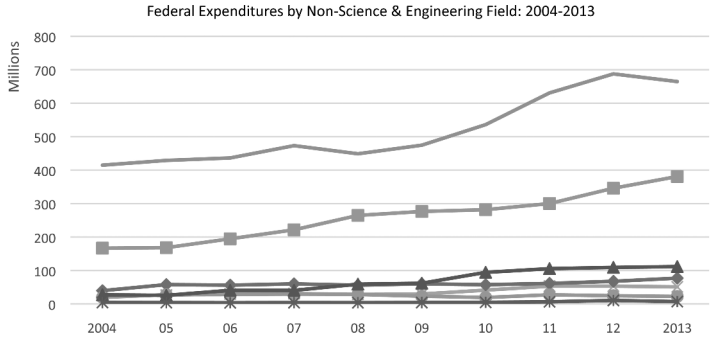

Non-Federal Expenditures by Science Field: 2004-2013 (excl Life Sciences)
Millions
140
120
100
80
60
40
20
0
2004 05 06 07 08 09 10 11 12 2013

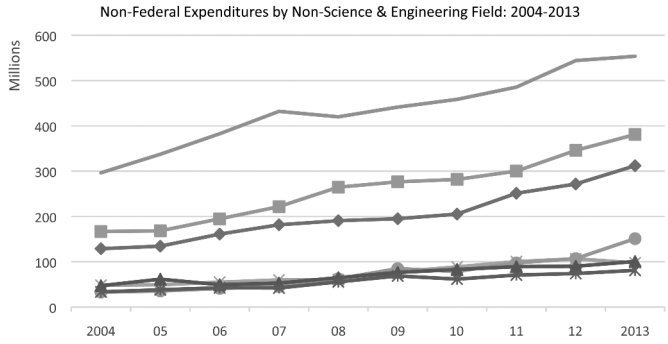

Computer Sciences
Environmental Sciences
Mathematical sciences
Physical sciences
Psychology
Social sciences


Federal Expenditures by Engineering Field: 2004-2013
Millions
1800
1600
1400
1200
1000
800
600
400
200
0
2004 05 06 07 08 09 10 11 12 2013


Non-Federal Expenditures by Engineering Field: 2004-2013
Millions
800
700
600
500
400
300
200
100
0
2004 05 06 07 08 09 10 11 12 2013


Aeronautical & astronautical
Bioengineering & biomedical
Chemical
Civil
Electrical
Mechanical


Federal Expenditures by Non-Science & Engineering Field: 2004-2013
Millions
800
700
600
500
400
300
200
100
0
2004 05 06 07 08 09 10 11 12 2013


Non-Federal Expenditures by Non-Science & Engineering Field: 2004-2013
Millions
600
500
400
300
200
100
0
2004 05 06 07 08 09 10 11 12 2013


Business & management
Communication, journalism, & library sci
Education
Humanities
Law
Social work
Visual & performing arts

Conclusion

The past decade has seen increasing intensity of university competition, whether for prestige, quality students, stellar faculty, or most importantly, for money. Economic challenges have affected every type and size of institution from the smallest of private liberal arts colleges to the most wealthy public and private research universities. Declining state funding for many public institutions has reduced the margin of disposable income available to invest in competitive research talent and facilities, and all research institutions have increased their pursuit of external research support from every possible source: federal, private giving, state and local grants, and foundation programs. Universities have continued to increase their internal funding of research throughout this ten year period, compensating in part for declines in other sources. The data displayed above indicate that while the overall trend of external research funding remained positive throughout the ten years reviewed here, significant variations by field and category of funding reflect changing priorities among providers.

The overwhelming importance of life sciences research funding within the context of all external research support remained constant throughout this period although the federal dollars available declined in the last three years while the non-federal dollars continued modest growth. Although the very large dollar amounts devoted to life sciences disciplines ($23B federal and $14B non-federal in 2012) surely reflect the nation's identification of life science issues as critical national priorities, the sums available for other fields and disciplines, while significantly smaller, prompted strong competitive behavior among academic institutions. In addition, although the dominance of science and engineering in the federal competition is clear, the non-federal dollars provided a growing marketplace for academic research competition and especially in the non-S&E fields where non-federal dollars predominate. The dominance of the over $40M group remained clear for most fields in the five- and ten-year perspectives except for engineering where the over $40M group lost market share of non-federal engineering funding. In the non-S&E fields, the over $40M group gained market share in both the federal and non-federal competition.

These shifts by discipline, field, and source of funding reflect a complicated interaction of multiple funding entities and subdivisions within funding agencies of the federal government with the circumstances and decisions of many individual institutions. The top universities, in spite of significant budget challenges stemming from the Great Recession of 2008, remain consistently dominant, setting the tone and in many ways determining the context of the competitions. Nonetheless, the large number of competing universities and the wide variation in their characteristics testifies to the continued importance of externally funded research as an essential element in the American concept of a quality university. While the predominance of life sciences funding in the total marketplace is of course a constant of this competition, the smaller scale of research funding in other disciplines does not necessarily diminish the competitive significance of these fields. A grant of $50,000 may well make a higher impact in producing quality humanities or fine arts research as a grant of $1M will make in supporting a complex life sciences research program.

In short, as the data displayed here illustrates, external academic research funding remains strong, growing in total amount consistently over the years. The specific variations in changes, both positive and negative, by field reflect changes in the funding priorities of the federal government, foundations, donors, and local and state agencies. The responses of universities to these changes reflect many individual circumstances of institutions, and resist easy generalization. The one certainty is that academic institutions continue to compete vigorously for all available external research support from every source, for research is the touchstone of quality for most American universities.

Appendix A - Comparison of Total Research Ranking with and without non-S&E Expenditures among Institutions with Over $40M Federal Research in 2012

Control	Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	Changes in Natl Rank by Including Non-S&E[1]	Changes in Ctrl Rank by Including Non-S&E[1]	Net Dollar Increase (000s)	% Increase	Non-S&E Portion of all Research Expendi-tures
Public	Arizona State U	$344,611	62	39	$385,959	58	37	4	2	$41,348	12.0%	11%
Public	Auburn U	$130,222	125	86	$133,013	131	92	-6	-6	$2,791	2.1%	2%
Private	Baylor College of Medicine	$474,700	36	14	$474,700	38	15	-2	-1			0%
Private	Boston U	$330,247	66	24	$334,496	69	25	-3	-1	$4,249	1.3%	1%
Private	Brandeis U	$69,489	170	48	$74,660	172	49	-2	-1	$5,171	7.4%	7%
Private	Brown U	$234,906	86	30	$365,120	63	24	23	6	$130,214	55.4%	36%
Private	California Institute of Technology	$374,075	57	22	$379,713	60	22	-3	0	$5,638	1.5%	2%
Private	Carnegie Mellon U	$254,992	79	29	$255,933	81	30	-2	-1	$941	0.4%	0%
Private	Case Western Reserve U	$430,246	43	16	$431,090	49	17	-6	-1	$844	0.2%	0%
Public	Clemson U	$110,493	137	96	$142,096	122	83	15	13	$31,603	28.6%	22%
Public	Cleveland State U	$60,481	182	134	$61,111	188	139	-6	-5	$630	1.0%	1%
Private	Cold Spring Harbor Laboratory	$84,072	152	45	$84,072	161	46	-9	-1			0%
Public	Colorado State U - Fort Collins	$335,336	65	42	$375,919	61	39	4	3	$40,583	12.1%	11%
Private	Columbia U	$847,809	11	4	$889,487	10	4	1	0	$41,678	4.9%	5%
Private	Cornell U	$507,012	34	13	$509,605	35	14	-1	-1	$2,593	0.5%	1%
Private	Dartmouth College	$195,251	97	34	$195,930	102	35	-5	-1	$679	0.3%	0%
Private	Drexel U	$112,390	135	41	$116,768	139	41	-4	0	$4,378	3.9%	4%
Private	Duke U	$1,004,759	7	2	$1,009,911	7	2	0	0	$5,152	0.5%	1%
Private	Emory U	$474,537	37	15	$565,766	33	12	4	3	$91,229	19.2%	16%
Public	Florida International U	$83,639	154	109	$118,058	136	97	18	12	$34,419	41.2%	29%
Public	Florida State U	$208,005	93	62	$225,378	90	60	3	2	$17,373	8.4%	8%
Public	George Mason U	$79,913	160	114	$90,198	156	112	4	2	$10,285	12.9%	11%
Private	George Washington U	$187,652	98	35	$196,448	101	34	-3	1	$8,796	4.7%	5%
Private	Georgetown U	$171,829	105	36	$180,308	107	36	-2	0	$8,479	4.9%	5%
Public	Georgia Institute of Technology	$683,894	23	15	$688,905	24	16	-1	-1	$5,011	0.7%	1%
Public	Georgia Health Sciences University	$70,526	169	122	$70,526	175	126	-6	-4			0%
Private	Harvard U	$753,973	16	7	$799,432	16	7	0	0	$45,459	6.0%	6%
Private	Icahn School of Medicine at Mount Sinai	$400,680	51	19	$400,680	53	19	-2	0			0%
Public	Indiana U - Bloomington	$151,240	117	79	$184,486	104	69	13	10	$33,246	22.0%	18%
Public	Indiana U-Purdue U - Indianapolis	$308,101	69	45	$316,914	70	45	-1	0	$8,813	2.9%	3%
Public	Iowa State U	$252,675	80	51	$260,995	79	50	1	1	$8,320	3.3%	3%
Private	Johns Hopkins U	$2,092,999	1	1	$2,106,185	1	1	0	0	$13,186	0.6%	1%
Public	Kansas State U	$169,863	106	70	$176,141	109	73	-3	-3	$6,278	3.7%	4%
Public	Louisiana State U - Baton Rouge	$279,019	75	48	$285,395	76	48	-1	0	$6,376	2.3%	2%
Public	Louisiana State U HSC - New Orleans	$53,712	190	141	$53,712	202	153	-12	-12			0%
Private	Massachusetts Institute of Technology	$770,367	15	6	$824,130	15	6	0	0	$53,763	7.0%	7%
Private	Medical College of Wisconsin	$209,040	92	31	$209,040	94	31	-2	0			0%
Public	Medical U of South Carolina	$236,586	83	54	$236,586	85	55	-2	-1			0%
Public	Michigan State U	$471,620	38	23	$507,061	36	22	2	1	$35,441	7.5%	7%
Public	Mississippi State U	$222,320	88	58	$233,197	88	58	0	0	$10,877	4.9%	5%
Public	Montana State U - Bozeman	$113,235	134	94	$124,228	134	95	0	-1	$10,993	9.7%	9%
Public	Naval Postgraduate School	$124,531	129	90	$132,450	132	93	-3	-3	$7,919	6.4%	6%
Public	New Jersey Institute of Technology	$91,407	149	105	$102,851	146	104	3	1	$11,444	12.5%	11%
Public	New Mexico State U - Las Cruces	$135,214	123	84	$141,151	124	85	-1	-1	$5,937	4.4%	4%
Private	New York U	$425,043	45	17	$458,645	39	16	6	1	$33,602	7.9%	7%
Public	North Carolina State U	$400,046	52	33	$404,225	52	34	0	-1	$4,179	1.0%	1%
Public	North Dakota State U	$133,874	124	85	$135,493	130	91	-6	-6	$1,619	1.2%	1%
Private	Northeastern U	$102,911	140	42	$107,862	143	42	-3	0	$4,951	4.8%	5%
Private	Northwestern U	$602,451	28	10	$631,078	27	10	1	0	$28,627	4.8%	5%
Public	Ohio State U - Columbus	$720,082	17	10	$766,513	17	10	0	0	$46,431	6.4%	6%
Public	Oklahoma State U - Stillwater	$166,523	107	71	$166,523	112	76	-5	-5	$0	0.0%	0%
Public	Oregon Health & Science U	$305,360	70	46	$305,530	72	47	-2	-1	$170	0.1%	0%
Public	Oregon State U	$239,571	81	52	$240,507	83	53	-2	-1	$936	0.4%	0%
Public	Pennsylvania State U - Hershey Medical Ctr	$84,338	151	107	$84,338	160	115	-9	-8			0%
Public	Pennsylvania State U - University Park	$699,556	19	12	$713,341	19	12	0	0	$13,785	2.0%	2%
Private	Princeton U	$264,980	77	28	$275,666	77	29	0	-1	$10,686	4.0%	4%
Public	Purdue U - West Lafayette	$528,140	33	21	$602,501	31	20	2	1	$74,361	14.1%	12%
Private	Rensselaer Polytechnic Institute	$92,348	147	44	$92,720	152	44	-5	0	$372	0.4%	0%
Private	Rice U	$115,235	133	40	$117,223	137	40	-4	0	$1,988	1.7%	2%
Private	Rockefeller U	$292,896	71	25	$292,896	73	26	-2	-1			0%
Private	Rush U	$80,300	159	46	$80,300	166	48	-7	-2			0%

Appendix A, Cont. - Comparison of Total Research Ranking with and without non-S&E Expenditures among Institutions with Over $40M Federal Research in 2012

Control	Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	Changes in Natl Rank by Including Non-S&E[1]	Changes in Ctrl Rank by Including Non-S&E[1]	Net Dollar Increase (000s)	% Increase	Non-S&E Portion of all Research Expenditures
Public	Rutgers U - New Brunswick	$420,737	47	30	$434,901	45	29	2	1	$14,164	3.4%	3%
Public	San Diego State U	$75,670	165	118	$92,867	151	108	14	10	$17,197	22.7%	19%
Private	Scripps Research Institute	$398,673	53	20	$398,673	54	20	-1	0			0%
Public	South Dakota State U	$68,554	171	123	$68,743	176	127	-5	-4	$189	0.3%	0%
Private	Stanford U	$854,580	10	3	$903,238	9	3	1	0	$48,658	5.7%	5%
Public	Stony Brook U	$218,209	90	60	$219,744	92	62	-2	-2	$1,535	0.7%	1%
Public	Temple U	$126,288	128	89	$138,318	126	87	2	2	$12,030	9.5%	9%
Public	Texas A&M U - College Station	$669,968	24	16	$693,421	23	15	1	1	$23,453	3.5%	3%
Private	Thomas Jefferson U	$100,506	144	43	$100,506	149	43	-5	0			0%
Private	Tufts U	$159,140	112	37	$160,922	115	38	-3	-1	$1,782	1.1%	1%
Private	Tulane U	$154,196	114	38	$164,373	114	37	0	1	$10,177	6.6%	6%
Public	Uniformed Services U of the Health Sciences	$151,392	116	78	$151,392	121	82	-5	-4			0%
Public	U at Albany	$135,673	122	83	$137,758	128	89	-6	-6	$2,085	1.5%	2%
Public	U at Buffalo	$340,930	63	40	$360,226	65	41	-2	-1	$19,296	5.7%	5%
Public	U of Alabama - Birmingham	$449,108	39	24	$453,779	41	25	-2	-1	$4,671	1.0%	1%
Public	U of Alabama - Huntsville	$83,076	157	112	$87,388	157	113	0	-1	$4,312	5.2%	5%
Public	U of Alaska - Fairbanks	$121,640	130	91	$160,407	116	78	14	13	$38,767	31.9%	24%
Public	U of Arizona	$615,434	27	18	$625,365	28	18	-1	0	$9,931	1.6%	2%
Public	U of Arkansas for Medical Sciences	$129,056	127	88	$129,056	133	94	-6	-6			0%
Public	U of California - Berkeley	$696,904	20	13	$730,348	18	11	2	2	$33,444	4.8%	5%
Public	U of California - Davis	$704,999	18	11	$713,292	20	13	-2	-2	$8,293	1.2%	1%
Public	U of California - Irvine	$335,874	64	41	$350,030	67	43	-3	-2	$14,156	4.2%	4%
Public	U of California - Los Angeles	$969,682	8	6	$1,003,375	8	6	0	0	$33,693	3.5%	3%
Public	U of California - Riverside	$129,609	126	87	$135,494	129	90	-3	-3	$5,885	4.5%	4%
Public	U of California - San Diego	$1,065,306	4	3	$1,073,864	5	4	-1	-1	$8,558	0.8%	1%
Public	U of California - San Francisco	$1,032,673	5	4	$1,032,673	6	5	-1	-1			0%
Public	U of California - Santa Barbara	$222,916	87	57	$233,883	87	57	0	0	$10,967	4.9%	5%
Public	U of California - Santa Cruz	$149,824	118	80	$155,516	119	80	-1	0	$5,692	3.8%	4%
Public	U of Central Florida	$102,562	141	99	$116,891	138	98	3	1	$14,329	14.0%	12%
Private	U of Chicago	$411,864	49	18	$419,631	51	18	-2	0	$7,767	1.9%	2%
Public	U of Cincinnati - Cincinnati	$408,294	50	32	$433,668	46	30	4	2	$25,374	6.2%	6%
Public	U of Colorado - Boulder	$373,512	58	36	$392,004	55	35	3	1	$18,492	5.0%	5%
Public	U of Colorado - Denver	$422,844	46	29	$431,977	48	32	-2	-3	$9,133	2.2%	2%
Public	U of Connecticut - Health Center	$102,530	142	100	$102,530	147	105	-5	-5			0%
Public	U of Connecticut - Storrs	$147,938	119	81	$154,324	120	81	-1	0	$6,386	4.3%	4%
Private	U of Dayton	$79,877	161	47	$81,030	164	47	-3	0	$1,153	1.4%	1%
Public	U of Delaware	$161,327	111	75	$170,174	110	74	1	1	$8,847	5.5%	5%
Public	U of Florida	$649,988	26	17	$696,985	22	14	4	3	$46,997	7.2%	7%
Public	U of Georgia	$311,498	68	44	$351,395	66	42	2	2	$39,897	12.8%	11%
Public	U of Hawaii - Manoa	$312,311	67	43	$312,311	71	46	-4	-3	$0	0.0%	0%
Public	U of Houston - University Park	$105,844	138	97	$116,288	140	99	-2	-2	$10,444	9.9%	9%
Public	U of Idaho	$95,327	146	103	$97,227	150	107	-4	-4	$1,900	2.0%	2%
Public	U of Illinois - Chicago	$381,918	56	35	$388,625	57	36	-1	-1	$6,707	1.8%	2%
Public	U of Illinois - Urbana-Champaign	$558,022	30	19	$583,754	32	21	-2	-2	$25,732	4.6%	4%
Public	U of Iowa	$432,980	42	27	$446,429	42	26	0	1	$13,449	3.1%	3%
Public	U of Kansas - Lawrence	$172,615	104	69	$202,567	98	65	6	4	$29,952	17.4%	15%
Public	U of Kansas Medical Center	$83,695	153	108	$83,695	162	116	-9	-8			0%
Public	U of Kentucky	$354,132	61	38	$360,776	64	40	-3	-2	$6,644	1.9%	2%
Public	U of Louisville	$165,319	109	73	$196,842	100	67	9	6	$31,523	19.1%	16%
Public	U of Maryland - Baltimore	$414,754	48	31	$433,228	47	31	1	0	$18,474	4.5%	4%
Public	U of Maryland - Baltimore County	$65,628	174	126	$74,993	171	123	3	3	$9,365	14.3%	13%
Public	U of Maryland - College Park	$498,417	35	22	$502,406	37	23	-2	-1	$3,989	0.8%	1%
Public	U of Massachusetts - Amherst	$178,207	103	68	$194,775	103	68	0	0	$16,568	9.3%	9%
Public	U of Massachusetts Medical Sch - Worcester	$256,090	78	50	$256,090	80	51	-2	-1			0%
Public	U of Medicine & Dentistry of New Jersey	$206,504	94	63	$206,504	95	64	-1	-1			0%
Private	U of Miami	$361,772	60	23	$365,301	62	23	-2	0	$3,529	1.0%	1%
Public	U of Michigan - Ann Arbor	$1,247,680	2	1	$1,322,711	2	1	0	0	$75,031	6.0%	6%
Public	U of Minnesota - Twin Cities	$806,832	14	9	$826,173	14	9	0	0	$19,341	2.4%	2%
Public	U of Missouri - Columbia	$234,975	85	56	$239,810	84	54	1	2	$4,835	2.1%	2%
Public	U of Nebraska - Lincoln	$238,471	82	53	$253,320	82	52	0	1	$14,849	6.2%	6%
Public	U of Nebraska Medical Center	$141,619	121	82	$141,619	123	84	-2	-2			0%

Appendix A, Cont. - Comparison of Total Research Ranking with and without non-S&E Expenditures among Institutions with Over $40M Federal Research in 2012

Control	Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	Changes in Natl Rank by Including Non-S&E[1]	Changes in Ctrl Rank by Including Non-S&E[1]	Net Dollar Increase (000s)	% Increase	Non-S&E Portion of all Research Expenditures
Public	U of Nevada - Reno	$83,137	155	110	$85,726	158	114	-3	-4	$2,589	3.1%	3%
Public	U of New Hampshire - Durham	$152,276	115	77	$165,156	113	77	2	0	$12,880	8.5%	8%
Public	U of New Mexico - Albuquerque	$216,218	91	61	$220,360	91	61	0	0	$4,142	1.9%	2%
Public	U of North Carolina - Chapel Hill	$864,748	9	7	$884,791	11	7	-2	0	$20,043	2.3%	2%
Public	U of North Dakota	$79,792	162	115	$80,149	167	119	-5	-4	$357	0.4%	0%
Private	U of Notre Dame	$143,328	120	39	$157,691	117	39	3	0	$14,363	10.0%	9%
Public	U of Oklahoma - Norman	$115,529	132	93	$139,326	125	86	7	7	$23,797	20.6%	17%
Public	U of Oklahoma Health Sciences Center	$101,648	143	101	$101,648	148	106	-5	-5			0%
Public	U of Oregon	$87,656	150	106	$105,030	144	102	6	4	$17,374	19.8%	17%
Private	U of Pennsylvania	$813,210	13	5	$847,077	13	5	0	0	$33,867	4.2%	4%
Public	U of Pittsburgh - Pittsburgh	$839,793	12	8	$866,638	12	8	0	0	$26,845	3.2%	3%
Public	U of Rhode Island	$97,845	145	102	$114,323	142	101	3	1	$16,478	16.8%	14%
Private	U of Rochester	$388,401	55	21	$389,612	56	21	-1	0	$1,211	0.3%	0%
Public	U of South Carolina - Columbia	$186,559	99	64	$214,901	93	63	6	1	$28,342	15.2%	13%
Public	U of South Florida - Tampa	$394,694	54	34	$443,206	43	27	11	7	$48,512	12.3%	11%
Private	U of Southern California	$593,003	29	11	$623,544	29	11	0	0	$30,541	5.2%	5%
Public	U of Tennessee - Knoxville	$165,708	108	72	$179,252	108	72	0	0	$13,544	8.2%	7%
Public	U of Tennessee Health Science Center	$77,749	164	117	$77,754	170	122	-6	-5			0%
Public	U of Texas - Austin	$549,312	31	20	$621,538	30	19	1	1	$72,226	13.1%	12%
Public	U of Texas Health Science Center - Houston	$236,250	84	55	$236,250	86	56	-2	-1			0%
Public	U of Texas Health Science Ctr - San Antonio	$184,298	100	65	$184,298	105	70	-5	-5			0%
Public	U of Texas MD Anderson Cancer Center	$685,814	22	14	$685,814	25	17	-3	-3			0%
Public	U of Texas Medical Branch - Galveston	$180,888	101	66	$180,888	106	71	-5	-5			0%
Public	U of Texas SW Medical Center - Dallas	$435,085	41	26	$435,085	44	28	-3	-2			0%
Public	U of Utah	$425,558	44	28	$430,056	50	33	-6	-5	$4,498	1.1%	1%
Public	U of Vermont	$115,569	131	92	$115,697	141	100	-10	-8	$128	0.1%	0%
Public	U of Virginia	$363,569	59	37	$383,359	59	38	0	-1	$19,790	5.4%	5%
Public	U of Washington - Seattle	$1,065,414	3	2	$1,109,008	4	3	-1	-1	$43,594	4.1%	4%
Public	U of Wisconsin - Madison	$1,030,605	6	5	$1,169,779	3	2	3	3	$139,174	13.5%	12%
Public	U of Wyoming	$63,812	177	129	$65,611	181	132	-4	-3	$1,799	2.8%	3%
Public	Utah State U	$155,305	113	76	$157,355	118	79	-5	-3	$2,050	1.3%	1%
Private	Vanderbilt U	$533,878	32	12	$560,466	34	13	-2	-1	$26,588	5.0%	5%
Public	Virginia Commonwealth U	$179,310	102	67	$201,366	99	66	3	1	$22,056	12.3%	11%
Public	Virginia Polytechnic Institute and State U	$448,054	40	25	$454,417	40	24	0	1	$6,363	1.4%	1%
Private	Wake Forest U	$203,730	96	33	$204,328	97	33	-1	0	$598	0.3%	0%
Public	Washington State U - Pullman	$288,693	74	47	$335,930	68	44	6	3	$47,237	16.4%	14%
Private	Washington U in St. Louis	$689,035	21	8	$706,410	21	8	0	0	$17,375	2.5%	3%
Public	Wayne State U	$221,666	89	59	$227,070	89	59	0	0	$5,404	2.4%	2%
Private	Weill Cornell Medical College	$292,782	72	26	$292,782	74	27	-2	-1			0%
Public	West Virginia U	$161,961	110	74	$169,303	111	75	-1	-1	$7,342	4.5%	4%
Private	Woods Hole Oceanographic Institution	$204,352	95	32	$204,352	96	32	-1	0			0%
Private	Yale U	$654,824	25	9	$656,555	26	9	-1	0	$1,731	0.3%	0%
Private	Yeshiva U	$289,027	73	27	$289,027	75	28	-2	-1	$0	0.0%	0%

Appendix B - Comparison of Federal Research Ranking with and without non-S&E Expenditures among Institutions with Over $40M Federal Research in 2012

Control	Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	Changes in Natl Rank by Including Non-S&E[1]	Changes in Ctrl Rank by Including Non-S&E[1]	Net Dollar Increase (000s)	% Increase	Non-S&E Portion of all Research Expenditures
Public	Arizona State U	$182,188	68	42	$194,376	66	40	2	2	$12,188	6.7%	6%
Public	Auburn U	$55,118	149	103	$55,557	151	105	-2	-2	$439	0.8%	1%
Private	Baylor College of Medicine	$268,753	47	23	$268,753	51	23	-4	0			0%
Private	Boston U	$273,204	44	21	$275,319	44	21	0	0	$2,115	0.8%	1%
Private	Brandeis U	$44,061	162	47	$44,532	162	47	0	0	$471	1.1%	1%
Private	Brown U	$127,665	85	32	$131,994	86	32	-1	0	$4,329	3.4%	3%
Private	California Institute of Technology	$322,295	34	16	$326,701	35	16	-1	0	$4,406	1.4%	1%
Private	Carnegie Mellon U	$209,307	60	25	$209,522	60	25	0	0	$215	0.1%	0%
Private	Case Western Reserve U	$358,722	26	14	$359,000	27	14	-1	0	$278	0.1%	0%
Public	Clemson U	$48,182	157	111	$51,764	156	110	1	1	$3,582	7.4%	7%
Public	Cleveland State U	$46,205	159	113	$46,645	159	113	0	0	$440	1.0%	1%
Private	Cold Spring Harbor Laboratory	$43,874	163	48	$43,874	163	48	0	0			0%
Public	Colorado State U - Fort Collins	$245,573	53	30	$252,286	53	30	0	0	$6,713	2.7%	3%
Private	Columbia U	$631,961	6	3	$645,573	6	3	0	0	$13,612	2.2%	2%
Private	Cornell U	$298,596	41	20	$300,245	42	20	-1	0	$1,649	0.6%	1%
Private	Dartmouth College	$147,218	79	31	$147,421	79	31	0	0	$203	0.1%	0%
Private	Drexel U	$85,584	119	38	$87,860	119	38	0	0	$2,276	2.7%	3%
Private	Duke U	$585,636	10	5	$587,268	11	6	-1	-1	$1,632	0.3%	0%
Private	Emory U	$360,934	25	13	$361,165	25	13	0	0	$231	0.1%	0%
Public	Florida International U	$54,204	153	107	$69,402	137	95	16	12	$15,198	28.0%	22%
Public	Florida State U	$131,998	84	53	$140,419	82	51	2	2	$8,421	6.4%	6%
Public	George Mason U	$57,504	145	99	$63,786	141	97	4	2	$6,282	10.9%	10%
Private	George Washington U	$111,068	96	36	$112,110	102	36	-6	0	$1,042	0.9%	1%
Private	Georgetown U	$113,229	94	35	$115,197	98	35	-4	0	$1,968	1.7%	2%
Public	Georgia Institute of Technology	$482,349	16	9	$484,212	18	10	-2	-1	$1,863	0.4%	0%
Public	Georgia Health Sciences University	$55,106	150	104	$55,106	154	108	-4	-4			0%
Private	Harvard U	$574,346	11	6	$589,860	10	5	1	1	$15,514	2.7%	3%
Private	Icahn School of Medicine at Mount Sinai	$271,722	45	22	$271,722	46	22	-1	0			0%
Public	Indiana U - Bloomington	$72,501	133	91	$79,727	129	89	4	2	$7,226	10.0%	9%
Public	Indiana U-Purdue U - Indianapolis	$165,374	73	45	$166,825	73	45	0	0	$1,451	0.9%	1%
Public	Iowa State U	$117,144	93	59	$118,242	95	61	-2	-2	$1,098	0.9%	1%
Private	Johns Hopkins U	$1,845,845	1	1	$1,857,580	1	1	0	0	$11,735	0.6%	1%
Public	Kansas State U	$73,247	131	89	$77,689	132	92	-1	-3	$4,442	6.1%	6%
Public	Louisiana State U - Baton Rouge	$91,238	114	77	$92,551	114	77	0	0	$1,313	1.4%	1%
Public	Louisiana State U HSC - New Orleans	$40,637	165	117	$40,637	169	121	-4	-4			0%
Private	Massachusetts Institute of Technology	$478,955	18	8	$496,132	16	8	2	0	$17,177	3.6%	3%
Private	Medical College of Wisconsin	$125,325	87	33	$125,325	90	33	-3	0			0%
Public	Medical U of South Carolina	$136,907	81	50	$136,907	84	53	-3	-3			0%
Public	Michigan State U	$250,416	52	29	$268,952	50	28	2	1	$18,536	7.4%	7%
Public	Mississippi State U	$96,132	111	74	$96,689	112	75	-1	-1	$557	0.6%	1%
Public	Montana State U - Bozeman	$78,409	125	85	$86,511	121	83	4	2	$8,102	10.3%	9%
Public	Naval Postgraduate School	$120,209	90	57	$127,049	88	56	2	1	$6,840	5.7%	5%
Public	New Jersey Institute of Technology	$57,513	143	98	$59,398	145	100	-2	-2	$1,885	3.3%	3%
Public	New Mexico State U - Las Cruces	$90,338	115	78	$90,722	116	79	-1	-1	$384	0.4%	0%
Private	New York U	$300,271	40	19	$316,208	36	17	4	2	$15,937	5.3%	5%
Public	North Carolina State U	$171,464	72	44	$174,758	70	44	2	0	$3,294	1.9%	2%
Public	North Dakota State U	$45,326	160	114	$46,490	160	114	0	0	$1,164	2.6%	3%
Private	Northeastern U	$75,733	129	42	$77,667	133	41	-4	1	$1,934	2.6%	2%
Private	Northwestern U	$385,377	24	12	$393,074	24	12	0	0	$7,697	2.0%	2%
Public	Ohio State U - Columbus	$416,304	23	12	$445,635	21	12	2	0	$29,331	7.0%	7%
Public	Oklahoma State U - Stillwater	$85,876	118	81	$85,876	123	85	-5	-4	$0	0.0%	0%
Public	Oregon Health & Science U	$242,219	55	32	$242,337	55	32	0	0	$118	0.0%	0%
Public	Oregon State U	$155,667	78	48	$156,446	78	48	0	0	$779	0.5%	1%
Public	Pennsylvania State U - Hershey Med Ctr	$56,615	146	100	$56,615	149	103	-3	-3			0%
Public	Pennsylvania State U - University Park	$469,597	19	11	$474,806	19	11	0	0	$5,209	1.1%	1%
Private	Princeton U	$160,985	75	30	$161,591	74	29	1	1	$606	0.4%	0%
Public	Purdue U - West Lafayette	$255,691	51	28	$270,655	47	25	4	3	$14,964	5.9%	6%
Private	Rensselaer Polytechnic Institute	$62,063	139	45	$62,341	142	45	-3	0	$278	0.4%	0%
Private	Rice U	$76,431	128	41	$76,964	134	42	-6	-1	$533	0.7%	1%
Private	Rockefeller U	$84,616	121	39	$84,616	124	39	-3	0			0%
Private	Rush U	$57,512	144	46	$57,512	146	46	-2	0			0%

Appendix B, Cont. - Comparison of Federal Research Ranking with and without non-S&E Expenditures among Institutions with Over $40M Federal Research in 2012

Control	Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	Changes in Natl Rank by Including Non-S&E[1]	Changes in Ctrl Rank by Including Non-S&E[1]	Net Dollar Increase (000s)	% Increase	Non-S&E Portion of all Research Expenditures
Public	Rutgers U - New Brunswick	$273,498	43	23	$279,161	43	23	0	0	$5,663	2.1%	2%
Public	San Diego State U	$51,690	155	109	$56,797	148	102	7	7	$5,107	9.9%	9%
Private	Scripps Research Institute	$309,471	36	17	$309,471	38	18	-2	-1			0%
Public	South Dakota State U	$41,941	164	116	$41,975	167	119	-3	-3	$34	0.1%	0%
Private	Stanford U	$607,578	8	4	$636,348	8	4	0	0	$28,770	4.7%	5%
Public	Stony Brook U	$123,198	89	56	$123,383	91	58	-2	-2	$185	0.2%	0%
Public	Temple U	$85,062	120	82	$90,243	117	80	3	2	$5,181	6.1%	6%
Public	Texas A&M U - College Station	$259,506	50	27	$269,460	49	27	1	0	$9,954	3.8%	4%
Private	Thomas Jefferson U	$68,976	136	43	$68,976	138	43	-2	0			0%
Private	Tufts U	$120,042	92	34	$121,512	93	34	-1	0	$1,470	1.2%	1%
Private	Tulane U	$101,130	108	37	$101,360	109	37	-1	0	$230	0.2%	0%
Public	Uniformed Services U of the Health Sci	$110,276	100	64	$110,276	104	68	-4	-4			0%
Public	U at Albany	$112,161	95	60	$112,989	100	65	-5	-5	$828	0.7%	1%
Public	U at Buffalo	$186,747	67	41	$193,613	68	42	-1	-1	$6,866	3.7%	4%
Public	U of Alabama - Birmingham	$303,677	39	21	$306,210	40	21	-1	0	$2,533	0.8%	1%
Public	U of Alabama - Huntsville	$75,715	130	88	$78,528	130	90	0	-2	$2,813	3.7%	4%
Public	U of Alaska - Fairbanks	$97,472	110	73	$99,674	110	73	0	0	$2,202	2.3%	2%
Public	U of Arizona	$328,369	33	18	$331,578	33	18	0	0	$3,209	1.0%	1%
Public	U of Arkansas for Medical Sciences	$69,883	135	93	$69,883	136	94	-1	-1			0%
Public	U of California - Berkeley	$333,179	30	16	$338,759	31	17	-1	-1	$5,580	1.7%	2%
Public	U of California - Davis	$356,540	27	13	$358,577	28	14	-1	-1	$2,037	0.6%	1%
Public	U of California - Irvine	$204,062	62	37	$206,985	62	37	0	0	$2,923	1.4%	1%
Public	U of California - Los Angeles	$527,899	14	8	$539,054	14	8	0	0	$11,155	2.1%	2%
Public	U of California - Riverside	$61,304	141	96	$63,821	140	96	1	0	$2,517	4.1%	4%
Public	U of California - San Diego	$653,549	5	3	$656,891	5	3	0	0	$3,342	0.5%	1%
Public	U of California - San Francisco	$559,329	12	6	$559,329	13	7	-1	-1			0%
Public	U of California - Santa Barbara	$134,984	82	51	$136,352	85	54	-3	-3	$1,368	1.0%	1%
Public	U of California - Santa Cruz	$91,409	113	76	$94,222	113	76	0	0	$2,813	3.1%	3%
Public	U of Central Florida	$72,620	132	90	$78,411	131	91	1	-1	$5,791	8.0%	7%
Private	U of Chicago	$329,119	31	15	$336,125	32	15	-1	0	$7,006	2.1%	2%
Public	U of Cincinnati - Cincinnati	$266,507	48	25	$267,691	52	29	-4	-4	$1,184	0.4%	0%
Public	U of Colorado - Boulder	$319,019	35	19	$330,089	34	19	1	0	$11,070	3.5%	3%
Public	U of Colorado - Denver	$308,023	37	20	$315,685	37	20	0	0	$7,662	2.5%	2%
Public	U of Connecticut - Health Center	$61,568	140	95	$61,568	143	98	-3	-3			0%
Public	U of Connecticut - Storrs	$88,834	116	79	$91,696	115	78	1	1	$2,862	3.2%	3%
Private	U of Dayton	$64,369	138	44	$65,169	139	44	-1	0	$800	1.2%	1%
Public	U of Delaware	$110,760	97	61	$117,072	96	62	1	-1	$6,312	5.7%	5%
Public	U of Florida	$295,745	42	22	$305,067	41	22	1	0	$9,322	3.2%	3%
Public	U of Georgia	$133,525	83	52	$137,710	83	52	0	0	$4,185	3.1%	3%
Public	U of Hawaii - Manoa	$193,722	66	40	$193,722	67	41	-1	-1	$0	0.0%	0%
Public	U of Houston - University Park	$54,657	151	105	$55,812	150	104	1	1	$1,155	2.1%	2%
Public	U of Idaho	$53,765	154	108	$55,115	153	107	1	1	$1,350	2.5%	2%
Public	U of Illinois - Chicago	$243,622	54	31	$246,128	54	31	0	0	$2,506	1.0%	1%
Public	U of Illinois - Urbana-Champaign	$348,536	28	14	$359,989	26	13	2	1	$11,453	3.3%	3%
Public	U of Iowa	$265,780	49	26	$269,734	48	26	1	0	$3,954	1.5%	1%
Public	U of Kansas - Lawrence	$99,034	109	72	$123,025	92	59	17	13	$23,991	24.2%	20%
Public	U of Kansas Medical Center	$48,018	158	112	$48,018	158	112	0	0			0%
Public	U of Kentucky	$157,813	77	47	$159,678	77	47	0	0	$1,865	1.2%	1%
Public	U of Louisville	$79,252	124	84	$89,976	118	81	6	3	$10,724	13.5%	12%
Public	U of Maryland - Baltimore	$229,858	56	33	$231,886	58	35	-2	-2	$2,028	0.9%	1%
Public	U of Maryland - Baltimore County	$44,669	161	115	$45,014	161	115	0	0	$345	0.8%	1%
Public	U of Maryland - College Park	$340,180	29	15	$340,180	30	16	-1	-1	$0	0.0%	0%
Public	U of Massachusetts - Amherst	$106,470	104	68	$115,280	97	63	7	5	$8,810	8.3%	8%
Public	U of Massachusetts Medical Sch - Worcester	$202,149	63	38	$202,149	63	38	0	0			0%
Public	U of Medicine & Dentistry of New Jersey	$110,595	98	62	$110,595	103	67	-5	-5			0%
Private	U of Miami	$222,535	58	24	$224,172	59	24	-1	0	$1,637	0.7%	1%
Public	U of Michigan - Ann Arbor	$773,766	3	2	$791,729	3	2	0	0	$17,963	2.3%	2%
Public	U of Minnesota - Twin Cities	$480,531	17	10	$485,462	17	9	0	1	$4,931	1.0%	1%
Public	U of Missouri - Columbia	$110,446	99	63	$114,345	99	64	0	-1	$3,899	3.5%	3%
Public	U of Nebraska - Lincoln	$103,294	106	70	$104,579	108	72	-2	-2	$1,285	1.2%	1%
Public	U of Nebraska Medical Center	$84,196	122	83	$84,196	125	86	-3	-3			0%

Appendix B, Cont. - Comparison of Federal Research Ranking with and without non-S&E Expenditures among Institutions with Over $40M Federal Research in 2012

Control	Institution	2012 Total Research Excluding Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	2012 Total Research Including Non-S&E (000s)	2012 Natl Rank	2012 Ctrl Rank	Changes in Natl Rank by Including Non-S&E[1]	Changes in Ctrl Rank by Including Non-S&E[1]	Net Dollar Increase (000s)	% Increase	Non-S&E Portion of all Research Expenditures
Public	U of Nevada - Reno	$55,150	148	102	$55,437	152	106	-4	-4	$287	0.5%	1%
Public	U of New Hampshire - Durham	$109,728	102	66	$119,451	94	60	8	6	$9,723	8.9%	8%
Public	U of New Mexico - Albuquerque	$159,302	76	46	$160,895	76	46	0	0	$1,593	1.0%	1%
Public	U of North Carolina - Chapel Hill	$597,629	9	5	$606,348	9	5	0	0	$8,719	1.5%	1%
Public	U of North Dakota	$54,411	152	106	$54,476	155	109	-3	-3	$65	0.1%	0%
Private	U of Notre Dame	$82,244	123	40	$83,295	127	40	-4	0	$1,051	1.3%	1%
Public	U of Oklahoma - Norman	$64,427	137	94	$74,137	135	93	2	1	$9,710	15.1%	13%
Public	U of Oklahoma Health Sciences Center	$59,704	142	97	$59,704	144	99	-2	-2			0%
Public	U of Oregon	$71,157	134	92	$86,316	122	84	12	8	$15,159	21.3%	18%
Private	U of Pennsylvania	$656,425	4	2	$669,970	4	2	0	0	$13,545	2.1%	2%
Public	U of Pittsburgh - Pittsburgh	$620,070	7	4	$637,857	7	4	0	0	$17,787	2.9%	3%
Public	U of Rhode Island	$78,194	126	86	$83,754	126	87	0	-1	$5,560	7.1%	7%
Private	U of Rochester	$307,390	38	18	$308,115	39	19	-1	-1	$725	0.2%	0%
Public	U of South Carolina - Columbia	$93,237	112	75	$98,836	111	74	1	1	$5,599	6.0%	6%
Public	U of South Florida - Tampa	$218,772	59	35	$236,148	57	34	2	1	$17,376	7.9%	7%
Private	U of Southern California	$433,136	20	9	$443,842	22	10	-2	-1	$10,706	2.5%	2%
Public	U of Tennessee - Knoxville	$103,147	107	71	$112,471	101	66	6	5	$9,324	9.0%	8%
Public	U of Tennessee Health Science Center	$48,473	156	110	$48,473	157	111	-1	-1			0%
Public	U of Texas - Austin	$328,560	32	17	$354,873	29	15	3	2	$26,313	8.0%	7%
Public	U of Texas Health Science Center - Houston	$146,424	80	49	$146,424	80	49	0	0			0%
Public	U of Texas Health Science Ctr - San Antonio	$106,177	105	69	$106,177	107	71	-2	-2			0%
Public	U of Texas MD Anderson Cancer Center	$196,753	65	39	$196,753	65	39	0	0			0%
Public	U of Texas Medical Branch - Galveston	$109,867	101	65	$109,867	105	69	-4	-4			0%
Public	U of Texas SW Medical Center - Dallas	$207,513	61	36	$207,513	61	36	0	0			0%
Public	U of Utah	$271,629	46	24	$273,150	45	24	1	0	$1,521	0.6%	1%
Public	U of Vermont	$87,843	117	80	$87,843	120	82	-3	-2	$0	0.0%	0%
Public	U of Virginia	$225,558	57	34	$240,254	56	33	1	1	$14,696	6.5%	6%
Public	U of Washington - Seattle	$876,941	2	1	$909,652	2	1	0	0	$32,711	3.7%	4%
Public	U of Wisconsin - Madison	$557,688	13	7	$580,661	12	6	1	1	$22,973	4.1%	4%
Public	U of Wyoming	$55,663	147	101	$57,441	147	101	0	0	$1,778	3.2%	3%
Public	Utah State U	$107,054	103	67	$108,501	106	70	-3	-3	$1,447	1.4%	1%
Private	Vanderbilt U	$430,445	22	11	$448,948	20	9	2	2	$18,503	4.3%	4%
Public	Virginia Commonwealth U	$124,836	88	55	$142,053	81	50	7	5	$17,217	13.8%	12%
Public	Virginia Polytechnic Institute and State U	$181,371	69	43	$184,175	69	43	0	0	$2,804	1.5%	2%
Private	Wake Forest U	$172,779	70	27	$172,779	71	27	-1	0	$0	0.0%	0%
Public	Washington State U - Pullman	$120,146	91	58	$129,255	87	55	4	3	$9,109	7.6%	7%
Private	Washington U in St. Louis	$432,434	21	10	$441,406	23	11	-2	-1	$8,972	2.1%	2%
Public	Wayne State U	$125,965	86	54	$126,915	89	57	-3	-3	$950	0.8%	1%
Private	Weill Cornell Medical College	$172,428	71	28	$172,428	72	28	-1	0			0%
Public	West Virginia U	$77,981	127	87	$82,149	128	88	-1	-1	$4,168	5.3%	5%
Private	Woods Hole Oceanographic Institution	$161,115	74	29	$161,115	75	30	-1	-1			0%
Private	Yale U	$517,072	15	7	$518,184	15	7	0	0	$1,112	0.2%	0%
Private	Yeshiva U	$201,397	64	26	$201,397	64	26	0	0	$0	0.0%	0%

Notes:

Since its inaugural report, the staff of the Measuring University Performance Center (MUP) have explored a wide range of topics related to university competition based on the data compiled for the annual Top American Research Universities report and the extensive data sets published on the MUP website [MUP.asu.edu]. Among the publications by the MUP Center staff relevant to the issues reviewed in this essay see the following, all available at [http://mup.asu.edu/publications.html]:

- The Best American Research Universities Rankings: Four Perspectives, 2013
- Measuring Research Performance: National and International Perspectives, 2012
- Moving Up: The Marketplace for Federal Research in America, 2011
- In Pursuit of Number One, 2010
- Research University Competition and Financial Challenges, 2009
- Competition and Restructuring the American Research University, 2008
- Rankings, Competition, and the Evolving American University, 2007
- Deconstructing University Rankings: Medicine and Engineering, and Single Campus Research Competitiveness, 2005
- Measuring and Improving Research Universities: TheCenter at Five Years, 2004
- University Organization, Governance, and Competitiveness, 2002
- Quality Engines: The Competitive Context for Research Universities, 2001
- The Myth of Number One: Indicators of Research University Performance, 2000

Particularly useful for understanding the structure of university funding and its relationship to tuition, research funding, and institutional budget requirements is the following item from members of the MUP staff: Elizabeth D. Capaldi and Craig W. Abbey. "Performance and Costs in Higher Education: A Proposal for Better Data," *Change* (March 2011).

The data for the tables, charts, and observations in this essay come from the following sources:

- NSF WebCASPAR database [https://ncsesdata.nsf.gov/webcaspar]
- NSF Higher Education Research and Development Survey (FY 2013) [http://ncsesdata.nsf.gov/datatables/herd/2013]
- NSF InfoBrief 15-314, February 4, 2015 [http://www.nsf.gov/statistics/2015/nsf15314]