The Center

Deconstructing University Rankings: Medicine and Engineering, and Single Campus Research Competitiveness, 2005

John V. Lombardi
Elizabeth D. Capaldi
Denise S. Mirka
Craig W. Abbey

December 2005
CORRECTED

An Annual Report from
The Lombardi Program on Measuring University Performance

Acknowledgments

The authors gratefully acknowledge the support of Mr. Lewis M. Schott, whose generous contribution established the Lombardi Program on Measuring University Performance.

Contents

Introduction

Background

The task of building and sustaining an American research university challenges every member of the institution's extended community. Progress in this permanent quest requires enthusiasm, commitment, talent, and resources as well as reliable comparative data. The task for universities is to improve – measured not only by what they did last year or the year before but also in comparison to what their counterparts and competitors have accomplished. Reference points for comparative success serve the utilitarian purpose of measuring progress.

The Top American Research Universities annual report charts the comparative performance of institutions, reflecting our conviction that research university success comes from effectively investing in and managing individual institutions. American universities exist in many different bureaucratic arrangements, and public universities in particular often form parts of complex statewide system structures. Nonetheless, the key decisions about faculty and students that produce successful research universities occur primarily at the campus level. For that reason, this publication focuses on the performance of individual campuses, rather than systems, and adjusts the data to reflect the performance of each campus within a system.

The Top American Research Universities also presents a categorization of research universities into groups based on their performance on nine measures, as described in the introduction to the tables. Institutions in the top group rank among the top 25 on all nine of the measures; in the second group they rank in the top 25 on eight measures; and so on. We similarly categorize universities that rank among the top 26 to 50 on at least one of the nine measures. This method does not produce a single ranked list; instead, it reflects our observation that the difference separating these top universities is not sufficiently great to justify creating a single, rank-ordered list.

The very best universities compete at top levels on most everything they do. Others compete well on some measures but not as well on others. *TheCenter*-defined groups identify clusters of institutions with roughly comparable performance on a variety of measures.

This sixth edition continues the practice – begun with the report's second edition – of highlighting the national competition among universities in *The Top American Research Universities* tables, although we also include the tables for the Top Private and Top Public institutions separately, as in the previous reports. This focus on national rankings recognizes that the competition for high-quality faculty and students is primarily a single endeavor in which both public and private universities participate, regardless of their control or ownership. A university's private or public ownership (or control) influences some institutional characteristics that bear on its competitiveness within the national context, rather than creating independent competitive contexts.

In addition to the rankings tables, this edition of *The Top American Research Universities* continues the practice begun in the 2001 report of presenting data for all major research universities, defined by *TheCenter* as those having more than $20 million in federal research expenditures. These tables include the nine indicators used to determine *The Top American Research Universities*, as well as a variety of institutional and trend data characteristics that may be of interest to many observers. The scope of these tables now includes non-federal research expenditures, total research expenditures by major discipline, and more trend data, and presents data on the top 200 institutions for each measure used in constructing the categories.

Each university, however, exists within a unique context and has different interests in these data. For this reason, *TheCenter* provides all of the data in this publication as well as additional tables of related information on its Web site [http://thecenter.ufl.edu] in two formats. This publication, in its entirety, appears as a PDF file, available for downloading and printing. All of the data tables presented in this report also appear on the Web site in Microsoft Excel format, suitable for downloading and further analysis. In addition, the Web-based tables include data and institutional characteristics for the approximately 600 universities and colleges with any federal research since 1990 (versus the more-than-$20-million group presented here). *TheCenter* Web site provides a variety of other information, as well.

Medical and Engineering Programs

In the essay portion of this 2005 edition of *The Top American Research Universities*, we build on the continuing effort to understand the impact of major components of research university activities on the key determinants of competitive research success.

We have looked at a wide range of characteristics including the impact of medical schools, the significance of undergraduate student enrollment, the impact of ownership (private or public), the organizational structure of public universities within their systems, the importance of disposable income in supporting research competition, and the role of intercollegiate athletics in research universities.

"The role of high performing medical schools and competitive engineering schools appears to give a critical advantage in the university competition for research funding."

In this year's report, we return to a topic of considerable continuing interest in the management of research university competition. Most observers of this competition see the role of high performing medical schools and competitive engineering schools as critical advantages in the competition for federal and other research funding. They worry that the comparisons between institutions with medical and engineering schools and those without distort their relative competitiveness. While the data are very clear that medical schools vary dramatically in their research productivity, we thought it useful to place the contribution of medical schools to their campus' research productivity into a clearer perspective. This edition includes a discussion of the impact of medical schools and engineering schools on research university competitiveness and provides a set of data that reorders the institutions with the medical school component removed. As is always our practice, we put the complete table used for this discussion on line in Excel format so our colleagues can download it and reorder or reanalyze it as appropriate for their needs.

TheCenter at Six Years

A unique research enterprise, *TheCenter* focuses on the competitive national context for major research universities. As mentioned above, *TheCenter*'s annual report, *The Top American Research Universities*, classifies universities into groups according to their standing on nine measures: total research expenditures, federal research expenditures, endowment assets, annual giving, National Academy members, faculty awards, PhDs awarded, postdoctoral appointees, and SAT/ACT scores. *The Top American Research Universities* not only provides data on various research universities, but also addresses a topic relevant to university performance as part of each year's publication. These studies, also published separately online, include:

- The Myth of Number One: Indicators of Research University Performance (2000)
- Quality Engines: The Competitive Context for Research Universities (2001)
- University Organization, Governance, and Competitiveness (2002)
- The Sports Imperative in America's Research Universities (2003)
- Measuring and Improving Research Universities: *TheCenter* at Five Years (2004)
- Deconstructing University Rankings: Medicine and Engineering and Single Campus Research Competitiveness (2005)

The Top American Research Universities provides a set of data universities find useful for many purposes in measuring their competitive performance. Many universities routinely request multiple copies of the report each year to give to donors, trustees, and legislatures. The report provides a context for monitoring progress from year to year, and serves as a benchmark for institutional comparisons. Universities also use our report as a means to complete strategic plans. Various other groups contact *TheCenter* for copies of the report or for permission to reproduce the parts of the report of interest to their institution. Agencies and consulting firms request copies when taking on higher education clients, and graduate students from across the country use *TheCenter* Web site and call seeking additional data for their research.

TheCenter also appears as a reference on various Web sites. These include the Association for American Universities (AAU; http://www.aau.edu) and the Association for American Universities Data Exchange (AAUDE; http://www.pb.illinois.edu/AAUDE/). Another site is the University of Illinois' education library's excellent site that references a wide range of college rankings publications (http://www.library.uiuc.edu/edx/rankgrad.htm). Many institutions use *TheCenter*'s faculty awards and honors list as a standardized source for these difficult-to-compile data.

Another feature of particular interest to institutions is the focus on campus-specific data within the tables of *The Top American Research Universities*. Many sources of university data report numbers for systems in some states and for individual campuses in others, making comparisons difficult. *TheCenter* allocates system data to individual campuses using the best information (usually from the campuses themselves) available. Indeed, it is this feature that prompted the Carnegie Foundation for the Advancement of Teaching to use *TheCenter's* methodology for allocating system data to campuses for its new classifications.

For R&D expenditures data, we used the allocation scheme developed by *TheCenter* at the University of Florida and used in their rankings of research universities (see http://thecenter.ufl.edu/DataNotesIntroText.html [accessed December 20, 2005]). The Carnegie Classification of Institutions of Higher Education (http://carnegieclassification-preview.org/pdf/preview-basic2005.pdf), accessed December 30, 2005.

The response includes an average of 6,300 hits within the four months immediately following its release each year. On average, *TheCenter* mails approximately 2,800 copies of the report each year, which includes foreign requests. Immediately following the release of the report, newspapers across the country call *TheCenter* to get more information regarding the results. National newspapers are often interested in the content of the new essay presented in the front section of the report each year.

In addition to the annual report and the separately published studies mentioned above, *TheCenter* also produces various other publications on issues important to research universities, such as national rankings and faculty data. Below is a comprehensive list of the publications produced by *TheCenter*.

- A series of columns (Reality Check), many on issues derived from *TheCenter's* work appears at Inside Higher Education, an online higher education publication. Available at [http://insidehighered.com/views/reality_check] some of the topics include:
  - Paying for the Research Juggernaut. (12/15/05)
  - Too Much Money? Sports and the Budget. (10/11/05)
  - We're All Getting Better. (10/17/05)
  - Rearranging the Deck Chairs. (7/15/05)
  - Equalizing Merit and Economic Opportunity. (5/19/05)
  - Accountability, Improvement and Money. (5/3/05)
  - Fuzzy Numbers [student/faculty ratio]. (4/15/05)
  - Luxury, Subsidy and Opportunity: Purchasing a Quality Education. (3/28/05)
  - Preserving the Audience: The NCAA and the APR. (3/14/05)
  - Who Gets In, What It Costs. (2/28/05)
  - Missing the Mark: Graduation Rates and University Performance. (2/14/05)
  - The Enemy Is Us: Cost Reduction in College Sports. (1/31/05)
- Using National Data in University Rankings and Comparisons (*TheCenter Reports*, June 2003) by Denise S. Gater [http://thecenter.ufl.edu/gaternatldata.pdf]
- A Review of Measures Used in U.S. News & World Report's America's Best Colleges" (*TheCenter*, An Occasional Paper from The Lombardi Program on Measuring University Performance, Summer 2002) by Denise S. Gater [http://thecenter.ufl.edu/gater0702.pdf]
- *TheCenter Top American Research Universities:* An Overview (TheCenter Reports, 2002) by Diane D. Craig [http://thecenter.ufl.edu/TARUChina.pdf]
- *The Top American Research Universities* (*TheCenter*, 2000, 2001, 2002, 2003, 2004, 2005) by John V. Lombardi, et al. [http://thecenter.ufl.edu/research2004.html]

- The Competition for Top Undergraduates by America's Colleges and Universities (*TheCenter* Reports, 2001) by Denise S. Gater [http://thecenter.ufl.edu/gaterUG1.pdf]
- The Use of IPEDS/AAUP Faculty Data in Institutional Peer Comparisons (*TheCenter* Reports, 2001) by Denise S. Gater and John V. Lombardi [http://thecenter.ufl.edu/gaterFaculty1.pdf]
- Toward Determining Societal Value Added Criteria for Research and Comprehensive Universities (*TheCenter* Reports, 2001) by Roger Kaufman [http://thecenter.ufl.edu/kaufman1.pdf]
- U. S. News & World Report's Methodology (*TheCenter* Reports, 2001, Revised) by Denise S. Gater [http://thecenter.ufl.edu/usnews.html]

In addition to publications, the staff of *TheCenter* has been asked to present talks on the research at various conferences, both nationally and internationally. The staff has made presentations at national conferences such as the National Education Writers' Association, Collegis Conference, National Council of University Research Administrators, Association of Institutional Research, Association of American Universities Data Exchange, Southern Association of College and University Business Officers, New England Association for Institutional Research, and American Strategic Management Institute. International presentations have also been made in China and Venezuela. In addition, *TheCenter* and its co-directors receive many visitors from various countries and institutions including Japan, US Naval Postgraduate School, Toyota Technical Center, and the Mitsubishi Research Institute.

The Advisory Board, The Staff, and Institutional Support

In developing this sixth edition of *The Top American Research Universities*, we continued to benefit greatly from many suggestions from our colleagues, but special thanks go to the members of our Advisory Board, listed on the inside back cover. Their observations, suggestions, and critiques help us immeasurably.

The work reflected in this publication draws on the exceptional support of Lynne Collis, who manages *TheCenter*'s administrative services. Without her expertise, dedication, and initiative, this publication would not have appeared. We appreciate the work of Craig Abbey at SUNY for his help with the study of medical and engineering programs.

This report draws on the work of Kristy Reeves as Research Director for the 2005 edition and the careful work of Craig Abbey, Research Director for this corrected edition. We have continued to rely on the expertise of Denise Mirka (University of Florida, Office of Institutional Research), and we are pleased to acknowledge Victor Yellen, Director of Institutional Research at Florida, for his constant support, encouragement, and expertise over the years.

Over the last several years, this publication, originally an effort of the University of Florida, has become a multi-university collaboration with support provided by the University of Florida; the University of Massachusetts Amherst; and SUNY, The State University of New York. This broad base of institutional support has made it possible for the co-directors to continue to sustain the *TheCenter*'s work and to insist on the principle that university data, derived from national sources and institutional cooperation, must be presented to the academic community in an open, comprehensive, and freely accessible format.

That mission has inspired *The Top American Research Universities* project since it came into being through a significant gift from Mr. Lewis M. Schott. His commitment to this project and its authors is a source of inspiration and encouragement second to none.

John V. Lombardi

Elizabeth D. Capaldi

Deconstructing University Rankings

Medicine and Engineering, and Single Campus Research Competitiveness

Finding Number One

Major research universities continually monitor their performance relative to other highly competitive institutions, seeking to understand their own position within the competition for the faculty, students, and resources that produce institutional quality and, by extension, prestige. We have participated in this effort at *TheCenter* for a number of years, producing tables on research university performance that rely on the best nationally available data. Many other organizations, mostly commercial, make various comparisons that attempt to rank institutional performance, but most of these efforts are highly controversial and often of dubious methodological reliability. The most suspect comparisons attempt to assign a single number that represents university quality in some way and then rank all institutions by this single number. Even though the errors in this process are many and an extensive literature exists critiquing the process, single-value rankings remain popular for many reasons.

The principal virtue of these spurious rankings is that they purport to declare a "winner" in the competition for institutional quality in a format familiar to followers of college sports teams or the magazine rankings of corporations, hospitals, restaurants, movies, towns, and every other facet of American life. The rankings of colleges and universities offer the possibility for an annual, end-of-the-competitive-season score that heralds the season's winner of the academic tournament. Although such notions become popular among various constituencies, the basic concept is foolish because university quality rarely changes dramatically from year to year, and the differences in the performance of similar institutions are not only too small to measure but essentially meaningless. As a result, institutions interested in understanding their relative position in the competition for quality look to other data such as the tables in *TheCenter's Top American Research Universities* (*TARU*) to provide them with a context for assessing their own performance over time.

Measuring Market Share

All efforts to categorize academic institutions have limits defined by the characteristics of the data used and the methodology that constructs the tables. Intelligent use of any comparative university data requires an understanding of the purposes of the tables, and a clear sense of the questions the methodology and the categories derived from it can reliably answer. *TheCenter's* data and methodology speak to a specific set of questions and provide answers within a specific context. Although we often make this point in various conversations, it bears repeating here. *TARU* does not attempt to measure something that might be called total university quality. It does not display the best undergraduate or graduate program. It does not find the highest-quality average faculty performance. These might well be useful outcomes, but the data currently available do not yield good answers to such questions, even though many commercial organizations attempt to provide answers using flawed data and unreliable methodology.

TARU asks a different set of questions. We have discussed this issue before, but the topic warrants continued attention. *TARU* is essentially a market share study. It begins with the observation that the pool of highly productive research talent is scarce relative to the number of higher education institutions competing for that talent. It continues with the observation that universities compete with each other to acquire as much of this talent as possible. *TARU* then looks at the national indicators that reflect institutional success in capturing shares of this scarce talent pool. As a result, in measuring federal research expenditures, for example, *TARU* reflects that portion of the total research dollars spent in any year attributable to the research work on each campus. This, in turn, is a reflection of the number of the campus' high-quality research people and their effectiveness in the competition for grants from the fixed pool of federal research support.

While the data to measure market share of research talent do not exist in any reliable form, various indicators do exist. Because universities acquire this talent in order to increase their research productivity, the measurement of an indicator of success in the competition for research funding and other scarce research products provides us with indicators of each institution's success in competing for talent. Choice of indicators is less the result of designing ideal markers of research productivity than it is a consequence of the national data collection that makes reasonably reliable information available about the nation's academic research productivity. For that reason *TARU* focuses on total and federal research expenditures, two categories of faculty awards and distinctions, private resources related to endowment and annual giving, numbers of doctorates and post-docs, and, for an indicator of the institutional competitiveness in attracting high-quality students, average SAT scores. These nine indicators reflect much of the competitive focus of major research universities. The data do not capture every element of high-quality academic research competition. For example, the data on research success in the humanities and social sciences are only marginally captured in the data on faculty distinctions, and limited information exists on the quality of professional schools such as law, business, or nursing.

"Top American Research Universities categorizes universities by how effectively they compete in all categories."

TARU also reflects another observation. Very good research universities often are very good in everything they do. Other institutions are nationally competitive in some things and not in others. As a result, *TARU* categorizes universities by how effectively they compete in all categories. In addition, because we think the real difference between similarly competitive institutions is quite small, we construct our categories broadly, taking institutions that fall into the top 25 in any category as being reasonably comparable in their competitiveness in acquiring market share of a particular resource in that category (research dollars, faculty awards, etc.). Even so, data have different uses in different contexts. While we have one perspective on these issues, others in the academic community may find other methods of arranging these data more useful in pursuing their institutional goals. *TARU* provides all the data used in the categorization as well as additional information about institutional characteristics to the academic community each year on *TheCenter*'s Web site [http://thecenter.ufl.edu]. This has two purposes. The first is to share the data with colleagues, and the second is to permit others to challenge, reconfigure, or replicate the work.

The Challenge of Comparability

Although this methodology and its data serve to distinguish the most competitive institutions and track the relative shares captured by institutions in this marketplace, *TARU* does not answer many other questions. For example, the success of any institution within this marketplace depends on a combination of many institutional characteristics. Some institutions have medical or engineering schools or colleges with significant emphasis on research fields of high significance to federal agencies with large amounts of available funding. Other institutions, with less emphasis on dollar-denominated science or with a relatively smaller commitment to fields of interest to federal research funding, for example, may end up with a smaller market share of federal expenditures, even though their faculty may be as distinguished and as productive as the science faculty of any institution.

Institutional size is relevant, as well, because all indicators speak to market share. The more faculty available to compete in the marketplace, all other things being equal, the higher the market share an institution can capture. University wealth is significant because the competition for talent requires money to hire highly talented individuals, to provide the research infrastructure, to support the institutional matching funds often required to compete for federal funding, to support the unrecovered costs of research activity, and to subsidize in many instances the time faculty spend on research rather than other revenue-generating activity such as teaching.

Previous editions of *TARU* have explored these topics as well as others, including the commitment of major research universities to high-cost and high-profile sports programs. These explorations have helped frame an understanding of the dynamics of institutional competition, and have contributed to an appreciation of the complexity of university research performance within a comparative context. If nothing else, the five previous editions of *TARU* have both confirmed the utility of the indicators provided and

highlighted the caution that must accompany broad comparative generalizations about institutional quality and competitiveness.

TARU includes a table (beginning with the 2003 edition) that displays the percent of federal research expenditures attributable to different disciplinary fields. These percentages offer an intriguing view into the wide differences in the distribution of research funding by discipline. These differences do not necessarily reflect a strategy related to research competition but rather may reflect institutional traditions, student profiles, state mission definitions, institutional scale, presence or absence of particular schools or colleges, and similar institutional characteristics that affect research competitiveness. Because research universities serve many constituencies, only one of which is concerned with research competitiveness, they rarely focus exclusively on research competition. The *TARU* and other studies that categorize institutions relative to their research performance speak only to that portion of the institution's mission associated with research.

The Magic of Medicine and Engineering

Among these compositional issues, it is common for university people to believe that the presence or absence of a medical school or an engineering college profoundly affects research competitiveness. This notion presumes that universities with medical schools have a significant competitive advantage because medical schools have a reputation for producing significant research funding. In an earlier *TARU* (2001) we looked at the question of whether having or not having a medical school distinguishes universities in terms of their research competitiveness. In that review, it became clear that the simple presence or absence of a medical school does not guarantee research success at high levels.

In this year's *TARU*, we look at the possibility of disaggregating the medical school component as well as the engineering component from the federal research expenditures reported in our data for those universities with more than $20 million in federal research expenditures. The data for this exercise proved somewhat difficult to acquire, given the various ways in which universities report information to different agencies for different purposes. As is frequently the case for university data, reports provided to one agency or for one purpose do not necessarily match information collected for another agency or purpose, even if the information appears to address the same universe. We have discussed elsewhere the extreme difficulty in identifying a number for faculty, even though common sense tells us it should be easy.

The Medicine and Engineering Data

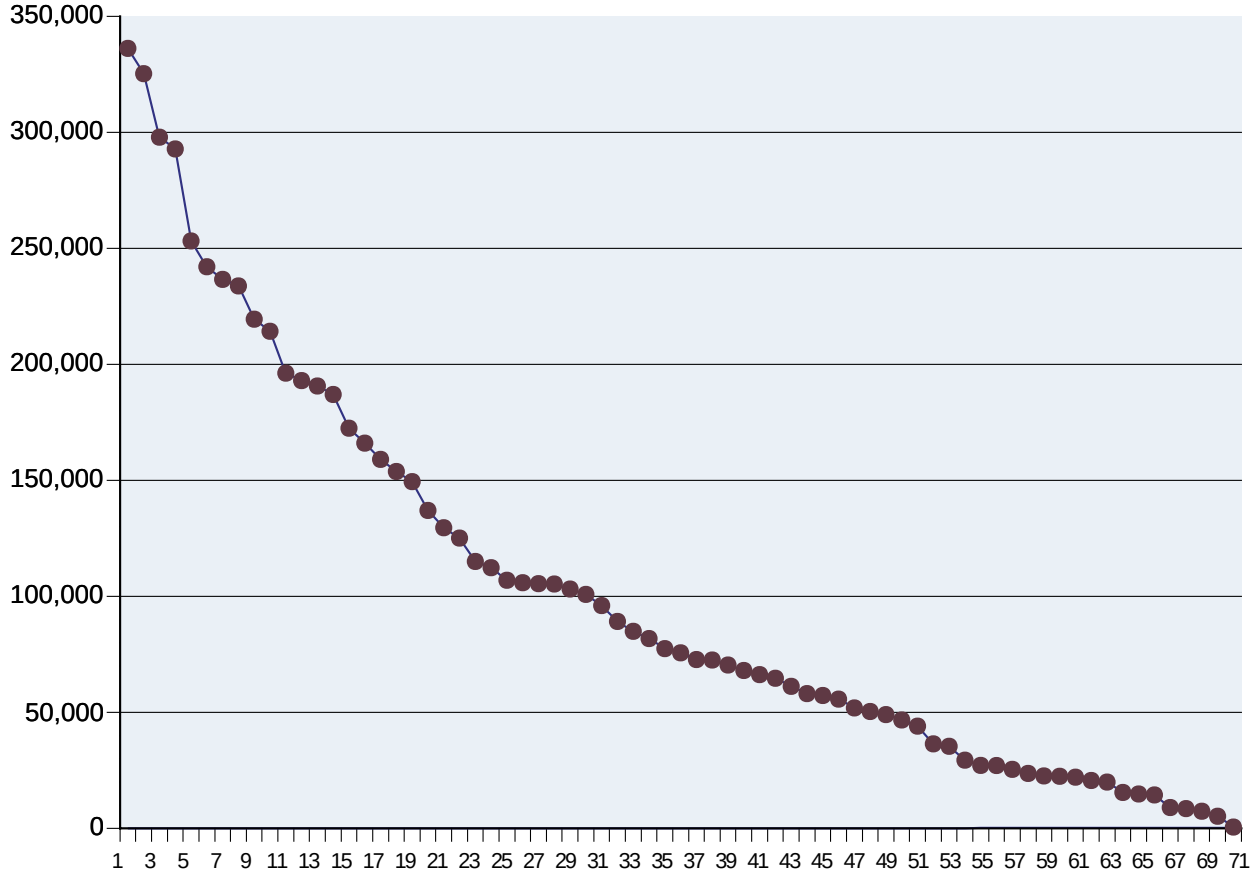
In the current analysis, we have three sets of data of interest. The primary set comes from the National Science Foundation (NSF) and captures all federal research expenditures. The second set comes from the Association of American Medical Colleges (AAMC) and identifies medical school research expenditures defined in the same fashion as the NSF data.† The third set comes from the American Society for Engineering Education‡ (ASEE) for engineering colleges, again using the same definitions as the NSF data, to capture engineering research expenditures. If we add up the engineering expenditures from ASEE and the medicine expenditures from AAMC for each institution, in some cases we have more expenditures than the institution reported to the NSF for all research fields. This usually means that the institution used slightly different definitions of what should be included in the various data reporting, which leads to some overlap. These inconsistencies in the data recommend caution in making too-fine distinctions among institutions because relatively small differences may well be data reporting artifacts and not reflections of actual differences in performance. For the broader issues related to understanding the general impact of

---

† The tables in the current study reflect the accreditation status of schools for the years reported. Florida State University (FSU) received initial accreditation for its medical school in 2005. However, the AAMC data provided to The Center showed FSU with $511,000 in 2003 which amounted to 0.6% of their NSF total. Florida State University's AAMC reported federal research expenditures were subtracted when we removed medical from the institutions with accredited medical schools. This had no effect on their ranking when removing medicine only. When removing both medicine and engineering, FSU ranked 35th but would have ranked 34th had the $511,000 not been removed. Rutgers which ranked 34th would then have ranked 35th.

‡ Not all institutions with federal engineering research expenditures reported data to American Society for Engineering Education (ASEE). For example, the California Institute of Technology does not report data to ASEE although it is a member institution. However, Cal Tech reported to NSF that 16.9 percent of their $219 million in federal research was in engineering. To take this into account, when an institution did not report to ASEE, their engineering dollars reported to NSF were used instead. For simplicity, the text and tables refer to institutions with and without ASEE Engineering Schools.

Figure 1. Federal Expenditures from AAMC Medical Schools (2003)



medical or engineering programs on campus research competitiveness, these data serve rather well.

This discussion takes a substantial subset of the institutions included in the *TARU* universe. As most readers of these reports know, *TARU* captures those single-campus institutions with federal research expenditures as reported by the NSF of at least $20 million per year. For this analysis using the 2003 data, 187 institutions meet this criterion and capture about 94% of all federal research expenditures reported to the NSF. Within this group, for this discussion, we excluded single-campus institutions composed of a medical center without substantial non-medical programs or degrees. For example, the subset does not include the University of California San Francisco or the University of Texas MD Anderson Cancer Center but does include the University of California Los Angeles.

The remaining 149 single-campus institutions include 71 with medical schools, 132 with engineering schools, and only 6 (Boston College, Brandeis, University of Montana–Missoula, New York University, Indiana University Bloomington, and the University at Albany) are without either engineering or medicine. In 2003 this subset of institutions represented about 81.5% of all federal academic research and development expenditures.

A close look at the data demonstrates that while most of the top research performers do indeed have medical schools, many of the institutions with much more modest research performance also have medical schools. Consequently, the data appear to indicate that while a research-oriented medical school may well be an advantage, many medical schools appear to contribute relatively little to the total research productivity of the institution. As Figure 1 demonstrates, the amount of research contributed by the 71 AAMC medical schools to their campuses included in this study varies widely from $336 million for The Johns Hopkins University to $0.511 million for Florida State University.

Even though this answers the question of whether the acquisition of a medical school signals a clear path to highly competitive research performance (it does not), we also need to look at the comparable data for engineering schools. As noted, most research universities – 132 out of 149 in these data – have an engineering school. The range of contribution to the federally funded research total has a high point at Johns Hopkins with $179 million to a low at the University of Oregon with $0.025 million. Although engineering schools do not provide the same amount of research funding as medical schools, they nonetheless provide a significant contribution. The more useful observation, however, is to note that almost 90% of all these institutions have an engineering school and, as a result, engineering is not as likely to be as much of a differentiator among institutions as are medical schools that exist on just under half of the campuses (47.7%).

Impact on Rankings

To understand the impact of medicine and engineering schools on ranking, we constructed a list of the 149 institutions and included columns for federal expenditures reported by the NSF, research expenditures attributable to their medical schools (if they have one as part of the campus), and research expenditures attributable to their engineering schools (again, if they have one as part of the campus).

We then produced four different rankings – one based on the NSF total, one based on the NSF total less the medical school amount, one based on the NSF total less the engineering amount, and one based on the NSF total less both engineering and medicine amounts. In this exercise we looked at how much of the rank based on NSF research expenditures, an indicator widely reported, is attributable to the contribution of medical and engineering schools. We then considered the change in rank that would result from ordering institutions by their NSF research expenditures without the medicine or engineering contribution.

It's no surprise to close observers of these data that the relative position of institutions after subtracting the medical school portion changes substantially. However, changes in rank vary significantly. While some highly performing institutions with medical schools do indeed drop in rank, not all drop by the same amount. Similarly in the reordering, not all institutions without medical schools improve dramatically in rank when compared to their counterparts minus the medical school contributions.

A simple demonstration of this effect appears in the following tables. The first table shows the institutions ranked in the top 20 in terms of their total research expenditures. This list is familiar to all observers of American research university competition and contains no surprises (see Table 1, page 12).

If, however, we take out the amount of research reported by the medical schools to the AAMC from the NSF total for those institutions with medical schools, eight institutions no longer occupy places among the top 20 by research expenditures. Note in Table 2 (page 12) that change in rank varies substantially with some institutions, falling by as much as 50 or more places in the case of Yale, Duke, and Washington University–St. Louis while others fall by much smaller amounts such as the University of Southern California at only 7 places.

Another group of 12 institutions remain in the top 20 regardless of whether the AAMC data contribute to the research expenditures or not (see Table 3, page 13). The appendix includes tables with the AAMC research totals for all the institutions with medical schools. Note that among the institutions that stay in the top 20, even with medical schools removed from the NSF totals, nine of them have medical schools, but their research volume from other parts of the campus remain high enough to sustain a top 20 competitive position. MIT, Penn State, and Illinois–Urbana-Champaign, institutions that do not have medical schools on the main campus or at all (in the case of MIT), nonetheless had enough research from other departments and disciplines on campus to sustain top 20 rankings within a context that includes as well as excludes medical school research productivity. This result appears to indicate substantial institutional commitment to support nationally competitive research activity across a broad range of disciplines in addition to medically related research.

"Many medical schools appear to contribute relatively little to the total research productivity of the institution."

A final group of eight universities rise into the top 20 ranked without AAMC data included in the NSF research expenditures. Again, for some of these

Table 1: Federal Research Expenditures Reported by the NSF (2003)		
Institutions Ranked by Federal Research Expenditures, (2003)	(000)	Ranking
Johns Hopkins University	1,106,971	1
University of Washington - Seattle	565,602	2
University of Michigan - Ann Arbor	516,818	3
Stanford University	483,540	4
University of California - Los Angeles	421,174	5
University of Pennsylvania	415,631	6
University of California - San Diego	400,100	7
University of Wisconsin - Madison	396,231	8
Columbia University	385,529	9
Washington University in St. Louis	357,364	10
Massachusetts Institute of Technology	356,206	11
Harvard University	348,620	12
University of Pittsburgh - Pittsburgh	345,625	13
Duke University	306,864	14
University of Southern California	300,195	15
Yale University	296,713	16
University of Minnesota - Twin Cities	293,266	17
University of North Carolina - Chapel Hill	280,678	18
Pennsylvania State University - University Park	270,985	19
University of Illinois - Urbana-Champaign	266,487	20

Table 2: Institutions Out of the Top 20 with AAMC Medical Expenditures Removed (2003)			
Institutions OUT OF TOP 20 without Medical School	NSF Total ($000)	NSF Rank	Change in Rank NSF less AAMC Exp.
University of California - Los Angeles	421,174	5	23
University of Pennsylvania	415,631	6	48
Washington University in St. Louis	357,364	10	65
University of Pittsburgh - Pittsburgh	345,625	13	30
Duke University	306,864	14	58
University of Southern California	300,195	15	22
Yale University	296,713	16	73
University of North Carolina - Chapel Hill	280,678	18	34

institutions the change in rank is significant, moving up at least 20 places in the case of the University of Colorado–Boulder and the University of Maryland–College Park (see Table 4, page 13). This may well indicate that on these campuses the medical school has less research volume relative to the other disciplines and programs that compete for funding from federal sources.

Before turning to a variety of ways to review these results, we should add the engineering component to this discussion. If we take the same group of 149 institutions and subtract out the engineering research as reported to the ASEE, we get a somewhat different effect. Note in Table 5 (see page 15) that of the top 20 institutions using total NSF expenditures, four rise into the top 20 and four fall out of the top 20 without the ASEE engineering data included.

Some Observations on Institutional Profiles

The focus on campuses excluding medicine reflects an academic commitment to the notion of the well-rounded university – the campus that cultivates the liberal arts and sciences as the core activity of a mainstream university. While not denying in any way the benefits from high degrees of specialization that

Table 3: Institutions Stay in Top 20 with AAMC Medical Expenditures Removed (2003)			
Institutions STAY IN TOP 20 without Med School	NSF Total ($000)	NSF Rank	Change in Rank NSF less AAMC Exp.
Johns Hopkins University	1,106,971	1	1
University of Washington - Seattle	565,602	2	6
University of Michigan - Ann Arbor	516,818	3	3
Stanford University	483,540	4	8
University of California - San Diego	400,100	7	12
University of Wisconsin - Madison	396,231	8	4
Columbia University	385,529	9	19
Massachusetts Institute of Technology *	356,206	11	2
Harvard University	348,620	12	15
University of Minnesota - Twin Cities	293,266	17	18
Pennsylvania State University - University Park *	270,985	19	5
University of Illinois - Urbana-Champaign *	266,487	20	7

* Campuses without an AAMC medical school.

Table 4: Institutions Entering the Top 20 with AAMC Medical Expenditures Removed (2003)			
Institutions ENTERING THE TOP 20 without Med School	NSF Total ($000)	NSF Rank	Change in Rank NSF less AAMC Exp.
University of Arizona	259,074	21	16
University of California - Berkeley *	238,206	23	9
University of Texas - Austin *	231,996	24	0
California Institute of Technology *	219,097	27	11
Cornell University	212,991	28	13
Georgia Institute of Technology *	203,582	33	14
University of Colorado - Boulder *	192,750	39	17
University of Maryland - College Park *	183,206	41	20

* Campuses without an AAMC medical school.

occur in many medical centers, an institution with substantial amounts of its work focused on medical center activities may have less of an engagement with undergraduate education, less involvement in Master's and Ph.D. education, and less engagement with other fields such as business or education. Of course, different institutions and their constituencies can value these concentrations differently depending on history and mission. But for those who seek an understanding of the core, non-medical-center activities of today's research universities, this conversation holds considerable interest.

Many possible explanations fit these data. The simplest is that research-oriented medical schools, with their strong commitment to basic and clinical research, generally must have effective systems for generating surplus revenue from patient charges, reimbursements, endowments, hospital subsidies, and other sources to support the highly competitive research enterprises required to successfully compete for federal research dollars. Compounding these advantages, the federal research establishment has seen large increases in the pool of funds available for a wide range of life sciences and clinically related research, further enhancing the opportunities for medical school research enterprises. Indeed, within the group of 149 campuses included here, the AAMC medical expenditures come to just under 36% of the NSF-reported federal research expenditures. Clearly, the distribution of fed-

eral dollars related to medical research substantially affects the overall research ranking of these institutions. In our previous work, we found a strong relationship between an indicator of the discretionary revenue an institution can generate (over and above what it costs to provide baseline instruction to undergraduates) and research success. When a medical enterprise has a substantial research focus, most likely the mechanisms for generating surplus revenue from various medical and hospital activities provide the essential subsidies required for successful research competition. Institutions with no medical enterprise on campus or those whose medical school does not generate substantial surpluses for investment in research show less success in their overall total NSF research funding.

"When medicine and engineering disappear from the totals of the highly competitive institutions, previously less-competitive institutions improve their score."

Medical schools, by virtue of their revenue model, have the opportunity to structure their business affairs to subsidize the basic sciences that compete for NIH and other life sciences funding and, in addition, subsidize clinical research conducted by the clinical faculty. Where medical schools have strong relationships with prosperous teaching hospitals, those hospitals often subsidize research costs because the hospital's competitiveness as a tertiary care medical facility depends in considerable measure on its affiliated medical school's reputation for research achievement.

This scenario, though familiar to those who work closely with complex university medical establishments, leaves considerable room for additional explanation. In some institutions with strong research medical schools, life sciences research, by design, may become concentrated in the medical school, and life sciences research in traditional arts and sciences departments may receive significantly less institutional support. An institution with this model, we could hypothesize, might well show a dramatic change in its research ranking with the medical school removed. Another institution, which encourages and supports life sciences research both in the medical school and in the traditional arts and sciences departments or perhaps in the life sciences related units of a significant land grant college, may see its rank fall some with the medical school removed but perhaps not by as much.

Similarly, if an institution does not have a medical school, it will by necessity concentrate its support of life sciences research in the arts and sciences departments, in land grant units, and in many cases in life sciences related engineering programs. Such institutions would rank lower in competition with campuses that include research-oriented medical schools because they would not enjoy the strong subsidies available to medical colleges. But with the medical school component removed from their competitors' totals, these institutions would rise in the rankings.

While these hypotheses surely have explanatory merit, experience with these data tells us that large-scale generalizations may well prove fragile. Institutions have widely varying financial and organizational models, different missions, varied ownership characteristics between public and private boards, complex arrangements between campuses and their affiliated medical enterprises, and different opportunities for subsidies from state public funds or corporate collaborations. These characteristics influence the success of an institution in achieving large market shares of federal research dollars.

Even so, it is probably reasonable to observe that institutions with a broad and comprehensive focus on research competitiveness, a clear sense of pursuing those parts of the research marketplace with the fastest growth rates, and a financial model that supports investment in research projects, facilities, support systems, and the like, will succeed with or without a medical school.

In addition, it is also reasonably clear that medical schools as an academic specialization do not necessarily provide the financial and institutional support required for successful research competition. When they do, they can be a major research asset. But not all of them provide significant contributions to the research productivity of individual campuses.

Another way of illustrating the variety of changes in rank among research campuses that occur with medicine and engineering research contributions removed appears in Figure 2 (see page 17). The trend line displays the rank order by total NSF research expenditures of all 149 research campuses included in this discussion. For each university campus the graph plots two additional points on a drop line to the full

Table 5: Institutions In and Out of the Top 20 with ASEE Engineering Expenditures Removed (2003)				
Institution	NSF Total ($000)	NSF Rank	Change in Rank NSF less ASEE Exp.	In / Out Top 20
Johns Hopkins University	1,106,971	1	1	
University of Washington - Seattle	565,602	2	2	
University of Michigan - Ann Arbor	516,818	3	3	
Stanford University	483,540	4	4	
University of California - Los Angeles	421,174	5	6	
University of Pennsylvania	415,631	6	5	
University of California - San Diego	400,100	7	9	
University of Wisconsin - Madison	396,231	8	10	
Columbia University	385,529	9	7	
Washington University in St. Louis	357,364	10	8	
Massachusetts Institute of Technology	356,206	11	24	Out
Harvard University	348,620	12	11	
University of Pittsburgh - Pittsburgh	345,625	13	12	
Duke University	306,864	14	15	
University of Southern California	300,195	15	23	Out
Yale University	296,713	16	13	
University of Minnesota - Twin Cities	293,266	17	16	
University of North Carolina - Chapel Hill *	280,678	18	14	
Pennsylvania State University - University Park	270,985	19	22	Out
University of Illinois - Urbana-Champaign	266,487	20	60	Out
University of Arizona	259,074	21	17	In
University of Alabama - Birmingham	245,217	22	18	In
Emory University *	228,255	25	19	In
Vanderbilt University	221,979	26	20	In

* Campuses without ASEE engineering school.

NSF rank: the rank with medicine removed and the rank with engineering removed. Simple inspection of this display suggests some observations that are familiar to those who have followed our conversation on the subject of university rankings over the years.

As Figure 2 illustrates, at the high end of the total NSF research rankings, removing the medicine and engineering contributions to research expenditures drops the ranking considerably, reflecting the importance of medicine, in particular, in driving the research performance of these top institutions. Institutions in the lower half of the distribution by total NSF expenditures tend to improve their position with medicine and engineering removed. This reflects the relatively smaller part of these institutions' total NSF dollars contributed by medicine and engineering. When medicine and engineering disappear from the totals of the highly competitive institutions, previously less-competitive institutions improve their score.

While the rankings analysis helps us understand the components that influence rankings, and urge caution in placing too much confidence in the meaning of relatively small changes in relative rank, the percentage of an institution's total research that comes from the medical school as reported in AAMC data offers another perspective on the dramatic variation in the importance of a medical school to individual campuses.

Of the 149 campuses in our data set, 71 have medical schools, and the medical school contribution to the campus total research expenditure of those 71 institutions ranges from a high of 100% to a low under 1%. Figure 3 (see page 18) illustrates the relationship between medicine's percentage of an institution's total federal research expenditures and the change in rank that occurs when we remove those medicine expenditures from the total. Not surprisingly, when medical research is a large percentage of a campus' research enterprise, it loses position relative to those universities without medical schools or whose medical schools do not produce much federal research.

In the case of engineering, as Figure 4 (see page 18) illustrates, the pattern is similar to the one for medicine but not as pronounced. Almost all of the institutions included here have an engineering school, and engineering expenditures represent only just over 17% of all federal research expenditures on average. The majority of institutions appear to cluster at the lower end of this distribution.

Deconstructing the Research University and the Search for Number One

This demonstration highlights a number of characteristics of university research competition. The most obvious is that highly competitive research-oriented medical schools contribute substantially to the success of many American research campuses. At the same time, simple formulations about the impact of medical institutions on academic research campuses likely will not help. Instead, we need a careful examination of the characteristics of the individual campuses before knowing how a medical enterprise – or the absence of a medical enterprise – affects the institution's competitiveness in gaining a significant market share of federal research. Some institutions – notably MIT – have been exceptionally effective at pursuing federal funding. Others, whose medical schools do not pursue research effectively, may experience no significant research benefit.

We also need to recognize that specific conclusions about the performance of research universities within the context of medical research create a struggle with a variety of data artifacts and anomalies in the reporting of information to the NSF and AAMC. Equally significant, some universities share the faculty engagement with the research enterprise with hospitals and other research institutions, and the success of these faculty appears in the totals reported for the non-university medical institution. Other campuses may operate the clinical research establishment of an affiliated hospital through the university's research system, adding the hospital-based research to the academic campus totals.

All of these circumstances challenge those who would make clear and unambiguous statements about the nature, effectiveness, quality, and quantity of the research performance of similar campuses. When the differences among campuses appear large, we may be on firmer ground in drawing some conclusions. But when the differences appear relatively small, and change from year to year, we should exercise great caution in presuming to know the difference between number 10 and number 15 in some ranking.

Although we have worked with the classification of research universities for some time, our recognition of the challenges remains as strong as ever. We know that, used carefully and effectively, the six years of data and discussion of *TARU* can help campuses better understand their competitive contexts and improve their performance. At the same time, we remain convinced that the search for the "Single Best American Research University" is mostly a waste of time and effort.

Figure 2. Change in Ranking by Original NSF Ranking, with AAMC data removed and with ASEE data removed (2003)

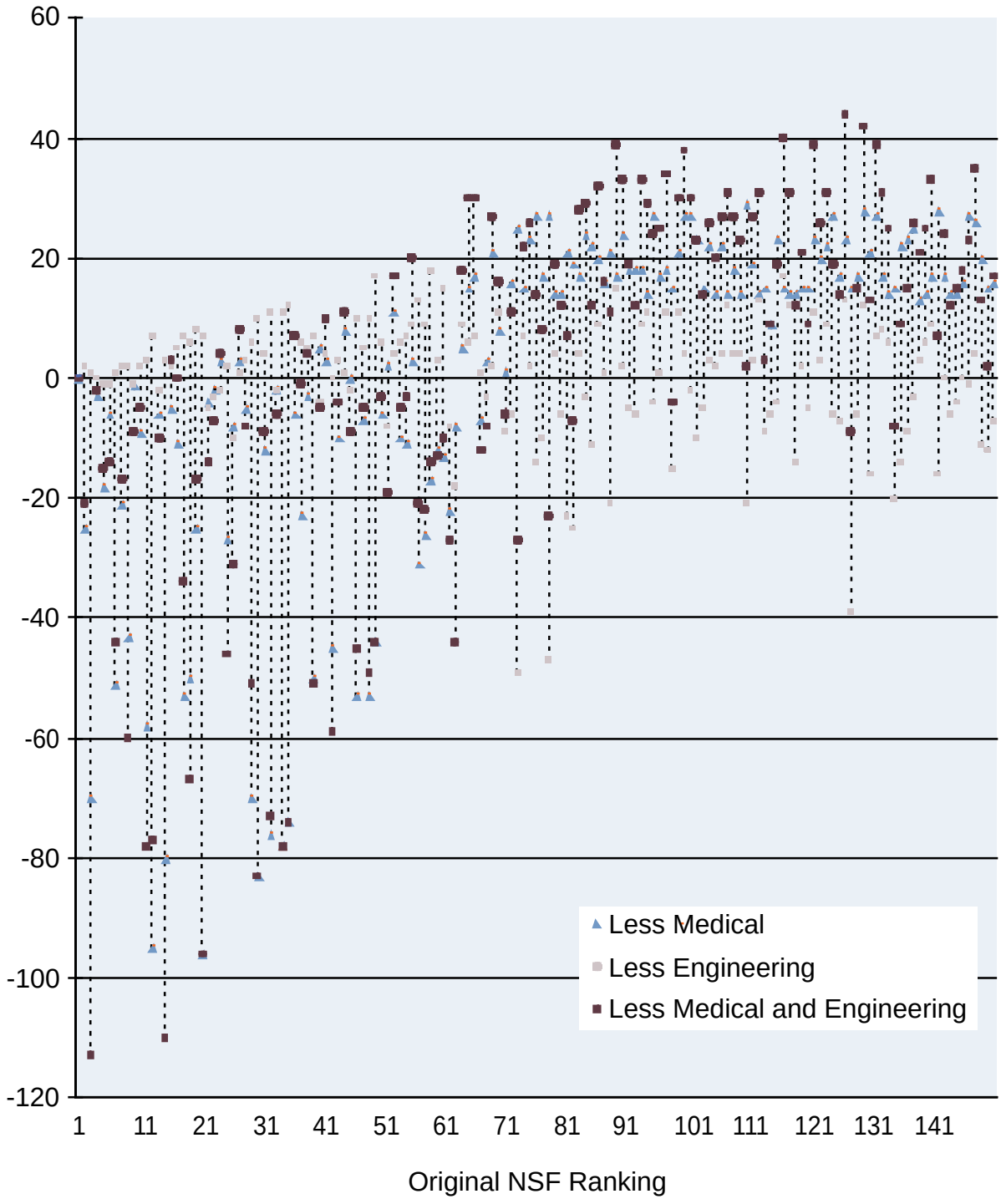


Figure 3. Change in Ranking with Medicine Removed by AAMC Medicine as a percentage of NSF Research Expenditures (2003)

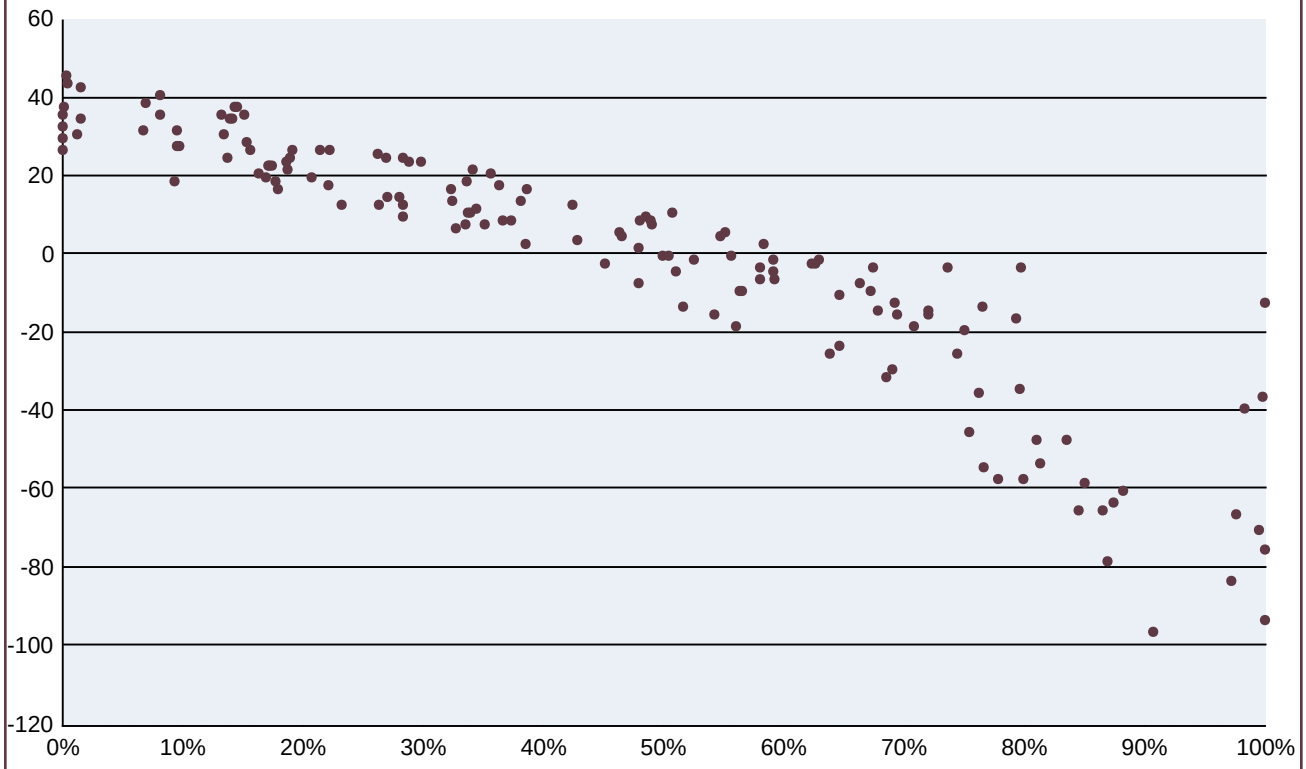
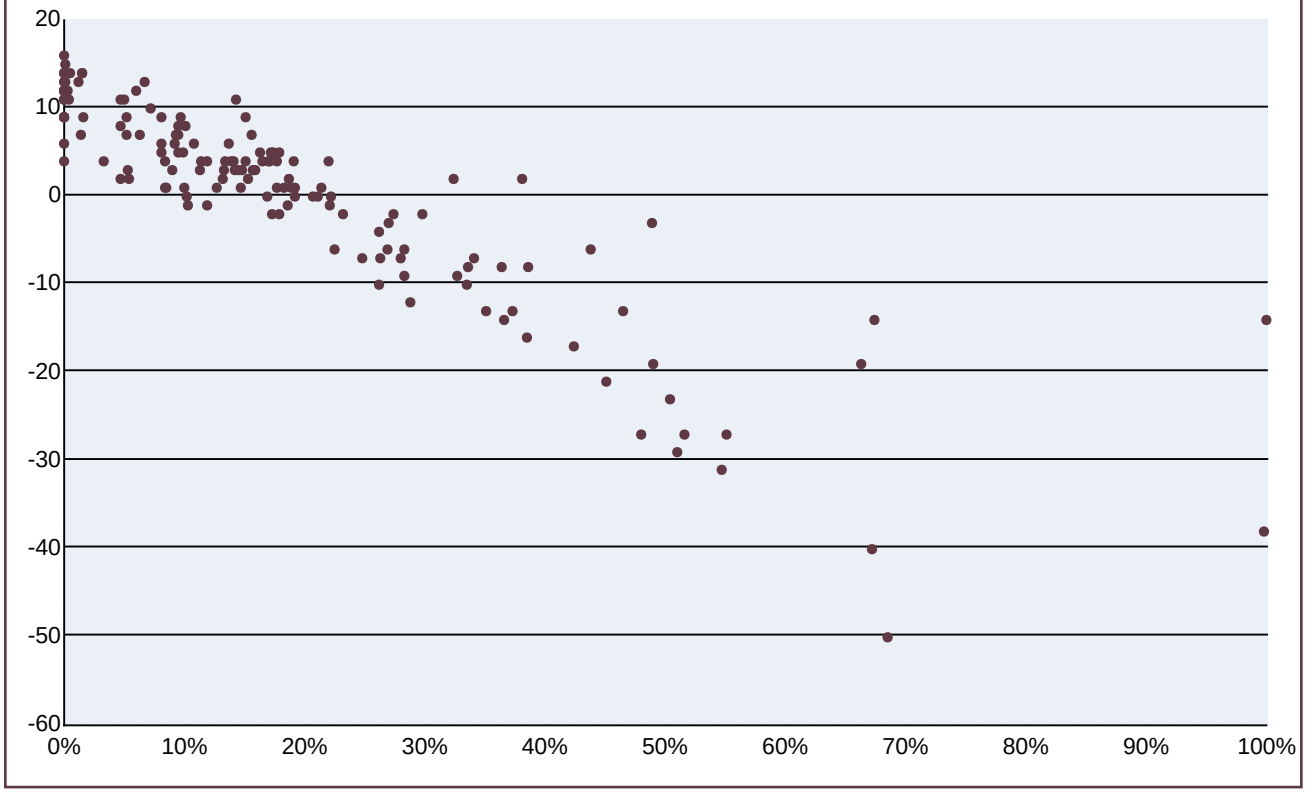


Figure 4. Change in Ranking with Engineering Removed by ASEE Engineering as a percentage of NSF Research Expenditures (2003)



Appendix

Appendix

149 Institutions Federal Research Expenditures with Medical and Engineering Expenditures Included and Excluded (2003)	Federal Research Dollars	National Rank	Rank Less AAMC
Johns Hopkins University	1,106,971	1	1
Massachusetts Institute of Technology	356,206	11	2
University of Michigan - Ann Arbor	516,818	3	3
University of Wisconsin - Madison	396,231	8	4
Pennsylvania State University - University Park	270,985	19	5
University of Washington - Seattle	565,602	2	6
University of Illinois - Urbana-Champaign	266,487	20	7
Stanford University	483,540	4	8
University of California - Berkeley	238,206	23	9
University of Texas - Austin	231,996	24	10
California Institute of Technology	219,097	27	11
University of California - San Diego	400,100	7	12
Cornell University	212,991	28	13
Georgia Institute of Technology	203,582	33	14
Harvard University	348,620	12	15
University of Arizona	259,074	21	16
University of Colorado - Boulder	192,750	39	17
University of Minnesota - Twin Cities	293,266	17	18
Columbia University	385,529	9	19
University of Maryland - College Park	183,206	41	20
Texas A&M University	177,119	42	21
University of Southern California	300,195	15	22
University of California - Los Angeles	421,174	5	23
New York University	166,033	45	24
University of California - Davis	208,327	29	25
Carnegie Mellon University	157,583	46	26
Ohio State University - Columbus	198,488	36	27
Purdue University - West Lafayette	129,199	53	28
University of Florida	194,958	38	29
University of Pittsburgh - Pittsburgh	345,625	13	30
Michigan State University	133,820	50	31
University of Hawaii - Manoa	143,580	48	32
Colorado State University	117,151	57	33
University of North Carolina - Chapel Hill	280,678	18	34
Princeton University	104,011	63	35
University of Rochester	208,148	30	36
Oregon State University	100,499	65	37
University of Tennessee - Knoxville	100,486	66	38
Virginia Polytechnic Institute and State University	98,143	67	39
Boston University	203,947	32	40
North Carolina State University	96,157	68	41
University of Cincinnati - Cincinnati	185,261	40	42
Utah State University	95,494	69	43
Northwestern University	200,316	35	44
Rutgers the SUNJ - New Brunswick	94,393	70	45
University of Georgia	93,884	71	46
University of Illinois - Chicago	168,063	44	47
University of Pennsylvania	415,631	6	48
University of California - Santa Barbara	88,422	73	49
Florida State University	87,985	74	50

Rank Less ASEE	Rank Less AAMC and ASEE	Has AAMC Medical School	Has ASEE Engineering School	AAMC Federal Research	ASEE Federal Research
1	1	Yes	Yes	336,144	38,458
24	6	No	Yes	-	165,677
3	5	Yes	Yes	214,214	109,136
10	2	Yes	Yes	115,001	68,615
22	4	No	Yes	-	73,169
2	3	Yes	Yes	297,872	57,692
60	29	No	Yes	-	179,033
4	16	Yes	Yes	242,025	92,659
30	8	No	Yes	-	66,762
31	11	No	Yes	-	61,079
27	7	No	Yes	-	37,024
9	17	Yes	Yes	186,975	71,565
42	19	Yes	Yes	-	77,859
52	25	No	Yes	-	99,660
11	13	Yes	Yes	153,774	29,224
17	10	Yes	Yes	66,221	21,642
38	14	No	Yes	-	36,482
16	15	Yes	Yes	103,105	37,276
7	9	Yes	Yes	196,165	18,098
49	24	No	Yes	-	70,671
69	36	No	Yes	-	97,574
23	49	Yes	Yes	129,529	109,405
6	20	Yes	Yes	253,136	50,211
33	12	No	No	-	-
26	18	Yes	Yes	46,669	23,534
77	41	No	Yes	-	86,134
35	26	Yes	Yes	61,166	35,051
80	44	No	Yes	-	61,951
40	40	Yes	Yes	68,002	53,430
12	27	Yes	Yes	219,422	29,437
47	23	Yes	Yes	8,931	11,982
41	21	Yes	Yes	19,902	7,483
63	32	No	Yes	-	31,482
14	22	Yes	No	165,996	-
75	39	No	Yes	-	29,999
37	65	Yes	Yes	106,895	51,660
61	30	No	Yes	-	13,939
62	31	No	Yes	-	14,166
84	54	No	Yes	-	41,584
29	46	Yes	Yes	105,836	32,496
78	42	No	Yes	-	25,151
32	37	Yes	Yes	89,140	18,795
119	100	No	Yes	-	65,374
34	53	Yes	Yes	105,278	36,610
68	34	No	Yes	-	12,440
57	28	No	Yes	-	1,428
36	33	Yes	Yes	77,425	7,841
5	66	Yes	Yes	325,256	41,426
102	77	No	Yes	-	45,052
67	35	No	Yes	511	5,562

Appendix

149 Institutions Federal Research Expenditures with Medical and Engineering Expenditures Included and Excluded (2003) *(continued)*	Federal Research Dollars	National Rank	Rank Less AAMC
Iowa State University	82,297	78	51
Mississippi State University	79,837	82	52
University of Utah	152,112	47	53
University at Buffalo	129,794	52	54
University of South Florida	106,102	61	55
University at Albany	76,038	84	56
New Mexico State University - Las Cruces	75,368	85	57
Duke University	306,864	14	58
University of Alaska - Fairbanks	72,607	86	59
University of Iowa	197,260	37	60
Arizona State University - Tempe	71,741	87	61
University of Delaware	69,493	89	62
University of Missouri - Columbia	84,211	76	63
University of Kentucky	120,003	56	64
Washington University in St. Louis	357,364	10	65
Washington State University - Pullman	63,800	91	66
Clemson University	62,552	93	67
University of New Mexico - Albuquerque	106,541	60	68
Indiana University - Bloomington	61,450	94	69
University of California - Irvine	133,873	49	70
University of Virginia	173,442	43	71
University of Massachusetts - Amherst	60,839	95	72
Yale University	296,713	16	73
University of Nebraska - Lincoln	60,005	97	74
Tulane University	82,118	79	75
University of New Hampshire - Durham	59,463	98	76
University of South Carolina - Columbia	63,044	92	77
Stony Brook University	112,452	58	78
University of Miami	130,863	51	79
University of Alabama - Birmingham	245,217	22	80
University of Connecticut - Storrs	53,593	99	81
Kansas State University	53,313	100	82
Montana State University - Bozeman	53,283	101	83
University of Kansas - Lawrence	53,072	102	84
University of Rhode Island	51,942	103	85
University of Chicago	201,129	34	86
Vanderbilt University	221,979	26	87
Louisiana State University - Baton Rouge	48,656	107	88
University of Central Florida	47,749	109	89
University of Dayton	47,327	110	90
Case Western Reserve University	205,452	31	91
West Virginia University	60,586	96	92
Auburn University	45,374	111	93
George Washington University	68,959	90	94
Brown University	81,445	80	95
Rice University	43,706	112	96
Tufts University	78,942	83	97
University of Idaho	42,861	113	98
Dartmouth College	106,034	62	99
University of Notre Dame	41,220	114	100

Rank Less ASEE	Rank Less AAMC and ASEE	Has AAMC Medical School	Has ASEE Engineering School	AAMC Federal Research	ASEE Federal Research
85	56	No	Yes	-	28,047
105	82	No	Yes	-	40,199
43	48	Yes	Yes	72,513	17,364
51	55	Yes	Yes	50,326	24,967
55	43	Yes	Yes	27,089	11,441
72	38	No	No	-	257
82	47	No	Yes	-	10,924
15	79	Yes	Yes	233,755	31,698
81	45	No	Yes	-	5,914
25	52	Yes	Yes	125,073	11,797
89	63	No	Yes	-	21,358
97	70	No	Yes	-	23,379
71	51	Yes	Yes	15,430	8,364
53	62	Yes	Yes	51,858	17,712
8	73	Yes	Yes	292,799	19,475
90	64	No	Yes	-	13,666
106	84	No	Yes	-	23,348
66	85	Yes	Yes	44,010	23,934
83	50	No	Yes	-	249
48	78	Yes	Yes	72,718	19,709
39	96	Yes	Yes	112,307	28,646
95	68	No	Yes	-	13,532
13	74	Yes	Yes	236,578	15,581
88	61	No	Yes	-	9,074
73	58	Yes	Yes	22,552	6,658
87	60	No	Yes	-	8,517
96	80	Yes	Yes	5,173	16,523
54	81	Yes	Yes	55,659	16,962
44	57	Yes	Yes	75,611	1,806
18	69	Yes	Yes	190,624	8,008
112	91	No	Yes	-	18,806
101	76	No	Yes	-	9,906
99	72	No	Yes	-	8,177
98	71	No	Yes	-	7,095
94	67	No	Yes	-	4,201
21	59	Yes	Yes	149,405	217
20	104	Yes	Yes	172,433	20,487
100	75	No	Yes	-	4,635
130	111	No	Yes	-	21,513
148	146	No	Yes	-	47,256
28	127	Yes	Yes	158,996	27,414
92	92	Yes	Yes	14,357	11,547
127	108	No	Yes	-	17,466
86	99	Yes	Yes	23,627	15,178
76	89	Yes	Yes	36,374	9,654
139	125	No	Yes	-	22,542
74	83	Yes	Yes	35,324	4,098
113	93	No	Yes	-	8,883
59	116	Yes	Yes	64,652	16,600
120	101	No	Yes	-	11,657

Appendix

149 Institutions Federal Research Expenditures with Medical and Engineering Expenditures Included and Excluded (2003) *(continued)*	Federal Research Dollars	National Rank	Rank Less AAMC
Florida International University	40,860	115	101
University of Mississippi - Oxford	40,577	116	102
University of California - Riverside	40,409	117	103
George Mason University	38,510	119	104
University of California - Santa Cruz	38,213	120	105
North Dakota State University	37,940	121	106
Oklahoma State University - Stillwater	37,748	122	107
University of Oklahoma - Norman	36,153	124	108
University of Oregon	36,127	126	109
University of Alabama - Huntsville	35,558	127	110
Emory University	228,255	25	111
Syracuse University	34,559	128	112
University of Maryland - Baltimore County	34,164	129	113
Brandeis University	33,722	130	114
University of Nevada - Reno	47,756	108	115
Wayne State University	102,963	64	116
University of Houston - University Park	32,556	131	117
University of Nevada - Las Vegas	32,511	132	118
Rensselaer Polytechnic Institute	32,295	133	119
University of Southern Mississippi	31,653	134	120
New Jersey Institute of Technology	30,535	135	121
University of Maine - Orono	28,901	136	122
Drexel University	49,271	106	123
San Diego State University	28,084	139	124
University of Montana - Missoula	27,220	140	125
University of Arkansas - Fayetteville	27,071	141	126
Northeastern University	26,895	142	127
University of Alabama - Tuscaloosa	26,241	143	128
Temple University	51,309	104	129
Jackson State University	25,607	144	130
University of Maryland - Baltimore	126,156	55	131
Virginia Commonwealth University	81,201	81	132
University of Wyoming	23,186	145	133
Texas Tech University	23,165	146	134
Boston College	22,907	147	135
University of North Dakota	28,336	137	136
Florida A&M University	18,273	149	137
Loma Linda University	22,675	148	138
Howard University	36,137	125	139
University of Louisville	39,924	118	140
University of Vermont	70,832	88	141
Saint Louis University - St. Louis	36,989	123	142
Loyola University Chicago	28,107	138	143
Wake Forest University	108,467	59	144
Georgetown University	83,745	77	145
Rush University	49,834	105	146
Thomas Jefferson University	85,348	75	147
Yeshiva University	128,894	54	148
Indiana University-Purdue University - Indianapolis	92,175	72	148

Rank Less ASEE	Rank Less AAMC and ASEE	Has AAMC Medical School	Has ASEE Engineering School	AAMC Federal Research	ASEE Federal Research
110	87	No	Yes	-	3,898
117	98	No	Yes	-	8,963
115	95	No	Yes	-	7,574
128	109	No	Yes	-	10,916
116	97	No	Yes	-	6,525
107	86	No	Yes	-	585
132	114	No	Yes	-	12,637
133	117	No	Yes	-	11,836
111	88	No	Yes	-	25
146	134	No	Yes	-	23,566
19	90	Yes	No	192,956	-
123	105	No	Yes	-	5,997
124	106	No	Yes	-	5,891
114	94	No	No	-	-
104	115	Yes	Yes	14,764	8,095
56	121	Yes	Yes	70,356	9,758
122	103	No	Yes	-	3,165
126	107	No	Yes	-	4,451
147	136	No	Yes	-	21,757
121	102	No	Yes	-	2,121
149	147	No	Yes	-	32,209
138	123	No	Yes	-	6,711
103	124	Yes	Yes	20,593	6,999
134	118	No	Yes	-	4,581
129	110	No	No	-	-
137	122	No	Yes	-	4,804
145	133	No	Yes	-	13,139
141	129	No	Yes	-	8,509
93	119	Yes	Yes	25,384	2,436
131	113	No	Yes	-	319
46	112	Yes	No	100,797	-
70	126	Yes	Yes	57,223	4,038
140	128	No	Yes	-	4,145
144	132	No	Yes	-	8,837
135	120	No	No	-	-
143	140	Yes	Yes	8,469	12,399
142	130	No	Yes	-	1,702
136	131	Yes	No	7,334	-
118	138	Yes	Yes	22,015	5,632
108	137	Yes	Yes	27,040	2,885
79	135	Yes	Yes	58,040	1,127
109	139	Yes	No	29,350	-
125	141	Yes	No	22,399	-
50	142	Yes	No	105,429	-
65	143	Yes	No	81,765	-
91	144	Yes	No	48,989	-
64	145	Yes	No	84,883	-
45	147	Yes	No	136,989	-
58	147	Yes	Yes	95,986	499