The Center

The Myth of Number One: Indicators of Research University Performance

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The Top American Research Universities
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Contents

The Top American Research Universities

The Myth of Number One

Americans love the eternal pursuit of the mythical number one. *First Place*, *Número Uno, Best of Class*... . We have many ways to express our enthusiasm for placing things in ordered lists: The best wine, the best dressed executive, the best cities, the best cars, and the best movies. This pursuit of the best carries with it a significant commitment to defining and measuring the quality that underlies the ranking and a recognition that competition tends to drive individuals and organizations towards higher performance. Yet, with all of our enthusiasm for identifying number one, there is a remarkable amount of controversy over exactly what we can measure that will define the best. We often qualify our understanding of the "best" and talk about the best minor league team, the best small cities, the best of show, or the personal best.

The Rankings Game

We who live in America's research universities also worry about which one is the best. When the various surveys and rankings appear from time to time, we eagerly consume them in search of the best colleges, the best American universities, the best business schools, the best MBA programs, or the best medical colleges in an ordered and numbered list. In almost every case, universities decry the commercialism of the rankings, attack the methodology of the ranking process, and proudly distribute to their alumni those rankings in which they appear high.

The most famous—and perhaps most controversial—of the rankings come from *US News & World Report*, whose annual issue ranking colleges and universities carries the same suspense for some academics that the final college football polls have for sports fans. University administrators, public relations officials, and fundraisers wait expectantly for the rankings, and institutional research officials fill out the forms for *US News* with great care and attention in hopes of improving their rank. The compilers of the *US News* rankings modify the criteria and weightings that drive their rankings with considerable frequency in an effort to improve the reliability of the results. Each change in methodology, however, changes the rankings of individual universities, creating an illusion that universities rise

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and fall in their relative significance from year to year.

This illusion of rapid and dramatic institutional change has some perhaps unintended benefits. From the magazine's perspective, it creates great interest, for if the rankings change from year to year, the newest issue attracts a larger audience. When a university rises in the *US News* lists, the administration promotes the new ranking widely as an example of superb management and high quality faculty productivity. When an institution falls in the lists, the administration highlights the errors and inappropriate methodology. Sometimes it simply ignores the rankings altogether. The variability of the *US News* methodology generates the interest that sustains the process. ‡

All major American research universities compete for their share of a relatively limited supply of highly productive research faculty.

While those of us who study the rankings know their faults well, we also know that underneath the hype lies a fundamental and important truth. American universities exist in a highly competitive marketplace, competing for the people and money that deliver excellence. All major American research universities compete for their share of a relatively limited supply of highly productive research faculty. These faculty, through their discoveries and writing, create the knowledge that drives our economy and defines our era. The larger the number of highly productive research faculty at a university, the more intellectually powerful the institution becomes.

The academic and public reputation of research institutions closely follows their success in acquiring research faculty, although reputations rise and fall much more slowly and uncertainly than the reality they reflect. Universities that seek to rise into the ranks of the nation's elite research institutions need reliable measures of performance that will reflect their success in the competitive higher education marketplace.

Characteristics of Universities

Most of the currently available rankings, focused as they are on an ordering of institutions from number one on down, obscure some of the fundamental characteristics of university change and the university marketplace. Over the past several years, *TheCenter* has developed a structure for identifying some key characteristics of top research universities in America. This structure helps institutions to understand the characteristics of the marketplace and the opportunities for improvement. *TheCenter* clusters universities into groups defined by their relative performance on a variety of research university characteristics: research, private support, faculty, doctorates, postdoctoral appointees, and undergraduate quality. While issues of scope (land-grant

‡ The literature on ranking, including critiques and alternative ranking methodologies, is extensive. By far the best guide to these resources is a web page maintained by the University of Illinois library. For those interested in following the debate, the on-line and printed sources available here are kept current and provide a comprehensive and annotated resource. *College and University Rankings*, (Education and Social Science Library, University of Illinois at Urbana-Champaign, March 2000) at [http://www.library.uiuc.edu/edx/rankings.htm]. A complete discussion of the *US News & World Report* methodology is available in a report published on *TheCenter* web site by Denise S. Gater at [http://thecenter.ufl.edu/usnews.html].

mission, health and engineering programs, affiliated laboratories and hospitals, and professional schools) provide a context within which research universities function, they do not determine the success of the research university. Institutions of quite different scope and scale (student, faculty, budget size) appear at all levels among America's top research institutions.

Any definition of university quality will provoke controversy and disagreement. This is both healthy and expected. For the purposes of this study, we use measures that identify institutional performance relevant for a top research university. We could imagine other measures as well, but in most cases, the data for more complex evaluations do not exist in a reliable form. Indeed, for all the intellectual sophistication of universities, they resist accurate, consistent, and standardized measurement of almost everything they do. Accounting practices, definitions of such fundamental concepts as teaching and research, and the methodologies for calculating measures of faculty productivity vary significantly from institution to institution, from state to state, and from private to public ownership. As a result, systematic evaluation of research universities must rely on surrogates, data elements with some degree of consistency and face-validity in the academic community that provide direct or indirect measures of institutional performance.

Universities of the highest quality tend to do most things very well. Other institutions will perform very well on some elements but not as well on all. Many institutions do not participate in the research competition at high levels, and for that reason the indicators used to characterize research institutions do not apply to them. While it is possible to proliferate measurements, we believe that for research universities a relatively few indicators provide sufficient evidence of overall quality. In most cases, the use of more indicators contributes little additional information. This is so because the difference among research universities with high levels of performance is not great. Ranking Berkeley, Michigan, and Wisconsin or Harvard, Stanford, and Chicago from one to three tells us very little more than if we ranked them in a different order. These institutions are different in many ways, but these six represent premier American public and private research universities. By using multiple indicators and combining them with different weights and formulas, we could produce rankings with these institutions in many different sequences. For this reason, we use the fewest measures needed to identify groups of outstanding institutions and make no effort to rank the institutions within groups.

For all the intellectual sophistication of universities, they resist accurate, consistent, and standardized measurement of almost everything they do.

Defining the Research University

American public and private universities come in a bewildering variety of institutional forms, embedded in political arrangements and governance structures of remarkable diversity. Some universities consist of multiple campuses, each governed independently with its own curriculum and student body. Others have geographically diverse campuses that function as a single institution.

Although this often appears in the form of a single geographic campus at Ann Arbor, Palo Alto, or Seattle, for example, it can also appear in multiple geographical locations in

Baltimore and Washington D.C. The key element is the organizational focus that permits the university to operate as a single institutional entity.

American public and private universities come in a bewildering variety of institutional forms, embedded in political arrangements and governance structures of remarkable diversity.

To take an example, the University of North Carolina has many campuses but only one president. For the purposes of our analysis, *TheCenter* considers the University of North Carolina at Chapel Hill as one research university and does not include the productivity of the faculty at other UNC campuses as part of the Chapel Hill data. This study defines the research university as the main campus of multi-campus universities, and we use the institutional definition of the main campus in adjusting the data.

Most private universities do not present as many definitional difficulties as do the complex political structures of public institutions, but The Johns Hopkins University is an instructive example. This university consists of various schools scattered over a wide geographic area from north Baltimore to Washington, D.C. Hopkins, nonetheless, operates as one institution with one governance and institutional structure, and the productivity of the faculty in all of the university's schools form part of The Johns Hopkins institutional data.

Hopkins offers an additional illustration of the difficulty of defining the scope of a university. It currently includes the research productivity of its Applied Physics Laboratory (APL) as part of the university's work. This rests on the recognition that APL's staff has a variety of teaching and academic missions that connect this laboratory organically to the university, even though the primary funding of APL derives from special appropriations from the federal government.

An alternative model occurs for the Department of Energy labs managed by the University of California system. Although The Lawrence Livermore Laboratory, for example, exists in close geographic and intellectual connection to the University of California campus at Berkeley, this institution does not include the research funding of the Lab in its totals.

Perfection in classification is difficult to achieve. Fortunately, while the Hopkins case creates an outlier in the research data, removing the APL component would not affect its inclusion within the top group, illustrating one benefit of the clustering methodology.

Universities also have complex and differing relationships with their teaching hospitals. In some cases, clinical research done by faculty physicians with appointment and tenure in the sponsoring university appears in the totals for the hospital that is the host for this research. In other cases, the clinical research flows through the university and appears in the university totals. These differences in organization affect both public and private institutions and led to the clustering strategy that puts high performing institutions in groups rather than in precise numerical rank order.

Often multi-campus public universities or university systems report data for the larger collection of campuses rather than for the research campus. In those cases, *TheCenter* staff worked with the campus institutional research offices and used data available from institutional and national sources to determine what portion of the reported data

we should assign to the research campus. This process serves to make the research universities comparable for the purposes of this analysis of institutional performance. An alternative research project might well choose to review the productivity of university systems composed of multiple campuses, but that is not the purpose of this project. A complete description of the adjustments made to the officially reported data for individual institutions appears in the Appendix and on *TheCenter* web site [http://thecenter.ufl.edu].

Indicators of Performance

The identification of performance indicators is the most important task facing any project that hopes to assess comparative institutional performance. Academics can identify a wide range of useful indicators, but only a few have reliable data available. Fortunately, there are enough measures with reliable data to support a clustering of universities by quality. The indicators of university performance used here permit the development of reliable comparative data that have face validity as reasonable references for research university performance.

No available data can accurately capture the totality of a university's quality and productivity. No available indicator can measure the complete performance of these complex and diverse institutions. At the same time, some measures provide quite reliable *indicators* of institutional performance, even when they do not capture all of that performance. This is particularly true of research universities, whose core competency and competitiveness in research define the institution's character.

While the measures we use bear some relationship to each other (for example, institutions with high research volume tend to have a significant number of doctorates and postdoctoral appointees),[‡] the relationship is not particularly strong. This is partly because research volume captures only a portion of a university's research productivity, while the doctorates indicator includes all disciplines: arts, humanities, social sciences, and professions, as well as the sciences. SAT scores for the undergraduate entering class bear almost no relationship to the research volume of the institution, but high quality undergraduates form an important part of America's premier research universities.

The following nine measures provide us with the reference points for identifying the top research universities:

- *Total research expenditures;*
- *Federal research expenditures;*
- *Endowment assets;*
- *Annual giving;*
- *Faculty members in the National Academies;*
- *Faculty awards;*
- *Doctoral degrees;*
- *Postdoctoral appointees;* and
- *Entering freshmen SAT scores.*

The measures used here provide quite reliable indicators of institutional performance even when they do not capture all of that performance.

[‡] Federal research and postdoctoral appointees correlate at .544 for all universities in this group; for federal research and doctorates, the correlation is .464. However, federal research and SAT scores correlate at only .287, a level that is not significant for either private or public universities at the .01 level.

TheCenter evaluates public and private universities in the same way, using exactly the same data. We present the performance of public and private universities separately, however, because the public and private research universities operate in significantly different contexts by virtue of their governance and funding structures. Private universities tend to have much larger endowments than public universities, while public institutions enjoy a much higher level of tax-based public support. Public universities tend to serve much more diverse constituencies in ways that affect their size and organization. Private universities often focus their efforts more closely and define their missions more precisely.

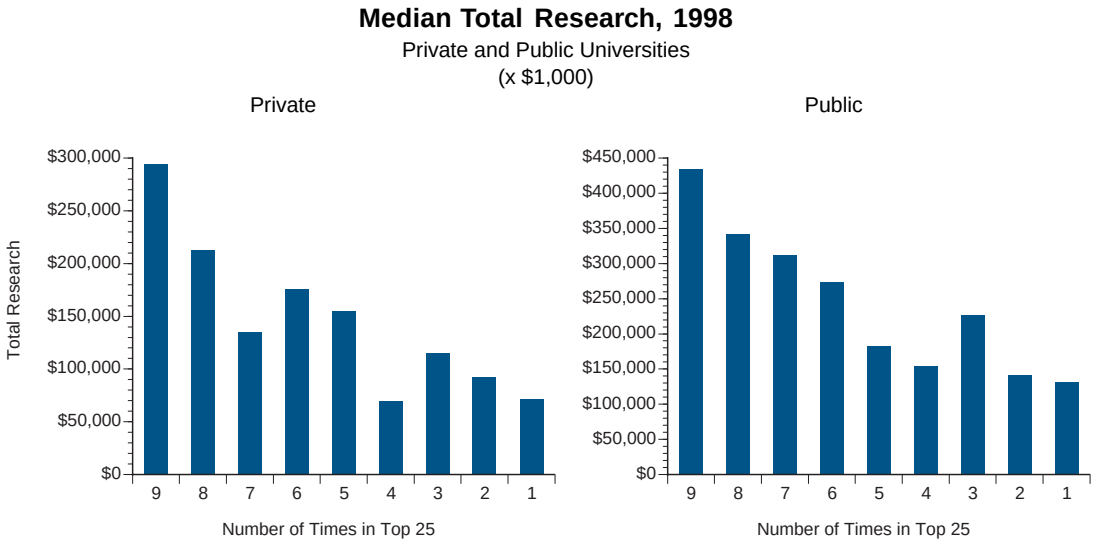
Public and private institutions compete for the same research grants, the same faculty talent, the same quality students, and in a similar fashion for private annual giving.

The goal of this analysis is to identify research university performance, not to analyze relative funding or governance. Public and private institutions compete for the same research grants, the same faculty talent, the same high quality students, and in a similar fashion for private annual giving. The top categories of American research universities include both public and private institutions, and *TheCenter* conducts the evaluation of top universities without regard to ownership, although it presents the results for public and private universities separately.

Because we believe that the top universities have strength in research, private support, faculty, graduate and post-graduate programs, and quality undergraduates, the methodology we use for the evaluation considers all nine indicators described above. At the same time, the precise ranking of a university on these indicators is less important than their inclusion within the top groups. For this analysis, we defined the top category in terms of the performance of the top 25 public and the top 25 private institutions on each indicator. To create the groups of universities, we identified the universities that ranked among the top 25 on each of the nine measures, again taking public and private institutions separately. We then grouped the institutions by the number of indicators for which their performance put them in the top 25. Obviously, the choice of 25 as the top quality cohort is somewhat arbitrary. A smaller definition of the top cohort would have included fewer institutions and would also have left out some clearly significant research universities. A larger cohort would have created groups that, upon closer inspection, do not always share reasonably equivalent levels of quality.

The top category in the public and private lists, then, includes universities that rank in the top 25 on all nine of the indicators. These institutions have high levels of research funding (total and federal), substantial endowments and strong programs of annual giving, excellent faculty in the sciences and in the humanities and social sciences, strong doctoral and postdoctoral programs, and outstanding undergraduate students. The second group includes universities with eight of the nine indicators in the top 25, and so on for the rest of the groups in the public and private lists.

For the purposes of this analysis, *TheCenter* includes only research universities with at least $20 million in federal research expenditures per year. This number is somewhat less than the Carnegie Classification cutoff for Research I ($40 million) and somewhat more than Carnegie used for Research II ($15.5 million).



Forty-seven public universities and thirty-five private institutions have at least $20 million in federal research and appear in the top 25 on at least one of the measures. These 82 institutions meet our criteria and thus appear in the lists. Each of the criteria, described in detail below, contributes to an understanding of the breadth of performance needed for a top research university.

Total and Federal Research Expenditures

Even with research, however, we must settle for something less than a measurement of an institution's total research and creative productivity. The only comparable and reliable indicators of university research measure the dollars spent by the institution from research grants and contracts. These measures, while expressed in mostly comparable terms for all institutions, are less a complete measurement of the university's research than they are representative of that research. The reason for this distinction is that the dollar numbers for total and federal research expenditures (*TheCenter* uses both measures) do not reflect many other kinds of significant university research.

The data used come from the NSF annual *Survey of Scientific and Engineering Expenditures at Universities and Colleges.* They explicitly exclude non-science and engineering research in such fields as law, education, humanities, business, fine arts, and journalism. While historians, poets, literary scholars, some social scientists, and most artists and composers, for example, produce exceptional research and creative products, these activities do not appear in the indicators of total or federal research because of the methodology defined by NSF's survey.

An additional element involves the mix of disciplines even within the externally funded marketplace of science and engineering. Research in experimental physics, for example, requires large grants to deliver modest results. Research in theoretical physics or mathematics, in contrast, may well produce significant results with relatively small grants. Meanwhile, federal preferences for physical or biological science research may shift funding opportunities differentially among institutions.

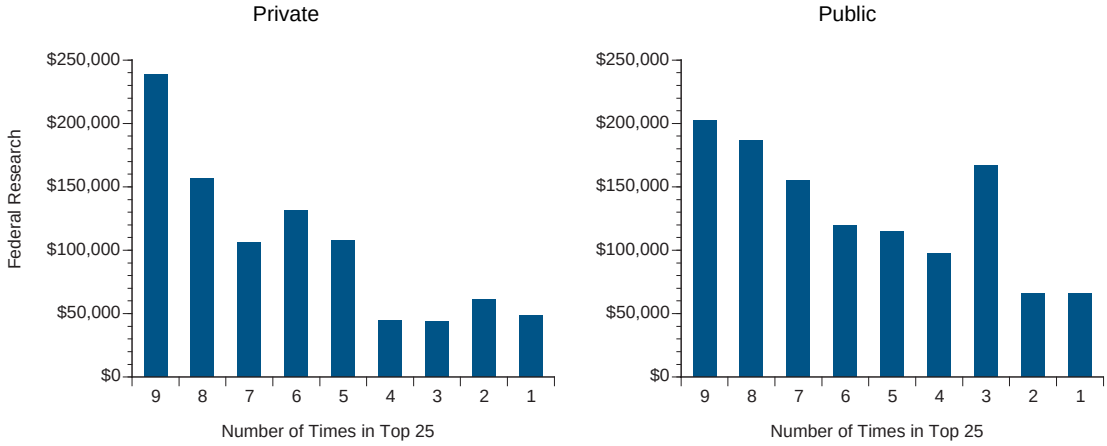
Finally, some forms of research in professional and other programs compete in an external marketplace that does not involve the university. For example, faculty in a business or engineering school may develop

The only comparable and reliable indicators of university research measure the dollars spent by the institution from research grants and contracts.

Median Federal Research, 1998

Private and Public Universities

(x $1,000)



research products within the context of relationships that pay consulting fees and reimburse expenses, which do not become part of the university's accounting system for grants and contracts.

Although these issues make the total and federal research numbers incomplete representations of research competitiveness, they nonetheless serve as good measures of an institution's overall commitment to and success in research. The numbers help us to understand the strength of research universities and provide two of the elements for grouping institutions. *TheCenter*'s approach to identifying top universities creates groups of institutions that demonstrate equivalent strength rather than sorting the institutions on a composite, weighted numerical scale.

While federal research expenditure is a relatively straightforward measure, the total research number requires some explanation. Total research includes all those expenditures on research reported by the university to NSF, including corporate, state, and local as well as federal sources. This number creates some potential for differential reporting by institution depending on the definition of local and state expenditures for research, but for the purposes of this clustering approach, the possible error does not appear too great. This research measure captures an important element of research for many institutions that have a large corporate support structure for their research or a mission that includes agricultural research funded by the state through a land-grant system.

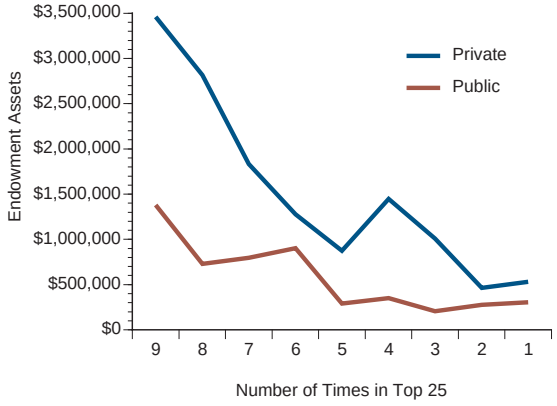
Private Support

The total financial resources of universities prove difficult to measure accurately given the wide diversity of mission and the varying structure of public and private funding sources in American research universities. Endowment

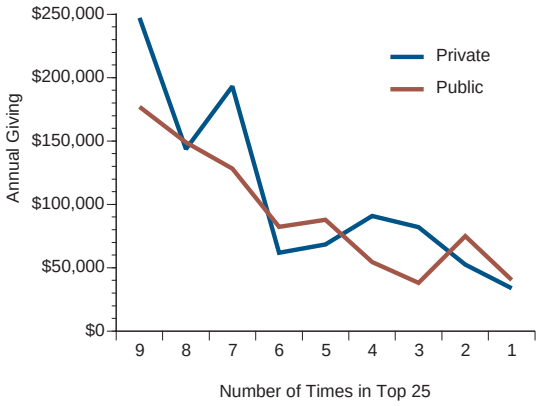
Median Endowment Assets, 1999

Private and Public University Groups

(x $1,000)



Median Annual Giving, 1999
Private and Public University Groups
(x $1,000)



assets capture a stable and common element in the financial resources of all research universities, both public and private. While private universities tend to have an economy that relies significantly on tuition revenue and endowment income, and public institutions receive significant tax-based support, all research universities devote considerable effort to raising private dollars. The endowments of public universities do not yet approach the level of private institutions, but within the context of public higher education, a university's endowment represents a significant source of revenue in support of research and quality education. This source of revenue is even more significant in the context of private research institutions. When looking at public and private universities separately, endowment serves as a useful indicator of an institution's available resources. Although endowments represent stable resources, their value at the end of each fiscal year also reflects the investment wisdom of managers and the portfolio composition of institutional endowment funds.

Endowment reflects generations of gifts and the investment growth of those gifts, not necessarily the current work of the university. *TheCenter*, then, also includes annual giving as one of its measures. All research universities commit themselves to the task of raising private money, and success in this competition serves as a useful indicator of the institution's ability to mobilize financial support from its many constituencies.

While these two measures serve as good references for institutional financial strength, they do so only within the separate contexts of public and private universities. Private universities with large endowments may appear better supported than they actually are in comparison to public universities with large tax-based contributions. Further complicating an evaluation of total financial strength, public and private universities often have very different mechanisms for acquiring capital investment for buildings and for funding the depreciation cost of those physical assets.

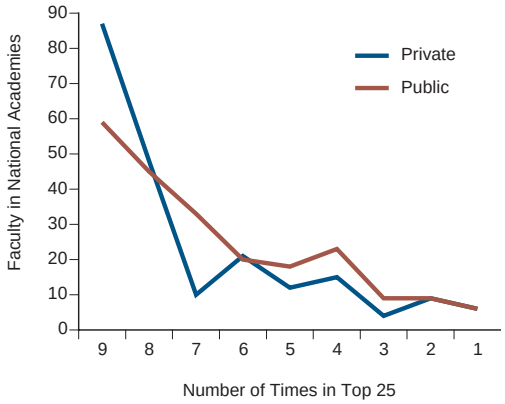
The measures of private support identify the success of the university in persuading its various constituencies that its programs represent a good investment.

Faculty quality, of course, is the primary source of the institution's strength as a competitive academic enterprise.

Faculty

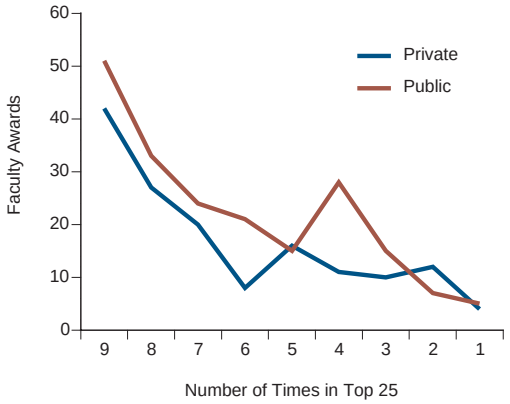
If research and private resources provide key measures for identifying America's top research universities, some other characteris-

Median Number of Faculty in National Academies, 1999
Private and Public University Groups



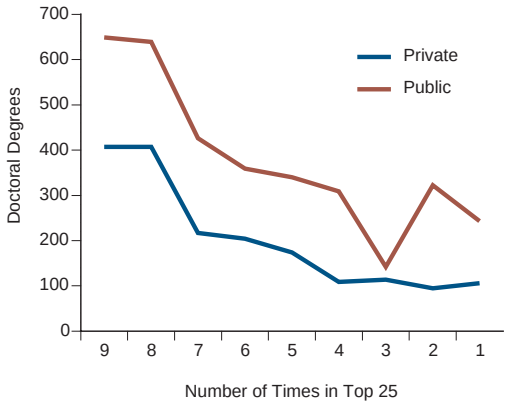
Median Number of Faculty Awards, 1999

Private and Public University Groups



Median Number of Doctorates, 1998

Private and Public University Groups



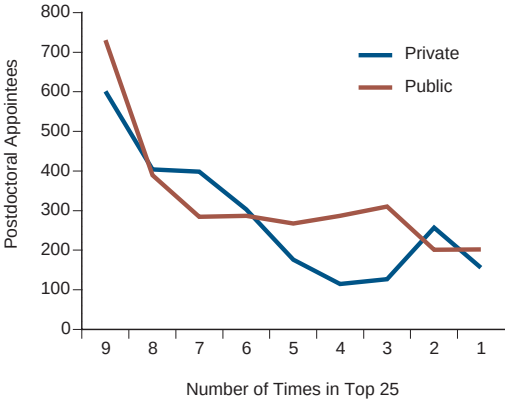
tics offer additional evidence of institutional quality for this analysis. Faculty quality, of course, is the primary source of the institution's strength as a competitive academic enterprise. While the research numbers offer an indication of the faculty's ability to compete for grants and contracts, the honors and awards of the faculty provide a somewhat different perspective on the institution's distinction and capture some elements of quality not reflected in the data on research expenditures. *TheCenter* uses two measures of faculty quality: membership in the three National Academies (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine); and the number of faculty receiving a range of academic awards in the sciences, social sciences, humanities, and health professions. The Appendix lists the awards included in this analysis.

Advanced Training

Research universities not only produce research, they also make a major contribution to the education and training of the next generation of researchers. As an indicator of a university's participation in this activity, *TheCenter* counts the number of doctorates awarded and the number of postdoctoral positions supported. These measures serve as indicators of the strength of an institution's graduate and post-graduate education and research training activities. The number of postdoctoral appointees also reflects the strength of medical school research programs that often support many postdoctoral positions.

Median Number of Postdocs, 1998

Private and Public University Groups



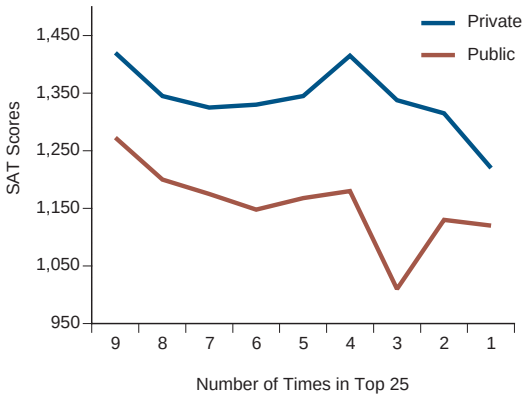
Undergraduates

While almost all of America's most successful research universities serve undergraduate student populations, the variation on this dimension is large. Public land-grant universities, for example, may have 30,000 undergraduates; smaller private universities may have 1,500 to 3,000; and specialized academic medical centers may have no undergraduates at all. Although *TheCenter* includes specialized medical centers in its evaluations since they are major competitors for faculty and research support, we make the judgment that a quality undergraduate program is an essential feature of America's top research universities.

The quality of undergraduate programs proves difficult to measure directly. The data on placement rates, persistence rates, and the like are often unreliable and difficult to acquire in consistent ways. These and other calculations, such as graduation rates, also fluctuate as a function of size, mission, geographic location, and ownership rather than as a function of quality or effectiveness.

We considered two possible measures of undergraduate quality: the median SAT scores and the number of National Merit and National Achievement Scholars in the entering class. Of these, the median SAT scores of the entering class offer the best general indicator of undergraduate quality. The number of National Merit and National Achievement Scholars varies depending partly on the size of the undergraduate population and partly on institutional policies that award special financial aid and scholarships to these students. The median SAT, while not a complete measure of student quality, is relatively standard because most institutions use it as part of the admissions process, and it is also less influenced by differences in undergraduate population size or financial aid practices. The median SAT scores for the top private universities are much higher than the scores for the top publics, reflecting the mission of public universities to provide access to a greater number of students.

Median SAT Scores, Fall 1999
Private and Public University Groups



The Purpose of The Top Universities

TheCenter's interest in this topic comes from the experience of observing universities and their supporters as they pursue improvement programs. Many universities want to get better, to improve their standing among their research university colleagues, and they have a keen interest in the variables that determine institutional performance. Traditional rankings that put universities in order by some weighted index of prestige, resources, or other categories do not help institutions to understand what makes research universities succeed. Sometimes the rankings fail to serve a useful purpose because they use inappropriate criteria. Primarily, however, the difficulty comes from the ranking and weighting process that, in its complexity, obscures the

relative strength of the institution's many elements.

In addition, weighted rank ordering – while it presents an easily referenced list – does not capture the complexity of American research university mission and performance. These rankings give the false impression that the precise order of institutions reflects precise differences. The very best universities excel in almost everything; very good universities excel in some things and perform less effectively in others. Aspiring research universities do well, but not at a level close to the top performers.

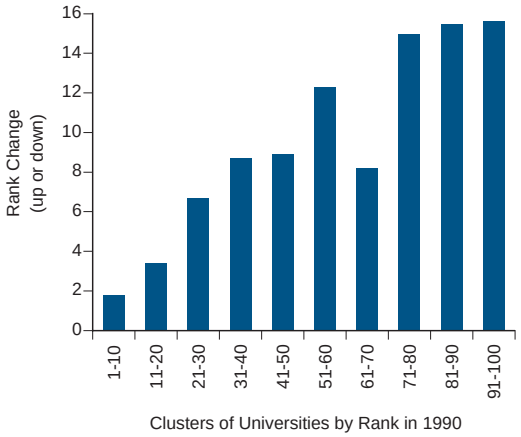
Successful research universities must have a constant, continuing commitment to competition and performance. Assertions about performance aspirations rarely have any effect unless accompanied by some sense of where an institution fits into the competitive structure of American higher education and unless supported by measurable indicators of comparative performance.

Successful research universities must have a constant, continuing commitment to competition supported by measurable indicators of comparative performance.

TheCenter's Top Universities provide that context and offer universities a reference for measuring their own achievement and clearly understanding the nature of the competition. When over-enthusiastic people assert institutional goals, such as reaching the top ten of American research universities by some not-too-distant date, they usually do so without understanding what this achievement actually entails. Research universities live in a highly competitive marketplace, and none of those in the top categories is likely to cease improving. This means that to get relatively better, a university must match and then exceed the growth of its competitors. This is a major challenge, and the indicators in these tables provide explicit reference points to measure this kind of success.

Average Absolute Change in Rank in Federal Research between 1990-1998

Top 100 Universities in 1990



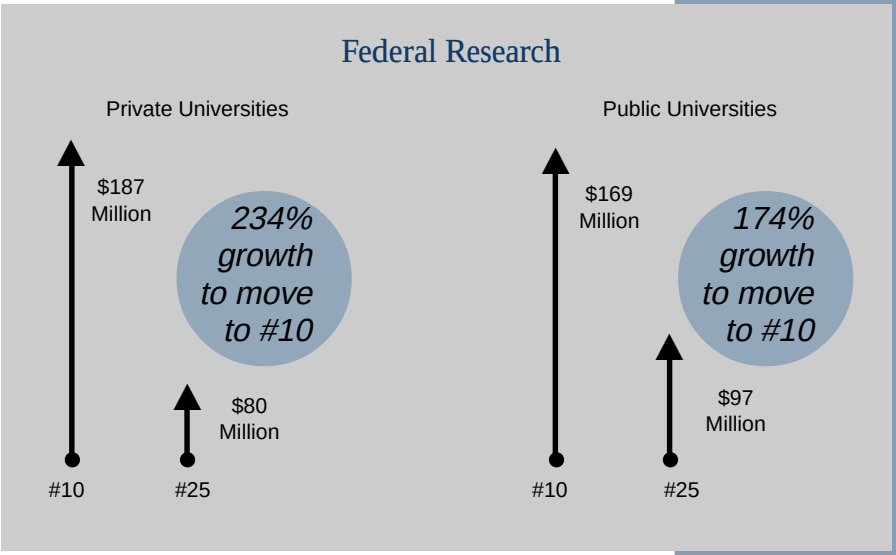
Although universities improve and decline in performance relative to each other, the patterns of change are much different in the top group than in the groups nearer the bottom of the table. In terms of federal research, for example, over a ten-year period, universities in the top groups change position infrequently. Members of these groups may move up or down by one position at most. In the bottom groups, however, universities change position by much larger margins.

This pattern reflects the increasingly greater intensity of the competition towards the top. Universities with $20 million of research can receive a few major grants and increase their spending by one or two million dollars over ten years and still improve their position, while other universities at similar levels of funding can easily lose the same amount of funding and decline. Institutions at the top, with $300 million or

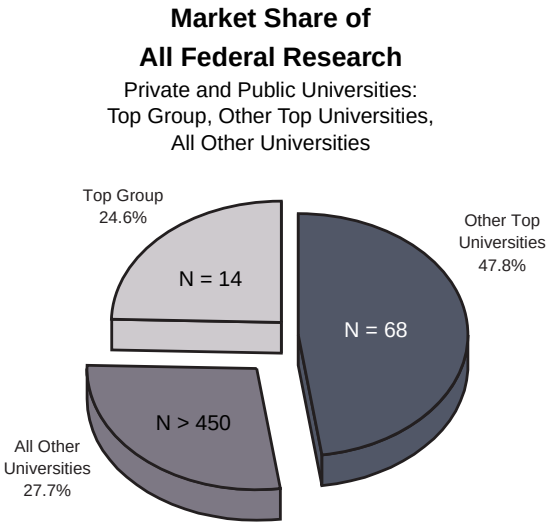
more of research, have so many people engaged in the research enterprise at such a high level that they rarely rise or decline much more than the other institutions in their group. This is partly because the scale of their research operations is so large that failures to win grants balance the successes in the acquisition of new grants.

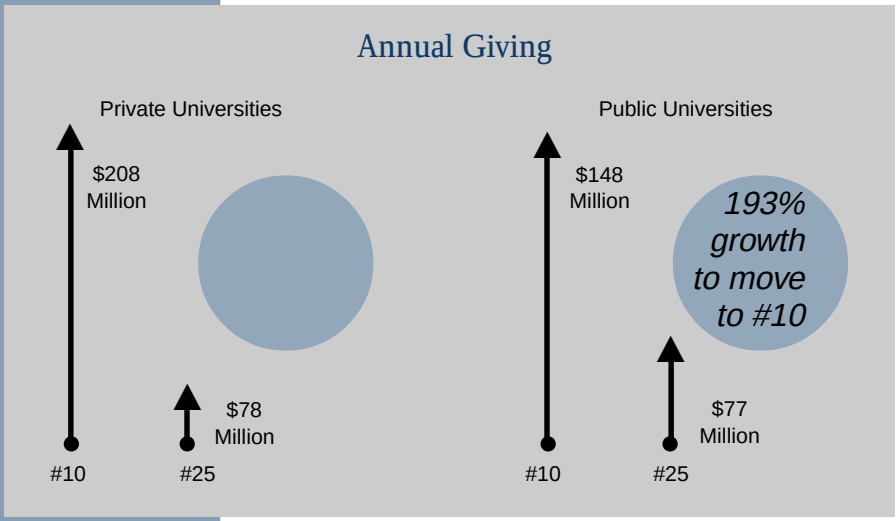
This group of universities also controls a large share of the federal research market. The relatively few universities identified by *TheCenter* as the very top group of universities (14 private and public universities) have 24.6% of the total federal research expenditures of all universities receiving federal funds. The other top universities in this study (68 private and public institutions) control 47.8% of the market, leaving all other private and public universities with a 27.7% market share. From another perspective, the 82 top universities included in this study have a 72% share of the total federal research expenditures reported by NSF for all universities in the country. The size of this group's participation in the research marketplace creates significant barriers to challenges from rising institutions, whether from outside the group included in this study or from the institutions included here but located at a considerable distance from the top group of institutions.

Another way of looking at this barrier is to isolate the federal research dollars among these very competitive institutions. The number 10 private university has about $187 million and number 25 has $80 million. To move from number 25 to number 10 in research performance would require the number 25 institution to more than double its research base. This would have to come, of course, from the market share of other institutions. On the public side, the number 10 public institution has $169 million and number 25 has $97 million. For the number 25 public university to move into the top ten will require an increase of 174%, again an increase that would have to come at the expense of other highly competitive institutions.



In the case that all universities are equally successful in gaining grants (which means that they all increase their grant volume by the percentage increase of the total pool), the top group of universities will continue to grow faster in total volume than the bottom groups. However, many universities in the





lower brackets grow faster in percentage terms than those in the upper brackets. This narrows the gap somewhat between the top institutions and those substantially below them in federal research. Recent increases in federal research spending have hovered around 8% per year. The rate of change required for a number 25 institution to make it into the top ten within ten years approaches 28% per year for a private university and 24.5% per year for a public institution. This represents a very challenging task and also explains the continued success of the top performers among research universities and the relative stability of American research university reputations.

If the competition at the top level seems daunting, movement at lower levels of the hierarchy is also challenging, despite the smaller margins of change. Among the private universities in this analysis, the institution with the least amount of federal research expenditures has about $23 million, and the number 25 institution has $80 million. For the last institution to reach the level of the number 25 institution, the faculty would need to more than triple their research productivity. For public institutions, the smallest federal research volume in this group is about $29 million and the 25th is $97 million, presenting the faculty of the public institution with a similar challenge of a more than threefold increase in research productivity.

Although large changes in the rank ordering of universities on many of these criteria appear difficult, smaller changes of one to three or four places on the list are well within the competitive capabilities of most institutions. Thus, a university that moves up from 25 to 23 in the federal research list has beaten some formidable competition. The university that sets a goal of moving from 25 to number 10 is probably engaged more in public relations than in academic competition or planning.

Similar calculations would produce similar results for other indicators in this study, although the dynamics differ. For example, the data show considerable volatility in the annual giving category as universities launch and complete successful capital campaigns. Even so, the range separating the fundraising capabilities of the top universities in this category from those in the middle is even larger than the range for research.

For the most recent year, the number 10 private institution raised about $208 million and number 25 brought in $78 million; the number 10 public institution gained about $148 million with number 25 raising about $77 million. For the 25th private university to achieve the fundraising success of the 10th most successful private institution, it would need to increase its annual giving by over two and a half times. For their public counterparts, the increase would need to be just under two times. Here, as in the case of research funding, the leading institutions do not stand still, but increase their annual giving every year. As a result, competitors

need not only to improve their own performance, they need to improve it by a factor larger than the improvement of their competitors.

We believe that universities have an organizational model that emphasizes self-replication. Institutions with large numbers of competitive faculty and students tend to replace these faculty and students with individuals of equivalent competitiveness. Those with less competitive faculty also replace themselves with less competitive faculty. Overall, and absent a strong drive for change, most institutions stay more or less the way they are: stable, competitive at their level, but unlikely to move dramatically without significant and unusual impetus.

This project to identify the top American research universities provides a frame of reference and the data to understand the structure of this segment of American higher education. This publication captures the current condition of these institutions, and subsequent editions will update the data as they become available. No observer is limited to the decisions and evaluations used here, for *TheCenter*'s web site provides all the data so others can construct and analyze the information for their own purposes.

As the work of *TheCenter* continues, additional publications will look at the process of change over the past decade that has produced the structure of research institutions outlined here.

Absent a strong drive for change, most institutions stay more or less the way they are: stable, competitive at their level, but unlikely to move dramatically without significant and unusual impetus.