

The Top American Research Universities

2016 Annual Report

The Center for Measuring University Performance

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American Research Universities in an Era of Change: 2006-2015

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Who Are We?

Over the years that we have measured various aspects of America's most competitive research universities, we have sought to identify the elements that characterize these institutions within the larger context of the higher education industry. Measuring colleges and universities is no easy task, as the endless surveys and ranking schemes demonstrate when they attempt to pinpoint the features that distinguish one institution from another. The task is complicated by the difficulty of describing the structure of the higher education business, reflected in the imprecision of the words we use. We speak of colleges and universities as if these words identify institutions belonging to a reasonably well defined universe when the terms cover a wide range of significantly different institutions designed to impart some element of knowledge or skill to some subset of the population.

We generally expect that colleges and universities are places that engage young people who have recently completed the equivalent of 12 years of schooling, but we also include older individuals whose life experience encourages them to acquire additional information or skills. We sometimes talk about higher education as being a process in which individuals learn how to become proficient at some skill or profession. We expect higher education to transfer important values and standards, we think higher education should serve as a vehicle to enhance equity and social justice, and we expect the industry that accomplishes this to be of high quality, inexpensive, efficient, effective, and inclusive.

Our students are often clearer about college and university, and simply refer to the institutions that make up this industry as schools. They say "Where did you go to school?" When they mean "What institution of higher education did you attend?" or "Where did you earn your degree or certificate?" This simplification clarifies what the institutions do by recognizing that the fundamental functions of all these places are instructional. Instruction provides the common link among most of the institutions that make up America's higher education system.

Almost all efforts to provide a clear taxonomy of American higher education fail to achieve precision because the range of institutional variation around common types is wide. We have what we call four-year colleges, institutions that

provide programs leading to a baccalaureate degree. We take some comfort in this designation even as we know that an elite private college with a large endowment, small classes, primarily residential and well-qualified students, highly trained and credentialed permanent professors, and elegant facilities is not operated in the same fashion as a small rural state college campus with modest facilities, predominantly commuter students, many under-prepared students, significant numbers of part-time adjunct faculty with basic credentials, and fragile budgets. We know that small private colleges with enrollment below 1,500 and minimal endowments operate on the thinnest of margins and live from year to year with the possibility of fiscal failure and extinction while large state flagships and prestigious private research universities may face financial challenges but never contemplate bankruptcy.¹

As a rough indication of the scale of American higher education, the National Center for Educational Statistics (NCES) reports the existence of some 4,583 degree granting institutions (a number that understates the total number of separate institutions since branch campuses are sometimes reported with the main campus). Of these, 3,004 are four-year campuses and 1,579 are two-year.

Although this gives a general notion of scale, it is useful to further separate the institutions by control or ownership: public or private. About a third of all institutions (1,620) are public, and of these publics 710 are four-year and 910 are two-year. The other two-thirds (2,963) are private, and of these some 1,701 are nonprofit and 1,262 are for-profit. Among the nonprofit private institutions, 94% are four-year (1,594) while among the for-profit institutions, 55% are four-year (700). In conversations about higher education we often find that many observers do not fully recognize that four year nonprofit privates outnumber public institutions by more than two to one.

This landscape is further complicated by the distribution of students among the various types of institutions. In Fall 2015 there were some 20 million students in degree-granting colleges and universities. Of those 15.6 million (or 73 percent) were in public institutions and 4.1 million in nonprofit private colleges and universities. However, the subdivisions and categories used by NCES are many. For example, in the group of public institutions, in an admirable effort to create a detailed taxonomy of higher education institutions, NCES provides information within the following categories:²

- Research university, very high
- Research university, high
- Doctoral/research university
- Master's
- Baccalaureate
- Special-focus
 - Arts, music, or design
 - Business and management
 - Engineering and other technology-related
 - Law
 - Medical schools and centers
 - Other health professions
 - Tribal colleges
- 2-year
 - High transfer institutions
 - Mixed transfer/career and technical institutions
 - High career and technical institutions
- Special-focus 2-year
 - Health professions
 - Tribal colleges
 - Other programs

This short summary provides a glimpse into the complexity and diversity of higher education institutions and contexts in the US and helps explain the difficulty in generalizing about “American higher education.”³

The Operation of America’s Higher Education Industry

All of these institutions, whatever their variety and complexity, share a commitment to schooling, providing training that meets a broad but nonetheless mostly standardized set of expectations, established and enforced by the accreditation process that certifies them eligible for federal financial support. We define the schooling through the designation of various levels of student accomplishment recognized by the award of degrees: Bachelors, Masters, and Doctoral degrees, but with a complex nomenclature that specifies various subcategories within these degrees: Bachelors of science or arts, Masters of business administration or public health, Doctors of philosophy or education.

While all this variety offers endless opportunity to those who participate in these schools, the complexity also reflects the competitive needs of the higher education industry. Colleges and universities constitute a highly competitive marketplace that sells relatively standardized services to a wide range of customers. Although the rhetoric of education imagines an enterprise that seeks a common benefit for society through the preparation of citizens capable of contributing to a prosperous community, American schooling has always been a process for training occupationally successful individuals to play significant roles in society. The nation at large surely benefits from the trained people schooled in colleges and universities, but the participants engage these institutions in search of the personal benefits that result from their educational work. Even when we look at society’s gains from education, they are not the result of preparing people with the best attitudes and values but from the necessity of prepar-

ing productive citizens whose schooling makes them effective at producing and delivering the goods and services that drive the American economy.⁴

The institutions that make up the higher education industry offer a wide range of elegant explanations of mission and purpose, but their behavior recognizes that their first priority is to attract sufficient business to generate the revenue needed to survive. Once survival is ensured, the institutions then compete to expand their reach and enhance their resources. This behavior can look much like the commercial behavior of other American business enterprises that expand to capture additional revenue, increase economies of scale, and generate higher value to their owners. However, colleges and universities (and here we speak of the nonprofit sector) have no stockholders. Their owners, whether the citizens of a state for public or trustees for private universities, do not operate to generate a profit for owners nor do the owners receive any significant direct personal benefit from the success of the institutions. Instead, the colleges and universities optimize a different set of characteristics.

Most colleges and universities compete to acquire within their institutional domains the highest level and the largest amount of quality possible. Some institutions focus on acquiring the highest quality student body, some seek the greatest research presence and the most qualified and competitive faculty, some compete to acquire quality in every institutional aspect. In almost every case the goal is to enhance the institution’s capabilities and quality.⁵

The schools then sell the opportunity to participate in the enterprise to many customers. They sell students the chance to be part of the high quality campus intellectual and social life, they sell industry the opportunity to acquire the highest quality graduates, they sell the government the opportunity to invest in the production of research results that can enhance the national economy, and they sell donors the opportunity to associate with the best as they give money to further the institutional competition for quality.⁶

Although a common notion imagines that universities take in students, process them in some fashion, and graduate them, creating a product that then goes into the American employment marketplace, this is not exactly how it works. Instead, the schools create an enterprise that sells students and parents the opportunity to participate and take away some individual value from that participation. In this view schools are more like orchestras or opera companies than commercial enterprises. An orchestra’s primary goal is to accumulate the musicians and other personnel who have the highest quality possible and then sell the opportunity for others to experience this quality through concerts and other performances. The transaction is surely financial, but a nonprofit orchestra does not generate revenue for its owners, and those who pay to experience a quality concert seek no

tangible element but only the personal and individual value they derive from an encounter with a quality performance.

In this model the transaction requires no exchange of product but only an individual purchaser's right to enjoy and benefit personally from the quality displayed. A key characteristic here is that the value to the consumer is individually determined. Not all members of a concert audience will take away the same benefit from the same performance. Some, with extensive musical backgrounds and perhaps talent, will understand and take away a complex and sophisticated understanding of the performance, the artists' talents, the significance of the conductor's choices, and the context of the composers' creativity. Some, will simply enjoy the music. Others, may decide they do not need this experience, and leave at intermission. While everyone in the audience has the same opportunity, and participates in the same experience of the performance, the benefit achieved by each attendee will vary significantly.

This rather abstract conversation offers some insight into the nature of America's higher education industry and helps explain the behavior of these institutions. Indeed, while perhaps something of an exaggeration, it is not too far off to say that the vast majority of accredited not-for-profit higher education institutions in America (of whatever size or characteristics) provide a reasonable undergraduate education. We know this not because we have excellent well established quality tools to measure the efficacy of a higher education institution but because the graduates of these places, of widely varying characteristics, generally become adults who perform well with good to exceptional lifetime records. Every college has a roster of distinguished graduates whose accomplishments the institution celebrates with the implied notion that these stellar achievements rest on the schooling provided at an earlier time. The data also show that having participated in any college and especially acquiring any post-secondary credential produces higher lifetime earnings than a high school credential alone.

Because the educational content of colleges are more or less academically equivalent, the key element for many is the opportunity to associate with and participate in a high quality environment rather than the guarantee that one environment or another will provide better schooling. Students compete to enter elite colleges to participate with other elite students in elite contexts, not because the elite school can guarantee that the chemistry they learn will be different from or better than the chemistry available at a nearby regional public campus. Indeed, what the customers seek is access to the quality elements assembled inside the college or university. Were it otherwise, the institutions would promote the rigor of their coursework, the challenge of achieving graduation, the competitive skills acquired measured against standardized external metrics, and not the context and experience of attending the college.⁷

Innovation, Change, and Competition

Over the years, the nation has argued about the roles, functions, styles, and values of colleges and universities. In the effort to adjust to the ever-changing international marketplace and the restructuring of enterprises in response to a highly technology-driven post industrial world, universities have modified a number of their operational practices to accommodate these external changes. Many of these modifications reflect the rapid introduction and spread of technology. Of all the technologies that often seem to overwhelm past practices, communication is one of the most significant for colleges and universities.

This is because schooling is mostly about communication between students and teachers, among research personnel, and between university people and others outside the university. Translating the new technologies to match and enhance the schooling styles and expectations of students and teachers and reconfiguring colleges to effectively use new technologies has provided endless examples of innovation and experimentation. Yet the traditional structure of classroom and teacher, assignment and testing, projects and laboratories remains the predominant modality for schooling in spite of the dramatic spread of computer-mediated distance education and the tremendous interest in MOOCs.⁸

The issue here of course is the distinction between the transmission of information and the participation of students. Information has always been available as demonstrated by the long-term commitment to public libraries in almost every American community. The electronic innovations brought by the Internet and the ubiquity of relatively affordable computing devices has expanded and facilitated the availability of information. But information is not schooling, for schooling requires a selection of a subset of information and the packaging of that information with a variety of tool skills that permit its effective use. Availability of information is much less valuable than the skills that make information useful. Providing skills is more complicated than providing information, and as a result, colleges and universities have changed less rapidly in recent decades than other industries that rely on information and technology.

This communication expansion has, nonetheless, had multiple consequences for colleges in the techniques and styles of instruction and in the organization and operation of the institutions. One of the most significantly visible consequences has been the dramatic redefinition of the role and function of university and college libraries. Once places for books and the quiet pursuit of information, libraries have dramatically reduced their on-site book inventories and transformed their physical facilities into student-focused educational support operations. Learning commons, where students gather individually or in groups to work on projects and engage with electronic resources, are now common features on almost every campus. The libraries no

longer seek the largest physical collections but instead subscribe to electronic databases of scholarly and other materials, relegating their previous, often extensive, book collections to remote storage. Librarians become experts in technology and information search and retrieval, they assist students in completing course work and faculty in using electronic resources for research. They struggle with the redefinition of their functions and purpose as it changes from custodian of core institutional information resources to facilitator of access to remotely maintained data and materials essential to university work.

The quality of libraries is no longer determined by the total size of a physical collection but by the adequacy of subscription access to current, remotely stored, information resources available to all. The prestige element of a library now tends to rely on the existence of unique physical resources in special collections of the institution. Of course, even here, the library with a special unique collection may well find the means to digitize it and provide it to the world, thereby reducing the uniqueness of the institution's physical resource. The library is a bell weather of the ability of higher education institutions to adapt to the opportunities of technological change without fundamentally changing the underlying academic structure of teaching and research.⁹

If we were to rely only on what appears in the media about colleges and universities we might come to believe that the industry is in great crisis, that dramatic change is in the offing or well underway, and that the institutions we know today will be radically different tomorrow. Some of this comes from the financial difficulties experienced by all of higher education throughout the early years of the 21st century, felt most severely during the economic downturn of 2008, and followed by the slow recovery since. Public universities and colleges saw a significant decline in state funding that has recovered some but not fully in the post-2008 years. Public institutions substituted tuition dollars for state funding to some extent but not enough to recover the lost public support. They also aggressively recruited out-of-state students and international students who paid higher prices and received smaller discounts. Private institutions reliant on endowment returns, suffered significant losses in the economic recession and also raised tuition although they had been adjusting tuition upward as a normal process throughout the years.¹⁰

Yet as nominal college prices rose, both public and private institutions found it necessary to expand traditional price discounting to acquire sufficient students to sustain their scale and operations. Something on the order of 80% of all students receive some type of tuition discount from their institutions with the overall discount rate for private institutions reaching 50% or more. All institutions expanded fund raising operations and launched significant to magnificent campaigns to raise funds for operations, capital, and schol-

arships. With all the national interest in college and university sticker prices, however, few focused on the fact that the net revenue from tuition and fees almost never covers the cost of the educational experience provided. Instead, institutions draw on endowment, annual giving, and state subsidies to cover the expense.¹¹

Institutions also instituted new programs to increase revenue. Small private colleges, as well as most universities, expanded masters degree and certificate programs, both online and residential, tailored to specific occupational specialties. These programs, because they are designed to enhance the earning power of their graduates, do not generally discount tuition and are profitable compared to standard bachelors degree programs that generally require a subsidy. Most institutions also expanded their online educational initiatives to capture student constituencies outside the traditional group of 18-24 year olds. These new customers are often adult learners, returning working students who need to complete a degree, or professionals seeking an all online degree or certificate. Such students may not require a tuition discount, and the programs, if operated at scale, can be significant revenue earners. Institutions also developed collaborations with for-profit enterprises to leverage commercial efficiencies on behalf of university or college operations.¹² All of this innovation can give a sense of great change, but perhaps the visibility is more dramatic than the fundamental change it reflects.¹³

As an example, in most of the innovative revenue-generating activities, one of the key values provided is not the content (which in most cases is generic: algebra is algebra, accounting rules are standard) but the institutional brand attached to the content. MOOCs become significant when endorsed by Harvard and MIT; for-profit educational service providers are made legitimate when accredited or covered by the brand of Purdue University. This tells us that the core competitive issues for colleges and universities remain much the same, even if expressed through new modalities enabled by technological and pedagogical innovations. Would a MOOC sponsored by a small rural state university campus have the same viability as one sponsored by MIT, even if the curriculum and programs were identical? Would Kaplan have made a deal with a little known private college rather than Purdue? Probably not.¹⁴

As a result, the primary driver of college and university prestige and reputation remains the acquisition of internal quality (faculty, students, facilities, research accomplishments, sports teams, student life amenities, and other highly visible internal assets). This constant pursuit of internal quality explains the relative stability of the general higher education marketplace, and especially the persistence of institutional success (as reflected in our core measure of annual federal science and engineering research expenditures) among the top research universities.

To be sure, some universities decline or rise as measured by one or another indicator. Among public research universities, for example, the change in state funding has been dramatic, but in spite of the reductions, other indicators of university performance do not appear to have been significantly impacted. This is because these institutions identified the resources needed to buffer short term changes, buy the time required to readjust expenditures and redesign program delivery methods, and the opportunity to invest in new revenue enhancing activities. Much the same is true of private research universities that have traditionally had large endowments and effective programs of annual giving. Absent a tradition of significant public tax based support, private universities have always been better prepared for changes in the economy. They move quickly to adjust, delaying large projects, readjusting expenditures, eliminating programs, and otherwise dealing directly with both the income and expenses of their operations. They too innovate and redesign programs and instructional modalities, but rarely undermine the core design based on the acquisition of internal quality.

For example, among the 125 public research universities we study (defined in the Appendix), the median contribution of state appropriations to total revenue (including investment income) between 2006 and 2015, after often steep reductions followed by partial recovery, declined by 5.7 percent. The experience of public institutions over this decade varied widely as different states pursued different policies in adjusting to declines in state revenue and increases in requirements for high priority state services. As the table below indicates, the largest percent reduction in state appropriations as a percentage of university revenues reached 21% while the largest percent increase over the decade reached almost 6%. In dollar terms, the top increase in state appropriations produced a \$215 million increase while the largest reduction was \$179 million. This helps illustrate the difficulty of generalizing about individual institutional experiences from aggregate data.

In looking at the state contribution to institutional revenue, it is important to recognize that even if a state increased its dollar contribution to a university's revenue, the percentage

of state funding within a university's overall revenue may nonetheless have declined because the institution raised tuition and fees or generated funds from many other sources that increased revenue even more. As a result, an increase in state appropriations may represent a smaller percent of a large total institutional revenue. For example, with the median net change in state contribution to institutional revenue declining by 5.7 percent, the institutions nonetheless experienced a median increase in state appropriations from 2006 to 2015 of about \$6.8 million. As the table above illustrates, the median change in net tuition and fee dollars as a portion of total revenue for the 125 institutions reached 6.5 percent or \$124 million.

The most successful public research universities show a somewhat different profile. Between 2006 and 2015, the top 10 public universities, measured by 2015 federal research expenditures, saw the state contribution to their revenue drop by a median of 4.7 percent. However, like other universities, these institutions identified a range of income sources beyond state dollars so that state revenue contribution as a percentage of total revenue declined even as the median state contribution in dollar terms increased by about \$2 million. Of course, in the worst case among these top ten, the reduction in the state percentage contribution to revenue also reflected a net loss of state funds over the 2006-2015 period of \$55 million. Among these top 10, all increased their tuition's share of the total budget over the past decade. While the median change in percentage of net tuition and fee dollars was somewhat lower than their public counterparts at 4 percent, the median increase of \$250 million was much greater.

In our work, one of the more useful indicators of research university performance has always been the annual federal research expenditures. Although changes in state support of public research universities over the decade 2006-2015 caused considerable institutional stress, required many readjustments in university operations that affect employment, restructured services, prompted outsourcing, encouraged the development of new programs and the elimination of others, the research mission of most of these institutions remained strong. The median increase in federal research

Top Public Research Universities: Change from 2006 to 2015 in State Funding, Tuition, Students, and Research

Public Research Institutions by Federal Research Expenditures	Net Change in % of State Appropriations	Net Change in State Approp \$ (000s)	Net Change in % of Tuition & Fees	Net Change in Tuition & Fees (000s)	Percent Change in Fall Enrollment	Net Change in Fall Enrollment	Percent Change in Federal Research	Net Change in Federal Research \$ (000s)
Top 125 Public Research Institutions								
Median	-5.7%	\$6,764	6.5%	\$124,380	12.1%	2,504	20.8%	\$10,512
Maximum Increase	5.9%	\$215,140	22.3%	\$720,556	98.2%	18,867	708.7%	\$290,312
Max Decrease/Min Increase	-21.1%	-\$179,132	-16.9%	-\$1,864	-16.6%	-4,921	-58.3%	-\$35,741
Top 10 Public Research Institutions								
Median	-4.7%	\$2,191	4.0%	\$250,186	7.9%	3,106	31.1%	\$143,652
Maximum Increase	-1.8%	\$184,734	10.0%	\$720,556	39.6%	7,098	112.6%	\$290,312
Max Decrease/Min Increase	-12.1%	-\$55,001	2.1%	\$140,772	0.6%	276	-0.2%	-\$1,102

expenditures among these 125 reaches 21% or an increase of \$10.5 million. Among the top 10 research performers the median increase was 31% or about \$144 million. As we have identified over the years in these annual reports, the success of America's public research universities in the federal research competition has been remarkably stable with most of the same institutions continuing their success over the decades. Indeed, even in the difficult times reflected in the 2006-2015 data, the best predictor of the growth in annual federal research expenditures of these institutions is the amount of research expenditures in 2015 (a correlation of .80).

The experience of 49 private research universities over this decade follows much the same pattern as observed among the 125 public institutions, although net tuition and fee dollar increases were slightly higher in the public sector, no doubt reflecting the tuition and fee adjustments made by private institutions over many previous years without the need to adjust to substantial changes in state appropriations. In addition, private institutions showed median increases in federal research dollars that somewhat exceeded those of their public counterparts. However, given the wide range of research performance among these top institutions, both public and private, clear distinctions are difficult to draw. As is the case with public institutions, the best predictor of the change in federal research expenditures between 2006 and 2015 is the amount of federal research expenditures in 2015.

If these high powered, prestigious public and private institutions appear to have managed the transition across the 2008 recession reasonably well, a counter example appears at the other end of the higher education industry among small private colleges with enrollments around 1,500 or less. These institutions are vulnerable to all the forces that challenge higher education. Deferred maintenance, declining college age populations, lower transfer rates from community colleges, higher percentages of tuition discounting to acquire sufficient student numbers to survive, and of course constant competition from public institutions with lower tuition and support from the remaining state subsidies. Between 2005 and 2015, 44 private nonprofit four-year institutions ceased operation. Of these 28 disappeared in the first five years and 16 additional in the second five years.

These institutional failures have attracted significant attention in the higher education press and lend some substance to the notion that American higher education is in a major existential crisis. However, while 44 institutions are a significant number, especially for their alumni, current students, and employees, they represent only 3 percent of institutions in this category and by the time of their failure often had very small remaining enrollment. Although not the topic of this paper, it should be noted that 122 for-profit two-year institutions also failed in the same ten-year period. As a related development, some state systems dealt with small campuses that fell below some reasonable level of survival by combining institutions or institutional

Top Private Research Universities: Change from 2006 to 2015 in Tuition, Students, and Research

Private Research Institutions by Federal Research Expenditures	Net Change in % of Tuition & Fees	Net Change in Tuition & Fees (000s)	Percent Change in Fall Enrollment	Net Change in Fall Enrollment	Percent Change in Federal Research	Net Change in Federal Research \$ (000s)
Top 49 Private Research Institutions						
Median	6.5%	\$121,053	11.8%	1,243	19.5%	\$18,002
Maximum Increase	18.5%	\$409,012	67.8%	10,012	152.6%	\$681,540
Max Decrease/Min Increase	-3.8%	\$5,370	-30.6%	-3,471	-48.9%	-\$17,840
Top 10 Private Research Institutions						
Median	1.5%	\$184,961	12.8%	1,972	26.5%	\$120,950
Maximum Increase	6.5%	\$622,934	30.0%	10,012	52.1%	\$681,540
Max Decrease/Min Increase	-3.0%	\$54,303	-4.3%	-767	2.2%	\$10,288

Note: As is often the case in measuring federal research expenditures, the Johns Hopkins University totals distort some indicators. The maximum increase in the table above would be \$144.1M rather than \$681.5M if we exclude Johns Hopkins.

As an additional recognition of the adjustments made by both public and private research universities in our group, we can observe that almost all institutions, public or private, increased enrollment (all credit earning enrollment) during this period. While the increase reached about the same percentage for the median institution in both groups, the public institutions, increased by just over twice as many students, reflecting the larger student bodies involved. It seems likely that these increases reflect not only strategic pursuit of greater scale but also revenue, for both public and private institutions the median increase in enrollment was accompanied by higher net tuition revenue.

management without necessarily eliminating the physical places.¹⁵

The Constant of Change

The challenge of capturing the changes currently underway in American higher education is to recognize the significance of many trends while at the same time understanding the flexibility and adaptability of this educational industry. Change is a constant of American higher education, and the institutions are remarkably skillful at adopting and absorb-

ing the effects of changes in the external environment without damaging continuing operations or substantially modifying the competitive structure of the business.

Each generation of students, faculty, staff, administrators, legislators, and citizens imagines that the changes of their time represent a critical moment that may force America's colleges and universities to become dramatically different in some fundamental way. And yet, crisis after crisis, the higher education enterprise slowly absorbs the changes that become necessary. Institutions readjust their operations to accommodate destructive pressures on one side and capture emerging opportunities on the other.

To be sure, the universities of today are different in many ways than they were in the 1970s or 1980s. But they still fundamentally operate on much the same basis, compete for the same elements of quality that continue to determine success and reputation, and engage in a constant and endless pursuit of the money that permits them to buy the essential elements of quality. Many of the trends apparent in the past decade or so will continue. Public university state funding will remain a challenge as the many other demands on tax dollars will continue to crowd out higher education needs. Moreover, we anticipate significant differences by state and by institution that make reliable overall predictions about the higher education industry based on aggregate data much less useful for understanding the circumstances of individual institutions.

Those states with growing populations in the 18-24 year-old category will likely see increased state revenue related to enrollment. Moreover, as states introduce various mechanisms of performance-based funding, generally indexed to graduation rates, employment success, or similar measures, the elite public institutions will fare significantly better than others in their states because the elite institutions already have high graduation rates and their graduates already find good employment or significant graduate educational opportunities. This is a function of institutional selectivity which ensures that well-prepared entering students produce successful graduates. Those institutions with less selective admissions struggle to overcome whatever educational deficits some students may have and find it much more difficult to meet high graduation and employment metrics. They also have many students with financial challenges who may take longer to graduate or drop out to take jobs. Institutions, both public and private, in states with declining populations will find recruitment and retention of students much more difficult.¹⁶

The marketplace of 18-24 year-olds appears to have leveled out primarily as a result of stagnant population growth and the already high level of participation in college, making enrollment growth difficult for less selective institutions. This development places increasing pressure on small

public institutions and marginally funded private colleges without the name brand, extensive program options, and resources of more competitive institutions. We can expect these institutions to introduce post-baccalaureate certificate and degree programs and invest in various online education products to allow them to reach more distant audiences and adult and other under-served populations. Whether these strategies will succeed remains to be seen as these marketplaces are increasingly being served by large public institutions and other perhaps better funded providers.¹⁷

As is always the case in American higher education, the best institutions (those with the highest levels of internal quality and thus prestige), whether public or private and whether four year undergraduate colleges or major research universities will continue to prosper, modifying, innovating, and readjusting their programs and activities to take advantage of changes in the economy, in the technologies available for higher education, and in the competitive marketplace for sustaining and renewing institutional quality. Others, less well endowed, less well funded from public sources, challenged to maintain student quality and numbers, and reaching a limit on the net tuition they can collect, will struggle. They have already seen significant changes in curricular structure, in the balance between part-time contingent and tenure or tenure-track faculty, and in the engagement with various systems of technology enabled instruction.

If we were to predict the future structure of American higher education, it does not take much insight to imagine that the separation between elite, semi-elite, generic, and struggling institutions will grow greater. The demographic pressures, the financial challenges, the advent of technology enhanced national competition will all provide an increasing advantage to the elite, the selective, and the well funded. Some number of small colleges will continue to fail, although it is hard to predict the scale of this change. While the elite continue to prosper, mid-range comprehensive universities will experience the greatest change as their faculty continue the trend towards majority part-time and contingent instructors, their programs become increasingly occupationally focused, and they seek combinations, collaborations, and mergers to enhance their scale and competitive position. Some innovations and transformations will be dramatic such as the creation of the Purdue-Kaplan institution, some will be prosaic such as the increased outsourcing of college and university administrative and operational functions.

Yet throughout, the long-standing trends of American higher education are likely to prevail: continuing readjustments to respond to external expectations, opportunities, and constraints performed against the constant background of the intense competition for internal quality.

- 1 For a clear view of the process that produced our current post secondary system see the definitive treatment in Arthur M. Cohen and Carrie B. Kisker, *The Shaping of American Higher Education: Emergence and Growth of the Contemporary System*, (2nd Edition, San Francisco: Jossey-Bass, 2010)
- 2 *National Center for Education Statistics*, Washington DC, 2016. [https://nces.ed.gov/programs/digest/current_tables.asp]
- 3 *The Carnegie Classification of Institutions of Higher Education*, Bloomington IN, 2016 [<http://carnegieclassifications.iu.edu/index.php>]
- 4 The commentary and analysis of the value of higher education to society and individuals is extensive. The following represent but a selection from this conversation. Joseph G. Altonji and Seth D. Zimmerman. "The Costs of and Net Returns to College Major," *NBER Working Paper Series #23029*, National Bureau of Economic Research, January 2017; Richard Vedder and Justin Strehle. "The Diminishing Returns of a College Degree. In the Mid-1970s, Far Less than 1% of Taxi Drivers Were Graduates. By 2010 More than 15% Were," *The Wall Street Journal*, June 4, 2017; Gareth Williams, "Higher Education: Public Good or Private Commodity?" *London Review of Education* (14:1, 2016); Arthur M. Cohen, Carrie B. Kisker, and Florence B. Brower. "The Economy Does Not Depend on Higher Education," *The Chronicle of Higher Education*, October 28, 2013; Robert G. Valletta, "Recent Flattening in the Higher Education Wage Premium: Polarization, Skill Downgrading, or Both?" *NBER Working Paper Series #22935*, National Bureau of Economic Research, December 2016; Anthony P. Carnevale, Tamara Jayasundera, and Artem Gulish. *America's Divided Recovery: College Haves and Have-Nots*. Washington, DC.: Georgetown University, Center on Education and the Workforce, 2016; Roger A. Kaufman, *Mega Planning: Practical Tools for Organizational Success*, Thousand Oaks, CA: Sage Publications, 2000.
- 5 For a collection of work on the topic of research competition see the publications listed on the website of The Center for Measuring University Performance, 2001-2015 [<https://mup.asu.edu/Publications>].
- 6 For an example of the institutional perspective on college quality see *The Ideal College Experience, Two Centuries in the Making* [<https://www.indiana.edu/about>]; *About UC Santa Barbara* [<http://www.ucsb.edu/pop>]; *Pomona College* [<https://www.pomona.edu/about>]; *The Johns Hopkins University: About Us* [<https://www.jhu.edu/about/>]. For alumni achievement see for example *Columbia College Today, Alumni in the News*, June 19, 2017 [<https://www.college.columbia.edu/cct/latest/alumni-news>] or *Montana State University Collegian*, 2016 [<http://www.msua.edu/s/1584/index.aspx?sid=1584&gid=1&pgid=1432>]. These examples can be duplicated for almost every college and university in America.
- 7 *Arizona State University: Prospective Students*, 2017 [<http://www.msua.edu/s/1584/index.aspx>] *University of Chicago Admissions, Academics*, 2017 [<https://collegeadmissions.uchicago.edu/academics>]. For a view of the undergraduate academic programs see for example *Berkeley, Academic Guide, 2017-18* [<http://guide.berkeley.edu/undergraduate/education/#collegerequirementstext>]; Some colleges cater to student preferences through open curricula with many options although nonetheless provide structured majors *Amherst College Open Curriculum and Majors, 2017* [<https://www.amherst.edu/academiclife/open-curriculum>] and [<https://www.amherst.edu/academiclife/departments>]. The websites of every college and university offer similar perspectives on academic opportunities.
- 8 As a clear example of the need to connect online courses to name brand institutional quality see the EdX site at [<https://www.edx.org/>] or the Coursera site at [<https://www.coursera.org/>]. A useful positive view of MOOC programs is available through Educause, Massive Open Online Course (MOOC). Blumenstyk, Goldie. "Same Time, Many Locations: Online Education Goes Back to Its Origins," *The Chronicle of Higher Education*, June 14, 2016. A valuable literature review is in George Veletsianos and Peter Shepherdson, "A Systematic Analysis and Synthesis of the Empirical MOOC Literature Published in 2013-2015," *International Review of Research in Open and Distributed Learning* (17:2, 2016).
- 9 For a clear picture of the challenges electronic technology has brought to university libraries see the articles in the peer reviewed journal portal: *Libraries and the Academy*, The Johns Hopkins University Press, 2001-
- 10 For an overview of state higher education finance see *SHEF: FY 2016 State Higher Education Finance*, State Higher Education Executive Officers Association, Boulder, CO: 2017.
- 11 Seltzer, Rick. "Private Colleges and Universities Increase Tuition Discounting Again in 2016-17," *Inside Higher Ed*, May 15, 2017; The *2016 NACUBO Tuition Discounting Study*, National Association of College and University Business Officers, 2017.
- 12 For an example of the proliferation of occupationally related graduate programs see the website for Baypath University, a small private institution in Longmeadow, Massachusetts. The site lists over 50 certificate, masters, or doctoral programs with specific occupational focus [<http://www.baypath.edu/academics/graduate-programs>]
- 13 University outsourcing of services has been a long standing trend including such activities as food services and bookstores. Many institutions contract with private developers for student housing and other infrastructure projects. Technology services in particular have become key avenues for outside providers as is summarized in Jacqueline Bichsel, "IT Service Delivery in Higher Education: Current Methods and Future Directions," *Educause 2015* [<https://library.educause.edu/~media/files/library/2015/5/ers1501a.pdf?la=en>]. Institutions also outsource online academic services Marc Parry "Outsourced Ed: Colleges Hire Companies to Build Their Online Courses," *The Chronicle of Higher Education*, July 18, 2010 [<http://www.chronicle.com/article/Outsourced-Ed-Colleges-Hire/66309>]. A cursory search for university public-private partnerships will produce many project examples.
- 14 In addition to the items cited above see Goldie Blumenstyk, "Purdue's Purchase of Kaplan Is a Big Bet--and a Sign of the Times," *The Chronicle of Higher Education*, April 28, 2017; Paul Fain, "Purdue Acquires Kaplan University to Create a new Public, Online University under Purdue Brand," *Inside Higher Ed*, April 28, 2017; Robert Shireman, "There's a Reason the Purdue-Kaplan Deal Sounds Too Good to Be True," *The Chronicle of Higher Education*, April 30, 2017.
- 15 U.S. Department of Education, National Center for Education Statistics, IPEDS Fall 2000 through Fall 2014, Institutional Characteristics Component. (Table was prepared July 2016.) The challenges of sustaining small private colleges have been a topic for at least the last fifteen years. John L. Pulley, "How Eckerd's 52 Trustees Failed to See Two-Thirds of Its Endowment Disappear," *The Chronicle of Higher Education*, August 18, 2000. James M. O'Neill, "Survival 101: Small Private Colleges on The Financial Brink," *The Philadelphia Inquirer*, 2001; Martin Van Der Werf, "Mount Senario's Final Act," *The Chronicle of Higher Education*, June 14, 2002; Kent John Chabotar, "What About the Rest of Us? Small Colleges in Financial Crisis," *Change*, (July-August 2010); Mark Keierleber, "Financially Strapped Colleges Grow More Vulnerable as Economic Recovery Lags," *The Chronicle of Higher Education*, March 24, 2014; Lawrence Biemiller, "Survival at Stake In the Aftermath of the Recession, Small Colleges Adapt to a New Market," *The Chronicle of Higher Education*, March 2, 2015; Kellie Woodhouse, "Enrollment Declines Drove Closure of Marian Court College," *Inside Higher Ed*, June 18, 2015; Rick Seltzer, "Vermont Pushes to Combine Public Colleges' Administrations," *Inside Higher Education*, July 27, 2016, and the *University System of Georgia Board of Regents Approves Proposals to Consolidate Institutions*, 2017 [http://www.usg.edu/news/release/board_of_regents_approves_proposals_to_consolidate_institutions]
- 16 For an example of the differential impact of performance-based funding models see the results for the State University System of Florida, *Performance Funding Model* at [http://www.flbog.edu/board/office/budget/performance_funding.php].
- 17 For an interesting presentation on the impact of changing population composition on college enrollment see Luke Juday, "The Demographics of Declining College Enrollment," *Stat Chat, Demographics Research Group*, University of Virginia, October 2, 2014. NCES in "The Condition of Education, Undergraduate Enrollment" (May 2017) provides projections that anticipate flat to gradually rising enrollments nationwide through 2026 [https://nces.ed.gov/programs/coe/indicator_cha.asp]. A short-term view of enrollment changes is available from the *National Student Clearinghouse*, "Current Term Enrollment Estimates - Spring 2017", Research Center, May 23, 2017 [<https://nscresearchcenter.org/currenttermenrollmentestimate-spring2017/>].

APPENDIX

The appendices list the institutions studied and their change between 2006 and 2015 on four key variables: percentage of state appropriations in budget, percentage of net tuition and fees, fall enrollment (undergraduate and graduate), and federal research expenditures. The 174 institutions (125 public and 49 private) included in this study are those that ranked in the top 200 on federal research expenditures between 2006 and 2015. We then excluded those with missing data that could not be reasonably estimated and standalone medical or specialized institutions.

Some universities changed how they report over the ten-year period and we had to combine campuses to make the data comparable. While we prefer to maintain the single campus approach as found in our annual Top American Research University tables for this exercise we felt it was important to leave these institutions in the analysis given their high research performance over the years and the dominance, among most campuses, of the main campus. The combined data are reflected in the institution's name

and include Penn State, Rutgers, Texas A&M, Tennessee, Connecticut, Kansas, and Mississippi. Though we attempt to account for any reporting changes, we recognize there may be others missed as IPEDS data definitions change and how those definitions are interpreted may vary over time within an institution and between institutions.

Finance variables used:

IPEDS Finance GASB - Publics

- F1B01 Net tuition and fees
- F1B11 State appropriations
- F1B25 Total revenue

IPEDS Finance FASB - Privates and a few publics

- F2D0 Net tuition and fees
- F2D03 State appropriations
- F2D18 Total revenue (2006)
- F2D16 Total revenue (2015)

Table A-1. Top Public Research Universities: Change from 2006 to 2015 in State Funding, Tuition, Students, and Research

2015 Federal Research (\$000)*	Institution	Net Change % of State Approp	Net Change in State Approp \$ (\$000)	Net Change in % of Tuition & Fees	Net Change in Tuition & Fees (000s)	Percent Change in Fall Enrollment	Net Change in Fall Enrollment	Percent Change in Federal Research	Net Change in Federal Research \$ (\$000)
851,573	University of Washington - Seattle	-4.5%	-\$55,001	8.0%	\$577,605	14.9%	5,884	30.9%	\$201,179
728,712	University of Michigan - Ann Arbor	-1.8%	-\$23,729	3.4%	\$399,415	9.1%	3,626	28.8%	\$162,973
601,184	University of California - San Diego	-5.4%	\$28,967	2.8%	\$308,320	25.4%	6,659	29.6%	\$137,377
577,574	Univ. of North Carolina - Chapel Hill	-4.9%	\$39,116	3.7%	\$199,123	4.9%	1,367	75.4%	\$248,359
554,658	University of Pittsburgh - Pittsburgh	-2.9%	-\$27,646	10.0%	\$232,892	6.7%	1,789	31.3%	\$132,342
548,063	Georgia Institute of Technology	-12.1%	-\$6,746	8.3%	\$212,442	39.6%	7,098	112.6%	\$290,312
512,206	Penn. State University, all campuses	-4.0%	-\$38,176	4.2%	\$720,556	3.4%	2,586	39.5%	\$144,991
506,910	University of Wisconsin - Madison	-2.5%	\$28,758	2.8%	\$140,772	4.1%	1,688	3.1%	\$15,100
482,771	Univ. of California - Los Angeles	-8.3%	\$184,734	9.9%	\$267,481	14.5%	5,297	-0.2%	-\$1,102
468,482	University of Minnesota - Twin Cities	-5.9%	\$11,128	2.1%	\$209,092	0.6%	276	43.6%	\$142,312
406,941	Ohio State University - Columbus	-4.0%	-\$2,894	0.8%	\$308,865	13.2%	6,845	28.8%	\$91,027
342,042	University of California - Berkeley	-14.6%	-\$111,563	8.6%	\$437,675	12.6%	4,269	30.7%	\$80,324
341,828	University of Colorado - Boulder**			-0.4%	\$210,142	4.4%	1,391	52.8%	\$118,162
333,413	Rutgers, all campuses + UMDNJ	-8.3%	-\$179,132	9.9%	\$414,218	21.9%	12,119	23.3%	\$63,034
332,079	University of Maryland - College Park	1.7%	\$137,583	2.7%	\$144,219	8.7%	3,038	58.3%	\$122,315
331,388	University of Texas - Austin	-2.1%	\$16,870	1.9%	\$135,962	2.5%	1,253	21.3%	\$58,241
330,479	Univ. of Illinois - Urbana-Champaign	-6.7%	-\$21,662	6.0%	\$359,013	7.3%	3,104	24.9%	\$65,834
325,008	University of Alabama - Birmingham	-3.6%	\$5,119	2.7%	\$95,317	10.7%	1,772	10.9%	\$32,046
322,919	University of California - Davis	-8.0%	-\$34,637	2.1%	\$241,105	18.8%	5,558	30.1%	\$74,729
291,714	Texas A&M University + Hlth Sci. Ctr.	-6.6%	\$151,222	3.5%	\$302,363	36.7%	17,121	20.8%	\$50,258
281,317	University of Florida	-10.7%	\$42,217	4.7%	\$223,315	-0.5%	-267	13.3%	\$32,995
270,311	University of Utah	-4.3%	\$38,321	1.1%	\$161,576	3.5%	1,081	54.6%	\$95,423
266,147	University of Colorado - Denver**			1.7%	\$124,380	17.4%	3,509	20.3%	\$44,933

* Indiana U., IUPUI, and U. Oklahoma 2015 Federal Research is based on preliminary estimate.

** The methods used by Colorado to fund state appropriations changed, which made comparisons unreliable so we did not include those data.

**Appendix A-1. Top Public Research Universities: Change from 2006 to 2015
in State Funding, Tuition, Students, and Research (cont.)**

2015 Federal Research (\$000)*	Institution	Net Change % of State Approp	Net Change in State Approp \$ (\$000)	Net Change in % of Tuition & Fees	Net Change in Tuition & Fees (000s)	Percent Change in Fall Enrollment	Net Change in Fall Enrollment	Percent Change in Federal Research	Net Change in Federal Research \$ (\$000)
265,878	University of Arizona	-14.8%	-\$84,147	12.2%	\$361,270	15.7%	5,790	-11.8%	-\$35,741
256,228	Michigan State University	-9.5%	-\$83,341	11.1%	\$424,227	11.0%	5,018	51.5%	\$87,112
250,457	University of Cincinnati - Cincinnati	-0.4%	\$19,281	16.3%	\$209,177	27.2%	7,715	24.1%	\$48,715
223,730	University of Iowa	-7.5%	-\$54,480	1.8%	\$181,320	7.0%	2,028	3.3%	\$7,209
213,685	Colorado State University	0.2%	\$2,355	7.3%	\$177,724	10.8%	2,978	17.0%	\$31,037
209,005	Purdue University - West Lafayette	-3.6%	\$23,569	8.0%	\$260,487	-0.3%	-137	32.8%	\$51,567
199,818	University of Hawaii - Manoa	-5.7%	-\$1,419	7.8%	\$93,749	-7.3%	-1,492	-1.3%	-\$2,601
196,215	University of South Florida - Tampa	-8.4%	-\$4,848	7.0%	\$119,217	-3.6%	-1,569	27.6%	\$42,478
196,058	North Carolina State University	-4.6%	\$81,588	5.9%	\$135,034	9.3%	2,885	49.4%	\$64,796
192,930	University of Illinois - Chicago	-5.5%	-\$33,231	2.6%	\$160,155	17.9%	4,404	-5.4%	-\$10,945
191,080	Virginia Polytechnic Inst. and St. U.	-8.7%	\$3,264	6.5%	\$196,885	14.7%	4,193	59.2%	\$71,086
186,890	Arizona State University	-15.5%	-\$30,526	18.4%	\$671,600	25.9%	18,867	70.1%	\$76,997
186,676	University of Virginia	-2.3%	-\$8,364	3.4%	\$222,972	-0.8%	-185	-8.4%	-\$17,102
174,146	University at Buffalo	-6.5%	\$29,920	8.3%	\$116,623	7.1%	1,973	13.7%	\$20,994
170,622	University of California - Irvine	-4.0%	\$31,836	6.0%	\$263,196	22.2%	5,606	0.4%	\$639
151,619	Univ. of New Mexico - Albuquerque	-5.2%	\$37,107	0.1%	\$48,819	6.1%	1,564	18.5%	\$23,712
150,625	Oregon State University	-11.0%	\$15,299	1.5%	\$160,389	52.8%	10,224	29.2%	\$34,039
145,829	Indiana U. - Purdue U - Indianapolis	-1.9%	\$18,322	5.7%	\$110,244	1.2%	341	42.4%	\$43,448
145,097	University of Kentucky	-7.2%	-\$34,682	2.4%	\$155,669	12.7%	3,345	-4.1%	-\$6,141
140,964	Univ. of Tennessee - Knoxville + HSC	-4.4%	-\$85,375	8.1%	\$90,649	-3.7%	-1,056	7.9%	\$10,274
135,349	Univ. of Connecticut + Health Center	-2.3%	\$215,140	0.6%	\$138,145	11.0%	3,143	8.4%	\$10,512
133,569	Florida State University	-7.1%	\$30,130	8.8%	\$137,281	2.1%	857	21.0%	\$23,211
128,374	University of Kansas + Medical Ctr.	-3.9%	-\$7,576	5.8%	\$104,668	-5.8%	-1,664	11.1%	\$12,852
127,825	University of Georgia	-13.0%	-\$18,653	9.6%	\$217,674	6.4%	2,171	38.0%	\$35,173
123,665	Virginia Commonwealth University	-8.2%	\$10,685	7.6%	\$157,044	2.4%	729	26.7%	\$26,089
121,627	Washington State Univ. - Pullman	-11.6%	-\$30,939	9.5%	\$159,219	25.5%	6,031	49.6%	\$40,303
119,945	Temple University	-4.8%	-\$41,098	3.1%	\$323,277	12.2%	4,142	135.6%	\$69,041
119,811	Utah State University	-2.6%	\$44,108	9.0%	\$78,887	98.2%	14,178	24.5%	\$23,569
115,031	Stony Brook University	-5.6%	\$80,324	3.2%	\$122,333	12.2%	2,750	1.8%	\$2,058
114,596	Univ. of California - Santa Barbara	-7.6%	-\$2,566	11.1%	\$170,569	11.5%	2,415	7.9%	\$8,427
113,443	Iowa State University	-8.5%	\$4,783	7.6%	\$163,619	40.3%	10,252	8.5%	\$8,890
109,258	University of Delaware	-3.6%	-\$2,411	14.0%	\$195,333	12.1%	2,472	37.2%	\$29,618
108,221	Wayne State University	-6.5%	-\$25,867	9.2%	\$101,747	-15.4%	-4,921	-8.3%	-\$9,821
102,852	University of Missouri - Columbia	-4.1%	-\$1,677	3.8%	\$156,730	25.7%	7,240	1.1%	\$1,120
97,206	Univ. of Massachusetts - Amherst	-6.0%	\$48,329	4.8%	\$145,288	14.4%	3,676	40.5%	\$28,030
94,763	University of Nebraska - Lincoln	-4.9%	\$53,109	4.9%	\$101,640	14.3%	3,154	17.4%	\$14,032
91,249	University of California - Santa Cruz	-2.2%	\$48,939	7.9%	\$118,725	16.3%	2,504	37.4%	\$24,859
84,723	Univ. of South Carolina - Columbia	-11.6%	-\$44,317	7.6%	\$176,375	23.1%	6,334	-5.1%	-\$4,571
83,733	University of Vermont	-1.5%	\$3,514	8.8%	\$112,164	8.0%	945	1.5%	\$1,214
83,106	Univ. of New Hampshire - Durham	-3.5%	-\$6,549	8.4%	\$76,002	3.7%	540	-3.8%	-\$3,310
82,276	Louisiana State Univ. - Baton Rouge	-14.0%	-\$67,544	7.5%	\$143,195	5.3%	1,599	3.9%	\$3,115
81,788	University of Central Florida	-9.1%	\$56,990	10.2%	\$167,078	35.0%	16,307	115.4%	\$43,814
79,181	Mississippi State University	-2.0%	\$34,690	6.7%	\$67,415	28.8%	4,667	-15.8%	-\$14,892
78,985	University of Alaska - Fairbanks	4.8%	\$64,918	1.5%	\$16,168	3.6%	298	-19.7%	-\$19,345
78,824	University at Albany	4.8%	\$36,955	6.0%	\$35,963	-1.5%	-256	-24.1%	-\$25,011
78,524	Indiana University - Bloomington	-7.1%	-\$11,752	12.3%	\$341,044	26.8%	10,267	15.0%	\$10,270
78,253	New Mexico State Univ. - Las Cruces	2.2%	\$19,100	4.6%	\$23,945	-5.6%	-925	-23.2%	-\$23,596
67,293	Florida International University	-6.9%	\$56,368	12.6%	\$176,134	31.0%	11,785	46.6%	\$21,399
66,632	Kansas State University	-13.9%	-\$4,758	3.3%	\$106,547	4.3%	1,005	26.6%	\$13,983
66,608	West Virginia University	-7.8%	\$14,494	6.1%	\$174,391	6.1%	1,661	4.5%	\$2,844
66,564	University of Alabama - Huntsville	0.8%	\$705	13.8%	\$26,117	10.9%	775	49.1%	\$21,928

**Appendix A-1. Top Public Research Universities: Change from 2006 to 2015
in State Funding, Tuition, Students, and Research (cont.)**

2015 Federal Research (\$000)*	Institution	Net Change % of State Approp	Net Change in State Approp \$ (\$000)	Net Change in % of Tuition & Fees	Net Change in Tuition & Fees (000s)	Percent Change in Fall Enrollment	Net Change in Fall Enrollment	Percent Change in Federal Research	Net Change in Federal Research \$ (\$000)
66,100	University of Louisville	-10.8%	-\$26,178	4.7%	\$99,478	2.5%	509	-6.2%	-\$4,381
62,827	Montana State University - Bozeman	0.7%	\$21,267	8.1%	\$58,004	26.4%	3,184	-16.6%	-\$12,535
62,642	University of California - Riverside	-2.3%	\$76,916	10.1%	\$163,982	26.7%	4,510	8.0%	\$4,619
61,085	University of Rhode Island	-9.2%	-\$13,266	6.0%	\$84,896	10.3%	1,551	30.3%	\$14,187
60,230	University of Oklahoma - Norman	-4.0%	\$18,186	9.3%	\$142,460	5.8%	1,505	23.8%	\$11,581
58,797	Univ. of Mississippi + Medical Center	-6.1%	\$70,347	3.1%	\$140,845	38.0%	6,394	-13.2%	-\$8,920
56,448	University of Oregon	-6.6%	-\$9,065	5.8%	\$186,480	18.1%	3,684	21.2%	\$9,865
54,516	University of Houston - University Park	-6.2%	\$6,764	8.2%	\$160,594	24.4%	8,370	41.4%	\$15,957
54,113	George Mason University	-10.9%	\$4,799	6.6%	\$171,698	13.5%	4,040	50.7%	\$18,202
50,554	New Jersey Institute of Technology	-10.2%	\$9,800	7.6%	\$63,997	38.0%	3,116	42.4%	\$15,065
49,977	University of Nevada - Reno	-8.6%	-\$37,401	9.4%	\$58,901	25.4%	4,235	-22.5%	-\$14,499
49,591	University of Idaho	-5.3%	-\$541	7.5%	\$37,432	-3.1%	-367	5.5%	\$2,573
47,939	Auburn University	-10.8%	\$238	9.0%	\$176,069	15.9%	3,740	5.3%	\$2,399
47,591	Univ. of Maryland - Baltimore County	0.4%	\$37,645	2.7%	\$42,819	17.3%	2,041	6.2%	\$2,761
47,232	University of Wyoming	-0.9%	\$86,013	0.7%	\$22,633	-4.2%	-555	82.8%	\$21,388
45,292	Clemson University	-9.4%	-\$28,333	11.3%	\$149,981	31.1%	5,389	-19.5%	-\$10,976
43,526	San Diego State University	-15.6%	-\$36,222	10.9%	\$93,454	2.4%	813	23.1%	\$8,175
41,721	Cleveland State University	-5.6%	\$1,040	7.0%	\$49,938	14.2%	2,108	708.7%	\$36,562
40,334	University of Texas - El Paso	-0.1%	\$23,892	6.3%	\$46,339	17.9%	3,555	108.6%	\$21,003
38,498	Oklahoma State University - Stillwater	-6.3%	\$23,962	7.9%	\$114,551	10.4%	2,431	1.5%	\$555
37,900	City University of NY - City College	-12.7%	\$41,561	-4.4%	\$18,346	19.9%	2,623	77.0%	\$16,492
37,457	University of North Dakota	0.3%	\$44,204	-4.6%	\$37,998	16.5%	2,117	-3.6%	-\$1,391
36,843	Georgia State University	-18.3%	-\$7,091	4.4%	\$116,157	22.7%	5,923	47.6%	\$11,875
35,037	North Dakota State University	0.9%	\$48,869	3.0%	\$51,163	18.4%	2,258	-22.9%	-\$10,381
35,033	University of Maine - Orono	-3.4%	\$374	7.4%	\$33,124	-7.4%	-875	-15.4%	-\$6,361
33,617	University of Montana - Missoula	3.9%	\$24,981	-0.7%	\$19,653	-6.3%	-881	1.7%	\$578
33,578	Colorado School of Mines**			11.0%	\$73,400	39.0%	1,697	63.5%	\$13,035
33,486	University of Arkansas - Fayetteville	-6.2%	\$32,509	7.8%	\$105,684	49.3%	8,828	4.9%	\$1,560
31,250	San Jose State University	-21.1%	-\$22,576	10.0%	\$98,914	10.7%	3,169	34.7%	\$8,053
30,776	University of Texas - Dallas	-6.9%	\$28,842	15.3%	\$166,920	69.1%	10,031	54.2%	\$10,822
28,998	University of Massachusetts - Lowell	-15.6%	\$15,368	6.8%	\$95,302	61.0%	6,840	54.7%	\$10,257
28,581	Michigan Technological University	-10.0%	-\$1,870	9.4%	\$42,441	10.3%	672	52.4%	\$9,824
28,488	South Dakota State University	-11.4%	\$6,967	4.5%	\$43,074	11.3%	1,273	122.8%	\$15,700
28,029	University of Alabama - Tuscaloosa	-9.9%	\$292	22.3%	\$317,297	55.6%	13,260	22.7%	\$5,182
27,857	Old Dominion University	-9.0%	\$29,624	6.4%	\$74,972	14.1%	3,047	1.3%	\$351
27,722	College of William and Mary	-5.2%	\$14,990	7.2%	\$86,571	10.1%	775	-4.8%	-\$1,399
26,970	University of Nevada - Las Vegas	-6.1%	-\$20,295	9.7%	\$68,740	2.5%	688	-36.9%	-\$15,802
26,858	University of Texas - Arlington	-10.0%	\$15,788	7.8%	\$124,205	69.1%	17,163	41.3%	\$7,852
26,814	Wright State University - Dayton	-2.6%	-\$6,406	11.1%	\$42,751	6.1%	982	19.5%	\$4,384
26,700	Florida A&M University	0.7%	\$1,184	2.4%	\$6,699	-16.6%	-1,979	7.2%	\$1,798
26,428	University of Toledo	-9.6%	\$30,939	-16.9%	\$65,816	5.2%	1,003	59.8%	\$9,894
25,458	Texas Tech University	-13.0%	\$30,315	-9.2%	\$117,263	28.1%	7,863	14.3%	\$3,180
24,710	University of Southern Mississippi	-0.4%	\$8,523	6.0%	\$27,505	-1.5%	-226	-28.5%	-\$9,867
24,222	University of Wisconsin - Milwaukee	-1.7%	\$35,857	-1.0%	\$59,943	-5.6%	-1,583	52.7%	\$8,355
23,389	Portland State University	-10.4%	\$5,150	-11.2%	\$66,605	13.3%	3,234	24.4%	\$4,592
23,108	University of Texas - San Antonio	-1.2%	\$28,289	6.2%	\$73,965	1.4%	408	14.0%	\$2,831
19,975	New Mexico Inst. of Mining and Tech.	5.9%	\$11,293	3.5%	\$5,800	17.3%	317	-58.3%	-\$27,926
18,449	Jackson State University	-0.3%	\$4,098	4.3%	\$11,812	18.7%	1,546	-40.1%	-\$12,334
18,177	University of Puerto Rico - Rio Piedras	4.6%	\$57,183	-1.4%	-\$1,864	-13.7%	-2,621	7.7%	\$1,296
17,306	Missouri Univ. of Science and Tech.	-3.7%	\$6,318	17.5%	\$48,522	51.7%	3,028	-22.6%	-\$5,045
9,286	South Dakota Sch. of Mines and Tech.	-7.9%	\$4,355	8.3%	\$13,353	52.1%	1,106	-5.6%	-\$548

**Table A-2. Top Private Research Universities:
Change from 2006 to 2015 in Tuition, Students, and Research**

2015 Federal Research (\$000)*	Institution	Net Change in % of Tuition & Fees	Net Change in Tuition & Fees (000s)	Percent Change in Fall Enrollment	Net Change in Fall Enrollment	Percent Change in Federal Research	Net Change in Federal Research \$ (\$000)
1,988,993	Johns Hopkins University	0.8%	\$216,439	15.1%	2,978	52.1%	\$681,540
645,633	Stanford University	-3.0%	\$118,448	-4.3%	-767	19.5%	\$105,564
597,791	University of Pennsylvania	-0.6%	\$246,123	4.8%	1,133	24.9%	\$119,018
577,833	Columbia University	6.5%	\$421,656	25.9%	5,769	28.1%	\$126,646
558,566	Duke University	1.3%	\$153,482	19.5%	2,611	34.8%	\$144,147
530,382	Harvard University	5.7%	\$257,853	15.0%	3,874	31.5%	\$126,924
486,650	Massachusetts Institute of Technology	1.7%	\$132,651	10.5%	1,078	2.2%	\$10,288
471,381	Yale University	1.2%	\$54,303	8.5%	970	35.3%	\$122,881
424,723	Washington University in St. Louis	2.4%	\$133,123	10.0%	1,333	4.0%	\$16,321
408,105	University of Southern California	1.7%	\$622,934	30.0%	10,012	22.4%	\$74,727
390,701	Vanderbilt University	-0.1%	\$84,038	8.3%	960	30.1%	\$90,278
385,868	Northwestern University	4.4%	\$171,971	17.1%	3,169	54.4%	\$135,888
346,534	Emory University	0.9%	\$121,957	11.8%	1,450	29.4%	\$78,640
326,691	New York University	-3.8%	\$626,083	22.4%	9,157	72.6%	\$137,415
307,960	Case Western Reserve University	9.6%	\$94,472	18.2%	1,748	0.3%	\$980
302,781	Cornell University	9.6%	\$181,140	11.5%	2,265	19.5%	\$49,504
291,397	University of Chicago	2.0%	\$129,660	7.9%	1,128	15.0%	\$37,926
269,156	California Institute of Technology	0.7%	\$17,200	8.1%	169	8.3%	\$20,565
261,023	University of Rochester	1.8%	\$128,000	25.5%	2,259	-6.2%	-\$17,376
256,562	Boston University	12.6%	\$335,446	1.9%	584	7.5%	\$18,002
214,976	University of Miami	-2.9%	\$175,224	7.4%	1,155	42.9%	\$64,568
187,259	Carnegie Mellon University	8.1%	\$209,296	29.6%	2,964	1.0%	\$1,870
180,791	Yeshiva University	9.0%	\$17,498	-0.3%	-17	17.6%	\$27,006
157,867	Princeton University	-0.1%	\$19,309	14.9%	1,053	34.0%	\$40,022
148,084	Wake Forest University	6.5%	\$106,284	16.3%	1,098	6.1%	\$8,535
145,807	Dartmouth College	4.8%	\$74,094	10.4%	597	3.8%	\$5,377
135,667	George Washington University	4.2%	\$212,927	6.9%	1,681	80.4%	\$60,458
127,886	Brown University	13.1%	\$117,584	16.4%	1,333	31.9%	\$30,964
120,181	Tufts University	15.9%	\$121,053	15.6%	1,499	25.2%	\$24,217
87,268	Georgetown University	4.4%	\$211,006	30.5%	4,311	-5.4%	-\$5,000
84,143	Tulane University	8.4%	\$142,088	22.0%	2,248	0.1%	\$91
82,615	University of Notre Dame	1.8%	\$82,088	5.9%	689	48.3%	\$26,905
78,379	Northeastern University	12.6%	\$409,012	-14.8%	-3,471	117.3%	\$42,308
74,548	University of Dayton	8.7%	\$83,098	7.1%	747	31.3%	\$17,769
73,817	Rice University	12.5%	\$76,873	33.7%	1,695	37.0%	\$19,937
67,226	Drexel University	13.9%	\$330,766	28.9%	5,735	-1.9%	-\$1,273
59,417	Rensselaer Polytechnic Institute	11.1%	\$78,840	4.5%	302	33.0%	\$14,727
46,764	Brandeis University	14.5%	\$60,625	8.3%	439	13.5%	\$5,580
38,051	Howard University	7.1%	\$48,003	-7.1%	-769	8.8%	\$3,092
27,380	Loyola University Chicago	14.1%	\$138,428	8.2%	1,243	7.7%	\$1,960
27,343	Saint Louis University - St. Louis	8.9%	\$73,344	14.4%	2,150	-39.5%	-\$17,840
26,769	Syracuse University	17.3%	\$198,823	14.2%	2,707	5.8%	\$1,470
25,743	Worcester Polytechnic Institute	17.1%	\$83,737	67.8%	2,655	152.6%	\$15,550
25,479	Illinois Institute of Technology	15.7%	\$77,519	15.5%	1,045	33.3%	\$6,358
25,054	Stevens Institute of Technology	12.8%	\$75,970	31.7%	1,530	11.3%	\$2,553
21,082	Loma Linda University	14.8%	\$67,968	15.7%	609	-26.8%	-\$7,706
20,680	Lehigh University	18.5%	\$60,762	2.9%	196	13.3%	\$2,432
17,409	Boston College	5.8%	\$115,145	-2.1%	-307	-5.1%	-\$935
14,609	Hampton University	5.5%	\$5,370	-30.6%	-1,883	-48.9%	-\$13,965

*Cornell's 2015 Federal Research is based on preliminary estimate.

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