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Funding and the Future of U.S. Public Research Universities

Innovation through research is a critical element to a nation's success in the highly competitive global marketplace. University research provides the base from which an important part of the most competitive innovations arise. The modern research university, with synergy flowing from a mix of research, graduate study and undergraduate instruction, is vital to simultaneously generating needed knowledge while also educating future generations of researchers and able graduates primed to take advantage of research findings. In the U.S. the very high proportion of research and graduate education done by public universities makes their futures key the future competitive success of the country.

The United States depends on public research universities to:

- Educate 85 percent of undergraduate students and 70 percent of graduate students enrolled in *all* research universities.
- Educate more than 50 percent of the doctorates produced annually in the United States in 11 of the 13 national needs categories, including 92 percent of doctoral degrees in agriculture, nearly 90 percent in natural resources and conservation, and 60 to 80 percent in computer and information sciences, engineering, foreign languages and linguistics, mathematics and statistics, physical sciences and security.
- Serve as the primary route to a research university degree for minority students, with more than 800,000 minority students enrolled in public research universities while just over 182,000 attend private institutions.
- Perform about 60 percent of the nation's federally funded academic research, some \$34 billion annually.
- Serve as an engine for the economy—research at public universities in fiscal

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This manuscript is derived from a longer work by the authors titled Forging a Foundation for the Future, available at <http://www.aplu.org/NetCommunity/Document.Doc?id=2263>.

year 2008 led to:

- 358 start-up companies,
- 2,891 new technology licenses (16,555 are actively in force),
- 6,460 applications for new patents, and
- 1,791 patents.¹

In recent decades and accelerating in the last two years, the state appropriation per student for many U.S. research universities has deteriorated and their ability to continue serve the nation's research needs is threatened. In addition, both public and private research universities have been harmed financially as endowment balances declined along with the markets. The nation's web of public and private research universities is interdependent; significant weakening of major research universities reduces the ability of the system to serve the nation's needs. Strong public and strong private universities are essential to this nation's future prosperity.

In 2005, the National Academy of Sciences published *Rising Above the Gathering Storm*, a landmark report recommending many courses of action to ensure the future competitiveness of the U.S. economy. Among its recommendations directly targeting research universities were:

Sustain and strengthen the nation's traditional commitment to long-term basic research . . .² become the most attractive setting in which to study and perform research so that we can develop, recruit, and retain the best and brightest students, scientists, and engineers from within the United States and throughout the world³ and ensure that universities and government laboratories create and maintain the facilities, instrumentation, and equipment needed for leading-edge scientific discovery and technological development.⁴

While many of the report's recommendations have been or are being implemented by actions at the federal level, the long-term reduction of real funding from the states to the nation's public universities has reduced the ability of many of them to contribute to these goals. Given the national reliance on public universities for majority contributions to the nation's need to advance knowledge and prepare new scientists and engineers, a serious decline in the capacity of public research universities critically risks the attainment of these national goals.

Concern about the future health of research universities is shared broadly. Just as *Rising Above the Gathering Storm* was initiated by a request from members of Congress, Senators Barbara Mikulski (D-MD) and Lamar Alexander (R-TN) and Representatives Bart Gordon (D-TN) and Ralph Hall (R-TX) asked the National Academy of Sciences on June 22, 2009 to initiate a new competitiveness study focused specifically on the health of research universities. Their request expressed concern that America's research universities were "at risk" and asked the National Academies to study the competitive position of American research universities, both public and private, and respond to the following question:

What are the top ten actions that Congress, state governments, research universities, and others could take to assure the ability of the American research university to maintain the excellence in research and doctoral education needed to help the United States compete, prosper and achieve national goals for health, energy, the environment, and security in the global community of the 21st century.⁵

The National Academies agreed to perform the study and it is scheduled to begin its work in 2010.

STATE SUPPORT FOR PUBLIC RESEARCH UNIVERSITIES IS DECLINING

Our focus is on public research universities because evidence of their deteriorating financial situation forces consideration of their critical ability to serve the nation's needs in the future. Writing in *The Chronicle of Higher Education* this year, Paul Courant, James Duderstadt and Edie Goldenberg describe a “failing” partnership between the states and federal government:

Today, the state side of the partnership is failing. Public institutions of higher education are gravely threatened. State support of public universities, on a per student basis, has been declining for over two decades; it was at the lowest level in 25 years even before the current economic crisis. As the global recession has deepened, declining tax revenues have driven state after state to further reduce appropriations for higher education, with cuts ranging as high as 20% to 30%, threatening to cripple many of the nation's leading state universities and erode their world-class quality.⁶

The decline in state support during the period 1987-2007 has been especially severe at public universities classified by the Carnegie Foundation as “high” and “very high” research universities. Real per full-time enrolled (FTE) student state appropriations revenue declined 13.2 percent at very high research public universities and 12.9 percent at the high research publics. This stands in contrast to the slightly smaller real decline of 9.1 percent for all state higher education per FTE student.

GROWING PUBLIC/PRIVATE RESOURCE DIFFERENCES

One potentially important indicator of public universities' future capacity is their position relative to private research universities. We do not make these comparisons to argue public research universities should be funded on par with private universities; rather we point out the funding disparity. A growing public/private research university salary, teaching load and student selectivity divide was first illustrated by the work of Thomas Kane and Peter Orszag⁷ (Director of the Office of Management and the Budget in President Obama's administration) in 2003. In faculty salaries, where parity between very high public and private research univer-

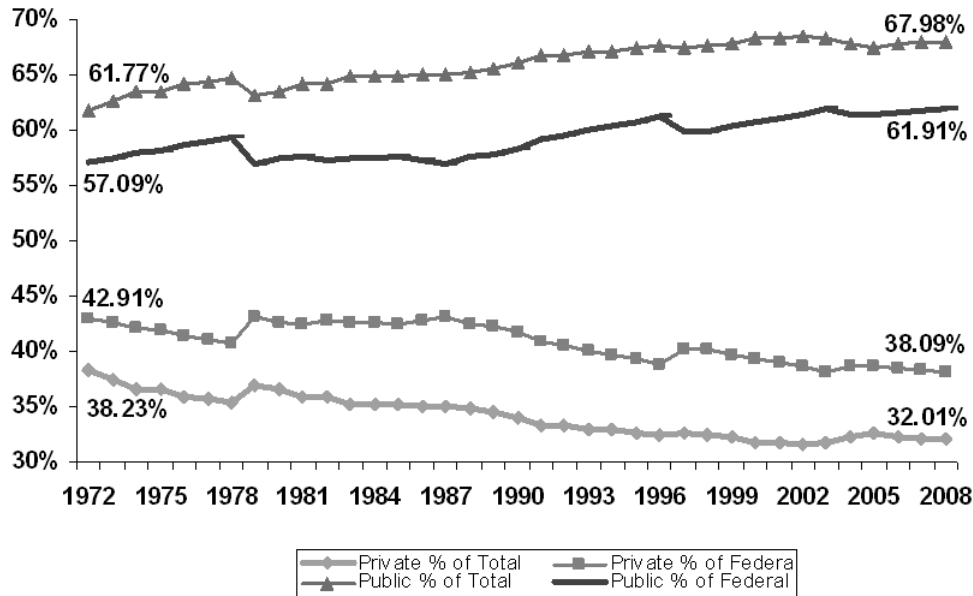


Figure 1. Public and Private University Percentage of Total University R&D and Federal R&D Expenditures.

sities was achieved in the decades of the 1970s, a 15 to 20 percent salary gap now exists.⁸

If public universities should fail to be competitive for research grants or have to shrink the size of their student bodies due to budget restrictions, private research universities are unlikely to have available capacity to replace the lost output. Since the preponderance of enrollment growth in four-year university education has occurred among public universities in the past 50 years, there is reason to doubt whether private universities can or would expand enrollment in response to a decline in capacity to enroll students at public institutions.

PUBLIC UNIVERSITIES REMAIN STRONG COMPETITORS

We have no evidence to show the resource challenges facing public universities have caused the quality of instruction to decline, nor research quality to suffer either in absolute terms, or in comparison with private universities.⁹ Since Council of Graduate Schools studies generally find links between adequately funded doctoral studies and time to degree, it would not be surprising to find that the funding picture we describe here is an adverse impact on doctoral students. We know that despite the growing revenue disadvantage per student, public research universities have slightly increased the proportion of federal grants they receive. However, with their rapidly diminishing ability to compete head-to-head with private universities for the best faculty and students, one has to worry that some

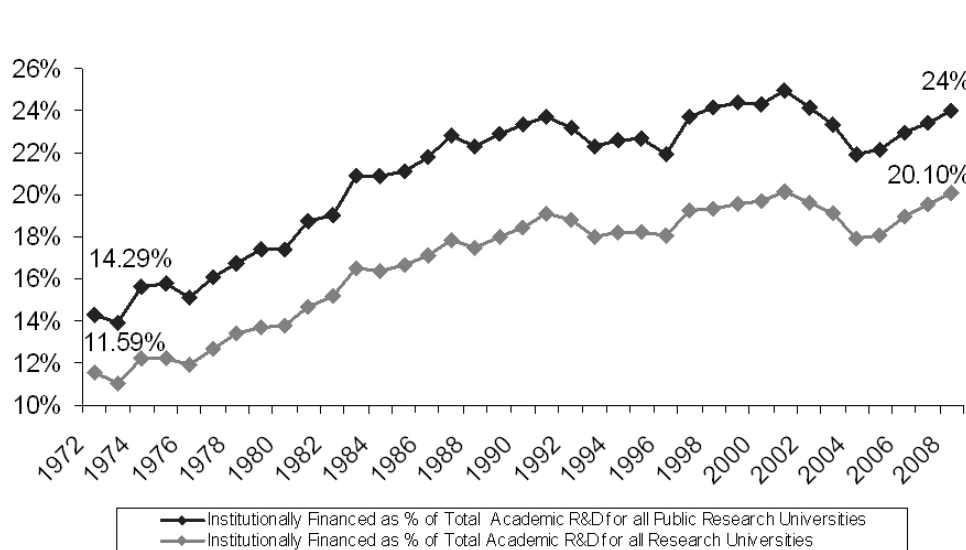


Figure 2. Institutionally Funded Research Expenditure as a Percent of All University Research and Development Expenditures

Source: Federal Funds for R&D for various years, National Science Foundation
<http://www.nsf.gov/statistics/fedfunds/>

decline in the quality of teaching and/or research at public research universities may be in the offing.

The mechanism through which the effect of relatively smaller resources at public universities than at private universities is transmitted is the labor market. Lower pay, higher teaching loads and a smaller proportion of high-ability students makes faculty positions at public universities less attractive. On each of these dimensions, the level of competitiveness of public universities has steadily worsened over the last 20 years and the private minus public gap is now quite noticeable. Today private universities have a competitive advantage over public universities when competing for faculty. It would be a strange market if the employers offering the best pay and working conditions did not use that ability to hire the most productive faculty members.

FEDERAL FUNDING AGENCIES ARE NOT PAYING THE FULL COST OF RESEARCH

Threatening both public and private research universities is the failure of U.S. research funding agencies to cover the total cost of the research projects they sponsor.

In March, 2008, COGR released its study, *Finances of Research Universities*. This detailed analysis estimated the university subsidy to all research, federal and non-federal, exceeded \$2.3 billion per year, and “a majority of that subsidy can be attributed to federal programs.”¹⁰ Their analysis relied on data from the National

Science Foundation's (NSF) annual survey on Research and Development (R&D) Expenditures at Universities and Colleges. The data element from that survey relevant to this matter is the ratio of university Institutional Funds used to support research to all academic R&D expenditures. Total university R&D amounted to \$51.9 billion in 2008; federally funded R&D, \$31.4B billion, and university-funded R&D, \$10.4 billion. Thus, university-funded R&D was 33.4 percent of federal-funded R&D in 2008.

COGR's thorough study describes a problem facing public and private universities alike: under-funding true facilities and administration costs associated with federal grants. Interestingly, universities receive lower indirect payments than do federal laboratories and industrial laboratories. RAND reports a 1996 study of indirect cost payments by Arthur Andersen found, "As a fraction of total costs, universities had the lowest percentage classified as indirect (31 percent). Federal laboratories were somewhat higher at 33% and industrial laboratories were higher still at 36%."¹¹

The COGR report relies on the *increasing* proportion of total R&D that is funded by institutional funds to argue that under-funding universities to perform federal R&D is a growing problem. They conclude "the risk is that additional financial burdens will move universities closer to a 'tipping point'. The result could be decline in the quality of research infrastructure and compliance initiatives, as well as a gradual degradation of research laboratories and facilities."¹²

SIGNS THAT FUNDING PROBLEMS ARE PRODUCING NEGATIVE EFFECTS

Thus public universities have been steadily losing real state appropriated base funding for decades. Their weaker state funding base combined with the superior ability of private universities to raise funding through endowment giving and tuition charges have produced relative weakening of public universities ability to compete for the quality staff and resources needed for research productivity. Both public and private research universities have experienced resource losses due to the impact of the financial market meltdown in late 2008 and 2009. Both public and private are funding and increasing proportion of the cost of federally sponsored research.

Perhaps a harbinger of the first stages of research decline by public universities is the recent National Bureau of Economic Research (NBER) working paper by James Adams.¹³ He found that the number of citations to published scholarly papers by faculty members at public universities in the United States is failing to keep pace with the flow from their private counterparts. His statistical investigation revealed a slowdown in the growth of resources was closely associated with this development. The abstract of his piece states the connection: "These developments can be traced to slower growth in tuition and state appropriations in public universities compared to revenue growth, including from endowment, in private universities."¹⁴

The relative decline in citations to published scholarly articles in journals that select papers after careful peer review could suggest a relative decline in the productivity of public university researchers already has occurred. If so, this is not a positive sign for graduate education and for future competitiveness for federal research grants.

Any decline in the quality or output of research from U.S. public universities, could impact the nation's global standing. Confirming evidence of the United States' relative decline in scholarly publications comes from a recent study reported by the *Financial Times*.¹⁵ It found China, Brazil and India led the United States in the rate of growth in scholarly publications from 1990 to 2008. While the United States remains the largest producer of scholarly journal articles, China is now second and, "if it continues on its trajectory it will be the largest producer of scientific knowledge by 2020." Evidence of this change can be found in the rapidly multiplying international rankings of universities and the declining dominance of U.S. institutions. While there is some disagreement about the importance given to these rankings,¹⁶ there is much evidence emerging that the energy and resources being invested in universities worldwide will challenge U.S. dominance in higher education in the future. Further funding losses in the large public sector American research universities can only hasten the decline.

EFFORTS TO UNDERSTAND AND RESOLVE THE FUNDING PROBLEMS

With the assistance of five member universities APLU conducted regional meetings of public research universities during April 2010 to consider the funding problem and to develop approaches that might help resolve them. For example, participants examined whether compacts might be formed with their states to align university efforts with state needs in return for adequate funding. The Facilities and Administration (overhead) negotiated rate setting process was examined and facets of it which might lead to underpayment of research cost were examined. Finally, the changing relationship over time between the locus of benefit from research university activities and the geographic jurisdictions of funders of those activities was considered in some detail. Perhaps better realignment of benefits with suppliers of funding would result in more robust funding. The full *Forging of Foundation for the Future* background paper addresses these issues. The process begun in these regional conferences should spawn serious reflection and research that will lead to innovations that will improve public (and private) research university funding.

We do not wish to be alarmist. The U.S. university research enterprise remains healthy. While public research universities arguably have experienced larger financial challenges than have their private counterparts, their relative success in competing for federal grants remains. However, the competitive asset that is the U.S. research university is threatened. To deal with this threat states must cease their steady defunding of public universities, donors must increase their philanthropic support of both public and private research universities and the federal govern-

ment must begin to pay the full cost of research. With these changes U.S. research universities can remain a key competitive asset for the country.

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2. *Rising Above the Gathering Storm*, (National Academies of Sciences, Washington, D.C., 2005) p. 6.
3. *Ibid*, p. 7.
4. *Ibid*, p. 8.
5. For a description of the letter and access to a PDF copy, see "Lawmakers Ask Academies to Study Ways to Help Research Universities," *Inside Higher Education*, June 23, 2009 <http://www.inside-highered.com/news/2009/06/23/qt#201813>.
6. Paul N. Courant, James J. Duderstadt, Edie N. Goldenberg, "Needed: A National Strategy to Preserve Public Universities," *The Chronicle of Higher Education*, January 3, 2010, <http://chronicle.com/article/A-Plan-to-Save-Americas-Pu/63358/>.
7. Thomas Kane and Peter Orszag, "Funding Restrictions at Public Universities: Effects and Policy Implications," Brookings Institution Working Papers, (Brookings Institution, September 2003); "Financing Public Higher Education: Short-Term and Long-Term Challenges," Ford Policy Forum, (Brookings Institution, 2004), pp. 33-39; and with Emil Apostolov, "Higher Education Appropriations and Public Universities: Role of Medicaid and the Business Cycle," Brookings-Wharton Papers on Urban Affairs, 2005, pp. 99-146.
8. 2007 figures computed from IPEDS for Very High Research Universities on 2/09/10 are Public Full Professor, \$113,173, Associate Professor, \$79,551, Assistant Professor, \$68,703 and the Private counterparts, respectively are \$144,363, \$94,771, and \$79,999.
9. The Voluntary System of Accountability (VSA) with its measurement of learning outcomes is not part of the private universities' University and College Accountability Network (UCAN).
10. *Finances of Research Universities* (Council on Governmental Relations, Washington, D.C., March 2008) p. 13.
11. Charles Goldman, Traci Williams, David Adamson, Kathy Rosenblatt, *Paying for University Research Facilities and Administration* (The RAND Corporation, 2000) p 29.
12. *Ibid*, p. 15.
13. James D. Adams, "Is the U.S. Losing its Preeminence in Higher Education," NBER Working Paper #5233, August 2009.
14. *Ibid*.
15. Clive Cookson, "China Scientists Lead World in Research Growth," *Financial Times*, January 25, 2010, <http://www.ft.com/cms/s/0/7ef3097e-09da-11df-8b23-00144feabdc0.html>.
16. For a recent discussion of the changing face of international rankings see Aisha Labi, "Rankled by Rankings," *The Chronicle of Higher Education*, February 2, 2010, http://chronicle.com/article/Criticism-of-Global-Rankings/63786/?sid=at&utm_source=at&utm_medium=en.