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# Can Public Research Universities Compete?[1]

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**Abstract**: Many leaders of public research universities worry about falling behind private research universities at a time when private university finances have improved dramatically and state support for higher education has declined. In this paper, I provide grounds for a more optimistic view of the competitive position of public research universities. I develop two Abusiness models@ for higher education: one based on low volume/high cost (the private research university model); the other based on high volume/low cost (the public research university model). I show that the private model, at its best, generates a high proportion of future leaders, stronger educational reputations, and leads to the accumulation of more wealth. However, the public model remains viable and successful, principally because it typically generates larger faculties. Larger faculties can educate more students and produce more research. The total societal contribution of public research universities, as measured by human capital development and research publication, is much greater than that of private universities. The current convergence between the two business models has been caused by the pressures on private universities to increase the size of their student bodies and faculties, as well as by declines in state appropriations for public universities.

A generation ago, the prospect of the domination of higher education by the independent, non-profit (or Aprivate@) universities would have seemed hardly worth discussing. Perhaps 20 private universities were truly outstanding, and these were matched by a very nearly equal number of outstanding public universities. Clark Kerr had presided over the increase in UC-Berkeley=s stature, culminating in its ranking in 1964 as the country=s Abest balanced distinguished university.@ (Kerr, 2001: 56). The great public research universities -- Berkeley, Madison, Ann Arbor, UCLA, Chapel Hill -- held their own with the privates in the years after World War II, at least until the mid-1970s, the beginning of an era of inconsistent and declining State support for public higher education.

Today, however, the question on the minds of many public research university presidents is: AHow do we compete?@ It is a worry that circulates from the bottom right to the top of the public sector. Not long ago, a former chancellor of the University of California, Berkeley told me: AWithout doubt, it is a real and troubling problem. We are losing some of our best people to private universities...Stanford can offer more than we can. We can=t compete on salaries or

administrative support.@ Salary data suggests that the chancellor is no alarmist. The last AAUP salary study that looked into differences between the private and public sectors found large gaps in the salaries of full professors. At the top 10 institutions in both sectors, these differences averaged $15-$20,000 per year for men and nearly that much for women.

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**Table 1**

Institutions Ranked by Average Salary for Full Professors, Women and Men, 2000-01

| Rank Based on Female Professor Salary | Institution | Female Professor Salary | Rank Based on Male Professor Salary | Male Professor Salary |
|---|---|---|---|---|
| *Private Institutions* | | | | |
| 1 | Rockefeller University | $141,000 | 1 | $137,800 |
| 2 | Harvard University | $125,400 | 2 | $137,400 |
| 3 | Stanford University | $122,200 | 3 | $127,400 |
| 4 | Princeton University | $121,500 | 5 | $126,300 |
| 5 | Yale University | $115,000 | 6 | $126,000 |
| 6 | University of Chicago | $114,200 | 4 | $126,700 |
| 7 | University of Pennsylvania | $113,500 | 11 | $121,600 |
| 8 | Babson College | $113,200 | 14 | $117,000 |
| 9 | Columbia University | $111,600 | 10 | $122,000 |
| 10 | New York University | $110,400 | 7 | $123,900 |
| *Public Institutions* | | | | |
| 1 | Rutgers University, Newark | $104,100 | 3 | $112,400 |
| 2 | U.C. Berkeley | $103,600 | 1 | $115,600 |
| 3 | UCLA | $102,800 | 2 | $115,100 |
| 4 | College of Wm. and Mary | $ 99,700 | 20 | $ 98,100 |
| 5 | University of Michigan | $ 99,000 | 5 | $106,500 |
| 6 | University of Virginia | $ 98,400 | 4 | $107,200 |
| 7 | Georgia Tech | $ 98,000 | 10 | $104,500 |
| 8 | Georgia State University | $ 96,800 | 14 | $102,600 |
| 9 | Rutgers University, New Brunswick | $ 96,300 | 12 | $103,800 |
| 10 | University of No. Carolina | $ 95,300 | 15 | $102,600 |

Source: Bell (2001): 33.

Every public institution has felt the impact of these disparities. Berkeley has lost dozens of full professors to private research universities in recent years, including such highly-regarded people as Manuel Castells, the theorist of the Anetwork society@; Seamus Davis, a leader in condensed-matter physics; and Stephen Greenblatt, the Shakespeare scholar.

Behind the career movements of faculty lies a change in the academic power structure: the growing wealth advantage of private universities. Six universities would have made the AFortune 500" in 2000, if universities were included on this list, and five of the six B Harvard, Yale, Stanford, MIT, and Duke B are private institutions (Brint, 2005a). Of the 13 universities with operating budgets over $2 billion, 11 were private and just two public. And, of course, this spending gap is more impressive in view of the much larger student populations, on average, of public universities.

**Table 2**
**Universities That Would Qualify for the "Fortune 500," 2000**

| | Rank | Annual Budget |
|---|---|---|
| Harvard University | 273 | $ 6.9 b. |
| Stanford University | 350 | $ 5.0 b. |
| Yale University | 396 | $ 4.2 b. |
| MIT | 419 | $ 4.0 b. |
| Duke University | 459 | $ 3.6 b. |
| University of Michigan | 491 | $ 3.3 b. |

Sources: Steven Brint, Charles S. Levy, Mark Riddle, and Lori Turk-Bicakci, The Institutional Data Archive on American Higher Education, 1971-2000 (Riverside, CA: University of California, Riverside,

2003); Editors of Fortune Magazine, "The Fortune 500 Largest American Corporations" Fortune Magazine 143 (8), F-1+. Figures are based on annual operating budgets.

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Concerns about the competitiveness of public research universities have been stimulated not only by the vast accumulations of wealth of some private universities, but by the many years of budget cutting public universities have endured at the hands of state legislatures. In spite of the cost pressures associated with Abuying the best@ (Clotfelter, 1997), the basic economics of private institutions -- high tuition coupled with voluntary support in the billions – is working better than the comparable economics of public universities: rising tuition (from a much lower base), smaller fund-raising efforts, and declining State aid. Since 1990, the States' contributions to total operating budgets have declined by about six percent (AASCU 2004: 7). Most public research universities receive 30 to 40 percent of their educational and research budgets from state appropriations, but some of the largest receive less than 20 percent of their budget from state appropriations.

The example of the University of Colorado, Boulder is instructive. Currently, only seven percent of the total University of Colorado budget comes from the State, but the university must negotiate with four parties -- the legislature, the joint budget committee of the legislature, the Governor, and the Colorado Commission on Higher Education -- to change its fee structure. Each one is jealous of prerogatives and fully ready to block the wishes of the others. An administrator at the University of Colorado, Boulder described a ravaged system: large State budget cuts for many years running, elimination and downsizing of academic programs, small or no raises for faculty and staff, decimation of student services, and no autonomy for the university to set tuition. According to this administrator, Athe ratio of government control to government

resources is the most onerous in the country.@ She would have an argument from university administrators in New Hampshire, Oregon, and Wisconsin, among others, about whether Colorado truly holds this dubious distinction.[2]

Why should we worry about these gaps between private and public universities? The most important reasons have to do with balance and competition. One of the great virtues of the American system of higher education has been the relatively balanced competition between private and public institutions. Balance has kept the ideal of equality of opportunity alive for students, broadened the competition for eminence (and therefore the total productivity of the system), and prevented leaders in the private sector from becoming too traditionalistic or self-satisfied.

In this paper, I will offer a different perspective on the fate of public research universities, and one that I hope will allay at least some of the anxieties that we hear so often today. I will argue that the situation is not as dire as the statistics on faculty salaries and State support suggest. The concerns of the Berkeley and the Boulder administrations are not baseless, of course, but they focus too much, I believe, on the career paths of a handful of eminent professors and the disappointing recent history of State appropriations. They miss the continuing comparative advantages of public research universities.

Specifically, I will argue that public and private research universities can be examined in relation to two quite different Abusiness models@: one based on high volume and low cost (the public model); the other based on low volume and high cost (the private model). Each of these models provides a viable path for universities. However, high volume – in other words, higher enrollment -- provides a number of advantages for research universities. It allows them to operate more programs, field larger faculties, and generally also to win more research funds. As

per capita producers of national leaders, and as Awealth accumulating@ institutions, it is true that the public universities really cannot compete. But as total human capital and research producers, they not only compete, they substantially outshine their competition in the private sector.

I will begin by defining the two Abusiness models.@ I will then show how faculty size can be predicted from a small number of variables associated more often with the public university model. I will then discuss the important advantages of the private model in the production of national leaders, the maintenance of strong educational reputations, and the accumulation of institutional wealth. Turning to the advantages of public universities, I will show that faculty size is the determining factor in degree production and that it is also strongly associated with success in the grants economy and productivity as measured by the quantity of peer-reviewed journal articles published. I will discuss the advantages size provides in the seeding of new research initiatives, and why it is entirely compatible with attracting sizeable absolute numbers of outstanding undergraduate students, many of whom go on to careers of high achievement.

Leaders from the two sectors have certainly seen the weaknesses of their own sector=s "business model." This has led to efforts by private university presidents to create Acritical mass@ in key areas of research funding and to efforts by public university presidents to expand fund-raising capacity well beyond anything considered feasible in the last generation. However, I will show that differences in the strengths of the two sectors remain significant, and, if judged from a broad societal perspective, very much in the favor of the public institutions.

## Two Business Models

Let me begin by describing the two basic business models for research universities. The first is low volume/high cost, and its goal is to maximize the undergraduate experience for a highly selected student body of potential leaders. Let=s assume a high net tuition of $25,000, a relatively small undergraduate population of 6,000, and a relatively low faculty to student ratio of 1:18. If we do the math, we obtain a total faculty of 333 (dividing 6000 by 18) and total net tuition of $150 million (multiplying $25,000 by 6000). The other business model is high volume/low cost, and its goal is to maximize contribution to the State through human capital development, research, and service. Here let=s assume a low net tuition of $5000 and a large undergraduate student body of 20,000. Let=s further assume a relatively high faculty to student ratio of 1:25. When we do the math in this case, we obtain a much larger faculty of 800 and a net tuition base of $100 million. Perhaps surprisingly, this hypothetical high volume/low cost model yields less tuition revenue but a faculty that is more than twice the size of the high volume/low cost model.

The two business models are, of course, very similar to what we find in many consumer industries: a Ahigh end@ for Aluxury goods@ (think of designer fashions) and an Aupper-middle range@ for Ahigh quality mass-produced goods@ (think of Neiman-Marcus or Nordstrom=s). Because knowledge is a public good, universities generally eschew comparisons with for-profit businesses, but the dynamics of market segmentation is not that different in our not-for-profit "industry." Indeed, the low end of the mass market (very low cost and very high volume) also exists in the academic "industry": in the community college sector.

Faculty size is behind most of the advantages of public research universities, and it

derives quite directly from the high volume/low cost model that I have associated with public institutions. A small faculty can be very distinguished, and it can train a highly selective student body to achieve great things, but a larger faculty trains more students to a relatively high level of human capital development, and, all else equal, it also produces more research. Clearly, the advantages that size brings would not exist without high quality faculty. Therefore, the supply of high quality faculty, trained in rigorous doctoral programs, must be considered a critical assumption underpinning the success of the public university "business model."

Table 3 provides statistical evidence, consistent with the first step in the argument, showing that public universities greatly outnumber private universities among the largest research universities. The table shows the total enrollment of the 40 largest and 40 smallest research universities. Only four of the 40 largest are private; all the rest are public. More than nine times as many students attend the public universities on this list than attend the private universities. By contrast, 32 of the 40 smallest universities are private, including all but one of the 17 that enroll fewer than 10,000 students. Overall, public research universities outnumber private research universities by about two to one, but they enroll almost four times as many undergraduate students.

**Table 3**
40 Largest and Smallest Research Universities, 2000, by Control

| *40 Largest Research Universities* | | *40 Smallest Research Universities* | |
|---|---|---|---|
| 1) University of Texas, Austin | 49,996 | ***1) Calif. Institute of Technology*** | ***1,968*** |

| | | | | |
|---|---|---|---|---|
| 2) Ohio State University | 47,952 | | ***2) Claremont Graduate University*** | ***1,969*** |
| 3) University of Minnesota | 45, 481 | | 3) CUNY Graduate Center | 3,567 |
| 4) University of Florida | 45,114 | | ***4) Rice University*** | ***4,205*** |
| 5) Arizona State University | 44,126 | | ***5) Brandeis University*** | ***4,774*** |
| 6) Texas A&M University | 44,026 | | ***6) Teachers College (Columbia)*** | ***4,949*** |
| 7) Michigan State University | 43,336 | | ***7) Catholic University*** | ***5,493*** |
| 8) University of Wisconsin | 40,658 | | ***8) Yeshiva University*** | ***5,814*** |
| 9) Pennsylvania State University | | 40,571 | ***9) Lehigh University*** | ***6,476*** |
| 10) Purdue University | 39,667 | | ***10) Princeton University*** | ***6,547*** |
| 11) University of Illinois | 38,465 | | ***11) Brown University*** | ***7,723*** |
| 12) University of Michigan | 38,103 | | ***12) Renssalaer Polytechnic Inst.*** | ***8,022*** |
| 13) ***New York University*** | ***37,150*** | | ***13) University of Rochester*** | ***8,071*** |
| 14) Indiana University | 37,076 | | ***14) Carnegie-Mellon University*** | ***8,514*** |
| 15) UCLA | 36,890 | | ***15) Tufts University*** | ***9,106*** |
| 16) University of Washington | 36,139 | | ***16) Case-Western Reserve Univ.*** | ***9,304*** |
| 17) Rutgers University | 35,236 | | ***17) University of Denver*** | ***9,444*** |
| 18) University of Arizona | 34,488 | | ***18) Howard University*** | ***10,010*** |
| 19) Florida State University | 33,971 | | ***19) Southern Methodist Univ.*** | ***10,064*** |
| 20) University of Maryland | 33,189 | | ***20) MIT*** | ***10,090*** |
| 21) Louisiana State University | 31,527 | | ***21) Vanderbilt University*** | ***10,092*** |
| 22) University of Georgia | 31,288 | | 22) University of Vermont | 10,118 |
| 23) Univ. of California, Berkeley | 31,277 | | 23) University of Maine | 10,282 |
| 24) University of Colorado | 29,352 | | ***24) American University*** | ***10,776*** |
| 25) ***Univ. of Southern California*** | ***29,194*** | | 25) Univ. of Maryland-Baltimore | 10,759 |
| 26) North Carolina State Univ. | 28,619 | | ***26) Notre Dame University*** | ***10,800*** |
| 27) ***Temple University*** | ***28,355*** | | ***27) Marquette University*** | ***10,892*** |
| 28) ***Boston University*** | ***28,318*** | | ***28) Yale University*** | ***11,099*** |
| 29) University of Iowa | 28,311 | | ***29) Emory University*** | ***11,393*** |
| 30) Virginia Tech | 27,869 | | 30) University of Idaho | 11,635 |
| 31) University of Cincinnati | 27,327 | | ***31) Tulane University*** | ***11,652*** |
| 32) Iowa State University | 26,845 | | 32) University of Wyoming | 11,743 |
| 33) Colorado State University | 26,807 | | ***33) Cornell University*** | ***12,043*** |
| 34) University of Pittsburgh | 26,329 | | 34) University of Mississippi | 12,118 |
| 35) Univ. of California, Davis | 26,094 | | ***35) Washington Univ. (St. Louis)*** | ***12,118*** |
| 36) University of Kansas | 25,920 | | 36) UC-Santa Cruz | 12,144 |
| 37) University of Tennessee | 25,890 | | ***37) Duke University*** | ***12,192*** |
| 38) University of Utah | 24,948 | | ***38) Georgetown University*** | ***12,427*** |
| 39) University of Illinois, Chicago | 24,942 | | 39) Binghamton University | 12,473 |
| 40) Univ. of North Carolina | 24,892 | | ***40) University of Chicago*** | ***12,531*** |

Note: Boldface = independent, non-profit
Source: NCES, 2002

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It is clear that undergraduate enrollments are one cause of larger faculties. After all, the more students enrolled, the more professors necessary to teach them. Professional students can

be considered in approximately the same light as undergraduate students. They are more or less full-paying students, and their support does not depend directly on the grants economy. Doctoral education certainly introduces complications, but not as many as might be imagined. Much doctoral education is subsidized by undergraduate tuition in the form of teaching fellowships. Thus, the numbers of graduate students are at least partly dependent on the undergraduate student base. Because they also finance their work by serving as research assistants, their numbers should be co-determined by the size of the research effort at universities (Gumport, 1993). The grants economy is rather unstable as compared to undergraduate teaching. Most universities can depend on new crops of freshmen every year, much more than they can depend on constant infusions of research funds. Planning for permanent faculty positions should be connected to these risk factors. Thus, we might expect that faculty lines are strongly associated with enrollments, but less strongly associated with research expenditures. We might expect further that graduate student numbers are co-determined, in a somewhat more balanced way, by enrollments and research expenditures.

Predictions of faculty size based on the size of student bodies must be adjusted for one important difference between public and private universities. Private universities have lower student-faculty ratios than public universities. I will use the averages for my sample to make this necessary adjustment: 18:1 for private universities and 25:1 for public universities. In this analysis, I use data for the 81 research universities included in the Institutional Data Archive (IDA) on American Higher Education (Brint, Levy, Riddle and Turk-Bicakci, 2003) for AY 2000, the most recent year for which complete data are available. I first divided enrollments by the constant term for student-faculty ratios. I used independent variables lagged four years behind the dependent variable on the theory that planners extrapolate from recent trends to

determine current staffing levels. I then ran regressions of this enrollment variable on faculty size. To these regressions, I added variables measuring research expenditures, endowment income, and operating budget. Because grants expenditures and total operating budget are highly correlated and therefore introduce problems of multicollinearity, I did not use these variables in the same equations.

As Table 4 shows, a very good model of research faculty size, explaining nearly 80 percent of the variance, can be developed using just two terms: one for average faculty-to-student ratio in the public and private sectors, and one for the number of students in the institution. The addition of research expenditures improves the prediction a little (but they are only about one-quarter as important in predicting faculty size as enrollments). The same basic model also applies to predictions of total faculty size and graduate student size, but here research expenditures are somewhat more important. Predictions of graduate student enrollments are not as strong as predictions of faculty size. The best predictions explain about two-thirds of the variance, and grants are a little more important in predicting graduate student size than they are in predicting research faculty size. Even so, they are only about one-third as important as enrollments in the prediction. When substituted in the equations for grants, operating budgets do not lead to better predictions.[3]

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**Table 4**
Predictions of Faculty and Graduate Student Size in American Research Universities, 1999-2000

A. Tenure and Tenure-Track Faculty, 1999

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|

| | B | (St.Error) | B | (St. Error) | B | (St. Error) |
|---|---|---|---|---|---|---|
| Constant | 135.6** | | 65.6 | | 103.6* | |
| | (47.6) | | (48.8) | | (48.7) | |
| Enrollment Ratios 1995 | .779*** | | .726*** | | .728*** | |
| | (.045) | | (.047) | | (.050) | |
| Endowment Value 1995 (in $10 millions) | ----- | | 1.55 | | 5.27 | |
| | | | (25.4) | | (28.8) | |
| Total Grants/ Contracts 1995 (in $10 millions) | ----- | | 71.9*** | | ----- | |
| | | | (19.9) | | | |
| Current Funds Revenue 1995 (in $100 millions) | ----- | | ----- | | 107.4* | |
| | | | | | (51.5) | |
| R2/Adjusted R2 (S.E.E.) | .792/.789 | | .823/.815 | | .807/.800 | |
| | (185.2) | | (166.4) | | (180.6) | |

B. Total Faculty (including non-tenure track) 1999

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | B | (St.Error) | B | (St. Error) | B | (St. Error) |
| Constant | 123.0 | | 19.3 | | 74.9 | |
| | (62.9) | | (67.0) | | (64.0) | |
| Enrollment Ratios 1995 | .942*** | | .919*** | | .869*** | |
| | (.059) | | (.064) | | (.065) | |
| Endowment Market Value 1995 (in $ 10 millions) | ----- | | 4.56 | | 6.27 | |
| | | | (34.8) | | (37.9) | |
| Total Grants/ Contracts 1995 (in $10 millions) | ----- | | 77.4** | ----- | | |
| | | | (27.3) | | | |
| Current Funds | ----- | | ----- | | 153.9** | |

| | | | |
|---|---|---|---|
| Revenue 1995 (in $100 millions) | | | (67.7) |
| R2/Adjusted R2 | .761/.758 | .793/.784 | .781/.773 |
| (S.E.E.) | (244.8) | (228.3) | (237.3) |

C. Graduate Student Population 2000

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | B | (St.Error) | B | (St. Error) | B | (St. Error) |
| Constant | 814.4 | (507.4) | -332.7 | (503.4) | 33.4 | (451.6) |
| Enrollment Ratios 1995 | 5.11*** | (.479) | 4.61*** | (.482) | 4.18*** | (.462) |
| Endowment Market Value 1995 (in $ 10 millions) | ----- | | 593.5* | (261.6) | 471.2* | (267.2) |
| Total Grants/ Contracts 1995 (in $10 millions) | ----- | | 819.7*** | (205.3) | ----- | |
| Current Funds Revenue 1995 (in $100 millions) | ----- | | ----- | | 1916.4*** | (477.8) |
| R2/Adjusted R2 | .590/.584 | | .700/.687 | | .713/.702 | |
| (S.E.E.) | (1974.5) | | (1715.0) | | (1674.2) | |

N=81
* = p < .05; ** = p < .01; *** = p < .001

Sources: NCES (2002); Brint, Levy, Riddle, and Turk-Bicakci (2003).

Notes: Private university enrollments divided by 18; public university enrollments divided by 25 to reflect average student-faculty ratio in the two sectors. Total Grants includes federal, state, local, corporate, and foundation grants and contracts.

It is plausible that wealth might be another important factor associated with faculty size; the larger the endowment the greater the opportunity to hire new professors in up-and-coming fields. But this appears not to be the case. The analysis in Table 4 suggests that neither endowment nor endowment income have a significant impact on the size of faculties. Endowment funds are generally earmarked for capital improvements on campus, or student financial aid. They are also used to augment faculty salaries and graduate student stipends, but the analysis suggests that neither endowment nor endowment income adds to the size of faculties, controlling for undergraduate student body and research expenditures.

Everything else seems to be equally irrelevant to predicting faculty size. The many Anon-traditional@ revenue streams cultivated by universities through intercollegiate athletics, health care services, and technology transfer contribute little to the prediction of faculty or graduate student size. The great majority of funds from these streams are simply reinvested in the activities that generate the revenues in the first place. Thus, revenues from inter-collegiate athletics are re-invested in athletic scholarships, coaching salaries, and stadium operations. Revenues from health care services are re-invested in the medical center, and income from technology licensing goes to pay the salary of the Office of Technology Transfer staff and the technology transfer research enterprise. Bookstores and other auxiliary enterprises are intended to be Abreak-even@ operations, and rarely contribute to general funds. A few universities do rely on continuing education to help finance the core educational operation, but any diverted funds are a drop in the bucket compared to net undergraduate tuition and fees.

## Advantages of the Private Research University Model

This evidence on the relationship of enrollments to faculty and graduate student size will

underlie my discussion of the advantages of public universities. But I want first to discuss the advantages of private universities. Although these advantages are not as overwhelming as many believe, they are nevertheless sizeable in some important domains. In particular, the private university business model yields a number of advantages related to exclusivity. It produces more national leaders, more donations, bigger donations per person, larger endowments, larger endowments per student, and (largely as a consequence of all this) a better reputation for educational quality among potential undergraduates and their parents.

Production of Leaders

In case any doubts exist about the private universities' role in the production of future leaders, consider the following: Since World War II, about one-third of all Rhodes Scholars= have been produced by just three institutions: Harvard, Yale, and Princeton (Youn, Arnold, and Salkever 1998). The private liberal arts colleges and military academies have produced another third of Rhodes Scholars, and private research universities other than Harvard, Yale, and Princeton another 12 percent. Only one-fifth of Rhodes Scholars have taken their baccalaureates from public universities other than military academies (calculated from Youn, Arnold, and Salkever 1998).

Studies of a broader stratum of high-achieving people also show a disproportionate share graduating from private colleges and universities, although public institutions do not fare at all badly in absolute numbers. A study I conducted based on a 10 percent sample of people listed in the 54th (2000) edition of *Who=s Who*[4] shows that public research universities, in fact, contribute a higher absolute number of biographies than either private research universities or private liberal arts colleges (Brint, 2005b).[5] Because public regional universities do not contribute at a

high rate to the production of national leaders, the overall balance of biographies in the study favored the private sector. In this study, some 55 percent of *Who=s Who* graduates from an American college or university took their degrees from a private institution, while 45 percent graduated from a State-supported institution.[6] While this does not represent a large absolute difference between the private and public contribution to *Who=s Who* biographies, the relative differences, controlling for the size of the two sectors, are impressive, because a significantly smaller proportion of students attended private colleges and universities during the period, 1945-1985, when most of those in the study attended college.

Based on existing statistical evidence, I estimated a distribution of all college students during the period of 60 percent attending public institutions and 40 percent attending private institutions, the latter including 10 percent attending private research universities (see NCES, 2002: 12). I further estimated that an approximately equal proportion of students attended public research universities as compared to all other public institutions (i.e. "state colleges@).[7] These estimates produce a clear advantage for private universities in the production of future leaders, as measured by *Who's Who*. Private research universities were over-represented as contributors to biographies in *Who=s Who* by a rate of 2.5:1. Other private colleges and universities (such as liberal arts colleges) contributed at approximately the rate that would be expected on the basis of their enrollments during the period, as did public research universities. Other public institutions contributed at a rate half of what would be expected based on their estimated share of undergraduate enrollment during the period (Brint, 2005b).[8]

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**Table 5**
Representation in *Who=s Who* by Institutional Type and Control, 2000

| Type of Institution | Baccalaureates Awarded in U.S., 1940-1980 (est.) | *Who=s Who* Proportion (N) | Smoothed Ratio |
|---|---|---|---|
| Private Research University | 10% | 26% (2311) | 2.5:1 |
| Public Research University | 30% | 30% (2676) | 1:1 |
| Private AOther@ Institution | 30% | 28% (2465) | 1:1 |
| Public AOther@ Institution | 30% | 16% (1372) | .5:1 |

Sources: Marquis Publishing (2001), pp. 182-615; NCES (2002), p. 12, 254.

Notes:

1. Data include only biographies of persons who have attested U.S.-based baccalaureate institutions. Some 13 percent of the sample had no attested baccalaureate institutions, and another six percent graduated from foreign institutions.

2. The estimate for the distribution of baccalaureates during the period of the study is based on estimates related to changes over time in the private-public ratio and in the distribution of students between institutional types. These estimates were derived from NCES data.

3. The *Who=s Who* proportion is based on a 10 percent sample from the 54th (2000) edition comprising all persons listed whose last name begins with the letter AB.@

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Donations and Wealth

More successful alumni translate into larger donations and larger endowments. Some public institutions have been rewarded with large gifts from entrepreneurs like Sam Walton ($300 million to the University of Arkansas in 2002) and David Geffen ($200 million to the UCLA School of Medicine in 2002), but the majority of large gifts continue to go to private universities. Of the gifts to colleges and universities over $50 million since 1967, more than two-thirds have gone to the private sector and nearly all of these to private research universities.[9] This includes seven of the 10 largest gifts B gifts of $200 million or more (calculated from Chronicle of Higher Education, 2003: 25).[10]

In alumni giving, no public research university can begin to match the record of Cornell University, where annual gifts totaled almost $160 million in 2002, with gifts from about three in five alums (Cornell University, 2003). The University of Michigan is one of the public university champions in the area of alumni giving, but its alumni giving total is less than half that of Cornell=s. Of the top 20 institutions for alumni support in 2002, 13 were private and 7 public universities. Eight of the top 10 were private, including each one the top five (Kaplan, 2003).

Total voluntary support is a broader category. It includes support through alumni giving, through donations from non-alumni, and through donations from corporations. In 2001-02, among the top 20 fundraisers B those with over $200 million in total support -- 12 were private research universities, including eight of the top ten. Looking across the spectrum of research universities, voluntary support of private research universities is nearly double that of public research universities B *averaging* over $103 million in 2001-02, compared to $57 million for public research universities (ibid.).

Essentially the same story holds, but in a more exaggerated way, if we look at endowments. To some degree, this reflects the long head start of the privates in building endowments. Highly organized fund raising campaigns were still a novelty in the public sector as late as the 1960s (Young, 1997), but had been a part of the fabric of college life in the private sector since the 1920s. Of the 39 college and university endowments valued over $1 billion in 2003, 28 (72%) belonged to private institutions. Only the University of Texas system, the Texas A&M system, and UC-Berkeley cracked the top 10 endowments (NACUBO, 2004). The wealth of the two Texas systems derives largely from proceeds from oil lands. Even drawing on the riches of oil land and hundreds of thousands of alumni in prosperous states, not a single public

university can claim to make the top 50 in endowment per student, a widely accepted measure of financial capacity. Here the leader is tiny Rockefeller University, with an endowment of more than $7 million per student. Three other private research universities B Harvard, Yale, and Princeton B manage endowments above $1 million per student. Even the wealthiest public research universities fall below $100,000 per student (ibid).[11]

Educational Reputation

Wealth is closely related to selectivity in admissions, which, in turn, is closely related to educational reputation. This can encourage a self-reinforcing cycle of distinction. The *U.S. News and World Report* (*USN*) ranking of AAmerica=s best@ colleges and universities is an influential, if widely criticized, measure of educational reputation.[12] The *USN* rankings for universities are based on seven indices, six of which are closely related to selectivity and/or wealth.[13] Not surprisingly, 19 of the 20 top ranked Anational universities" in recent years have been highly selective private institutions (*U.S. News and World Report,* 2002). Other commercial college raters, such as the *Princeton Review,* also overwhelmingly choose private colleges and universities as Athe best.@[14]

My analysis of the 2002 *USN* rankings of Anational universities@ suggests that as much as 70 percent of the variance in rank can be explained by *just one* independent variable: the average SAT/ACT scores of the freshmen class. Because wealth is highly correlated with selectivity (r=.71 in my sample), wealth must be considered a major, though indirect, influence on *USN* rank.[15] Characteristics that are important to the public research university Abusiness model@ B undergraduate student size, graduate student size, faculty size, and percentage of total

federal research conducted B do not improve the prediction of *USN* rank.[16]

Many doubts can be raised about the validity of commercial measures of educational quality, but these doubts should not obscure our understanding of the real capacity of private universities to provide high quality educational experiences for undergraduates. The undergraduate experience at these institutions is substantially enriched, in the first place, because many other high-achieving students are in residence. The institutions can also offer smaller classes and more research opportunities, staff larger and higher quality student services offices, sponsor internship and study abroad programs, pay for undergraduates to attend professional conferences, and invite famous alumni and friends of the university to discuss their work and spend time with students.

In sum, the advantages of the private research university Abusiness model@ are impressive: Private research universities enroll a more highly selected undergraduate population. This fact alone is strongly associated with the reputation of the institutions for higher educational quality. These highly selected students go on more often to achieve eminent careers than undergraduates at public research universities. Partly in gratitude for the outstanding education they have received, private university students contribute to their alma mater at a rate far in excess of the contribution of public university graduates. These gifts contribute to the long-standing wealth advantage of private institutions. This wealth advantage, in turn, allows private institutions to recruit many of the best (and wealthiest) students from the succeeding generation and thereby to gain still more wealth. It also allows them to pay promising young professors and eminent senior professors high salaries, and therefore to win the majority of recruitment battles.

These advantages of the leading private universities have depressed morale among

administrators of elite public universities, but the competition for a handful of eminent professors is marginal to the total societal contribution of public universities, which consists, much more importantly, of human capital development (including opportunities for less advantaged students) and research productivity. As Charles Clotfelter (1997) observed, elite private universities can Abuy the best.@ However, it is necessary to add a corollary: they cannot usually also Aproduce the most.@

## Advantages of the Public Research University Model

As this corollary suggests, public research universities have different, but no less important advantages, particularly if we look at the issue from a societal perspective. Educators are inclined to view size as a liability, because it leads to large classes and less personal attention for students. But size is a critical advantage when it comes to overall productivity. Public research universities produce a large proportion of college-educated people, including a large proportion of those with important types of human capital: bachelors= and Masters= level scientists and engineers, and Ph.D.s. They also produce more total research than private universities. Each of these contributions is related to size, the key advantage of the public university business model. In so far as research productivity is connected to reputation, public universities could theoretically also enjoy an advantage in the area of research reputation. However, private research universities obviously have the capacity to compete effectively in these areas by hiring scholars and scientists who are at the forefront of important developments in their fields.

Human Capital Development

The productivity advantages of public research universities are greatest in bachelors= and Masters= production. Nationally, about two-thirds of undergraduates complete degrees in public institutions (NCES, 2003: 315). Public universities produce a similar proportion of masters' degrees. The public universities, with their Land Grant roots, produce an even higher proportion of bachelors= in science and engineering. Nearly 70 percent of students completing bachelor's degrees in science or engineering are from public institutions (ibid.).

Public research universities are also successful in advancing their undergraduate students into graduate and professional schools, if not quite at the same rate as the most selective private colleges and universities. *College and Beyond* data for the graduating class of 1989 show that one-third of students from selective public research universities in the *College and Beyond* sample enrolled in graduate or professional programs.[17] By contrast, slightly fewer than half of students from selective private colleges and universities enroll in graduate or professional schools within the first few years of their college graduation.[18] If these rates are extrapolated to the broader population of graduating seniors, public university students can be expected to outnumber private university students by approximately three to one in graduate and professional schools. Moreover, the *College and Beyond* data suggests that, while public university graduates enroll at a lower rate, they are at least as likely to complete programs as their private school counterparts.

The public sector advantage is equally notable in the area of doctoral production. Of the top 50 doctorate producers, more than two-thirds (36) are public, including the top eight institutions. Another top doctoral-producing university, Cornell University, is largely private,

but partly public. Only 13 of the top 50 doctorate-producing institutions are private. Among the top 50, public universities award about four times as many Ph.D.s every year as private universities B more than 15,000 of the 21,000 total in 2001 (NCES, 2001). Overall, public institutions produce 63 percent of doctorates (NCES, 2002: 315). By any measure, as contributors to the production of scientific and scholarly manpower, public universities are the workhorses of the American university system.[19]

Educational Opportunities

Public universities are particularly important in educating students from lower-income backgrounds; they are therefore one of the important remaining centers of opportunity in American society. The graduates of private universities also come, on average, from far more affluent families than their counterparts in the public universities. In fall 2003, nearly 40 percent freshmen entering the most selective private universities estimated their family=s annual income at $150,000 or more (Higher Education Research Institute, 2003: 78). This compares to 20 percent of freshmen in selective public universities who have come from such affluent families in recent years, and 16 percent of freshmen in all baccalaureate-granting institutions (ibid.).[20] To put these numbers in perspective, it is important to keep in mind that just five percent of all Americans reported annual family incomes at this level (U.S. Census Bureau 2003: Table 3). The socio-economic distribution of students in public universities is certainly broader than in private universities, but it in no way reflects the distribution in American society at large. Similarly, freshmen from low and middle-income families (below $60,000) comprised one-third of public university student bodies in 2003, but less than one-quarter of private university student bodies (Higher Education Research Institute, 2004).

Because private universities have made a strong effort to improve minority recruitment and retention, the public advantage is not as large in the area of race as it is in the area of family income. In recent years, students from minority groups have comprised about one-quarter of all four-year college students (and 22 percent of graduates) (NCES, 2002: 245, 325). While public research universities have been only slightly more likely to enroll minority students than their counterparts in the private sector, they nevertheless enroll and graduate more than twice as many minority students simply because they enroll twice as many undergraduate students.

Research Productivity

The public research university Abusiness model@ also pays off in research productivity, as measured by the quantity of peer-reviewed publications. Of course, quantitative studies of research are very one-sided; when we look at research productivity as a quantitative variable, we are obviously not attempting to evaluate the quality of published work. Professors in some small, high-quality programs may produce fewer books and articles overall, but those produced may be highly influential. By contrast, professors in less well-regarded programs may produce mountains of research, but much of it run-of-the-mill. Moreover, studies of research productivity are limited in other ways by the conventions used to count publications, notably by an emphasis on articles as opposed to books. My focus in this part of the paper will be on an admittedly blunt measure of productivity, and the discussion should therefore be treated with the proper number of grains of salt.[21]

Publication counts, contained in the Institute for Scientific Information=s (ISI) AWeb of Science,@ provide one quantitative measure of productivity. These counts include all articles

published in the tens of thousands of scientific and scholarly journals monitored by ISI. A count of publications over the most recent 10-year period (1995-2005) shows that faculty size is strongly related to publication count. Of the 20 most prolific research faculties during this period, two-thirds (13) were located at public institutions. In my sample of 81 research universities, I was able to explain three-quarters of the variance in ten-year publication rates using a model containing just four independent variables and a constant term.[22]

Because publication counts are skewed toward the lower end of the distribution, for purposes of multivariate analysis I logged publication counts to produce a distribution more closely approximating normality. The analysis shows that research faculty size, the key advantage of public universities, is strongly associated with higher levels of publication. Other factors associated with higher levels of publication are total grants support and the market value of endowment. The standardized coefficients for faculty size and grants income are approximately equal, and both are twice as large as the standardized coefficient for endowment. Once these three variables are controlled, public sector is insignificant, and so, somewhat surprisingly, is having a medical school.)

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**Table 6**
Institutional Predictors of Total Publication Counts, 1995-2005

| *Variables* | *Logged Publication Counts* B (St. Error) |
|---|---|
| Constant | 8.57<br>(.161) |
| Research Faculty 2000 | .001***<br>(.000) |

| | |
|---|---|
| Grants Expenditures 2000 (in $10 millions) | .027*** (.005) |
| Endowment Market Value 2000 (in $10 millions) | .001* (.000) |
| Private Institution | .026 (.141) |
| Medical Center | .185 (.133) |
| R2/Adjusted R2 (S.E.E.) | .696/.676 (.489) |

N=79
* = p>.05; ** = p<.01; *** = p<.001 (one-tailed)

Sources: Brint, Levy, Riddle, and Turk-Bicakci (2003); ISI (2005).

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Faculty size is also connected to at least one measure of research reputation, the total number of programs ranked by the National Research Council (NRC) in its last study of graduate program quality and effectiveness in 1993. Twenty-one of the 32 universities with 30 or more programs ranked by NRC were public universities. As Table 7 indicates, I was able to explain about two-thirds of the variance in number of programs rated. The findings indicate that faculty size in 1990 is strongly associated with the number of programs rated by the NRC, and that its contribution is about the same as total research and development expenditures in 1990. It is not quite as important in this explanation as the average SAT/ACT scores of student bodies. Thus, size allows universities to compete for recognition in a broad array of fields, but so does the related variable, R&D capacity, and so, too, does a variable connected to educational quality: selectivity of the student body, as measured by SAT/ACT scores.[23]

While size helps to explain breadth of academic field coverage, it is not a statistically

significant predictor of outstanding program quality, as measured by number of programs in the top quartile of NRC ratings for faculty quality and program effectiveness. Because the data in this analysis are left-censored (i.e., include a number of zero scores), I used Tobit regression to provide more reliable parameter estimates.[24] In this analysis, faculty size was statistically insignificant in predictions of the number of programs rated in the top quartile of either faculty quality or program effectiveness. Thus the public sector edge in quantity of production has not carried over into scholarly perceptions about quality of production. Instead, R&D expenditures and selectivity are the more important determinants of the NRC faculty quality and program effectiveness ratings, among the variables in my analysis. With other variables in the model controlled, the private sector also shows up as a significant predictor of program ratings in the top quartile.

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**Table 7**
Predictions of NRC Rankings on Three Dimensions

| | *Dependent Variables* | | |
|---|---|---|---|
| | *OLS Regression* | *Tobit Regressions* | |
| | Number of Programs Ranked | Number of Programs in Top Quartile: Faculty Quality | Number of Programs in Top Quartile: Program Ef-Fectiveness |
| | B (St. Error) | Parameter Est. (St. Error) | Parameter Est. (St. Error) |
| *Independent Variables* | | | |
| Constant | -18.5*<br>(7.3) | -73.6***<br>(14.2) | -58.9***<br>(10.6) |
| Total Faculty 1990 | .007***<br>(.002) | .0017<br>(.002) | .0015<br>(.002) |

| | | | |
|---|---|---|---|
| Average SAT Score | .03***<br>(.008) | .060***<br>(.012) | .049***<br>(.009) |
| Endowment Market Value 1990 (in $10 millions) | -.019<br>(.019) | .019<br>(.023) | .017<br>(.019) |
| Total R&D 1990 (in $10 millions) | .401***<br>(.107) | .780***<br>(.132) | .753***<br>(.108) |
| Control (Public=0) | -3.15<br>(2.3) | 5.92*<br>(2.87) | 5.84*<br>(2.34) |
| R2/Adjusted R2<br>(S.E.E.) | .662/.636<br>(5.53) | | |
| Log-Likelihood | | -174.0 | -187.4 |

N=71

* = p<.05; ** = p < .01; *** = p < .001 (one-tailed)

Source: Brint, Levy, Riddle, and Turk-Bicakci (2003).

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In sum, the combination of high quality, low cost, and large size found in public research universities leads to some important positive outcomes: more total human capital development, greater opportunities for students from disadvantaged backgrounds, a higher absolute amount of research publication, and greater breadth of academic field coverage. These are the primary advantages of public research universities, but they are not the only advantages. Public universities can also create Acritical mass@ in new research areas more easily than private universities, and they are attractive to many highly able students.

## Critical Mass

Because of their size, public research universities can put together teams in important

new areas of research without expending scarce capital to build new programs more or less from scratch. They have more in-built flexibility in this regard than private universities can often afford. A top research administrator at the University of Wisconsin made this point in a compelling way when discussing the organization of new interdisciplinary initiatives at Madison: AWe are large. Size is helpful, because we have people working in many different areas. We don=t have to move about when the environment changes. We have 120 Ph.D. graduate programs. We have new ones cycling in and others cycling out. We have little red tape for creating new centers, and nine out of ten of these are interdisciplinary.@ Smaller institutions cannot compete simply by allowing existing research workers to rearrange themselves as the environment changes.

Public universities also maintain a critical mass of outstanding undergraduate students. Geiger (2002) studied Asuper students@ at American colleges and universities, those who had achieved at least one 700 plus score on the SAT. While elite private institutions enrolled higher proportions of Asuper students,@ he found that public research universities rivaled the privates in the absolute number of Asuper students@ enrolled. In fact, four public universities (the University of California-Berkeley, the University of Illinois-Urbana, the University of Michigan-Ann Arbor, and the University of Wisconsin-Madison) enrolled a higher number of these Asuper students@ than the highest-ranking private university, Harvard. Geiger argued that low cost is an important attraction, but reputation in research may be even more important. As he observed, A Public universities have much to offer superior undergraduates in peer (challenges) and subsidization, but their stature in research is perhaps their chief competitive advantage...@ (Geiger, 2002: 102).[25] Even Anational merit scholars,@ the top one percent of high school

seniors, are distributed relatively evenly between the two sectors. Twenty-two of the top 50 destinations for freshman national merit scholars are public research universities, led by the University of Texas, Austin in second place with 266 freshman scholars in 2002 (NMSC, 2002).

## Anomalies

In this paper, I have contrasted two business models: one based high cost/low volume and the other on low cost/high volume. This contrast is clearly over-simplified. Some public research universities, even though relatively inexpensive, are not large; and some private research universities, even though expensive and highly selective, are not small. These are deviant cases, but they include some of the most prestigious universities in the country, and therefore require at least a brief discussion.

### Small Public Universities

The circumstances of small public research institutions are relatively easy to understand. In every case, these institutions would be inclined to follow the low cost/high volume model, but they lack one or more of the conditions that allow the model to be fully realized: either they are located in states with small populations and little tradition of higher education, or they have failed to receive enough state subsidy to keep tuition low, or both. Thus, the state universities of Idaho, Maine, Mississippi, Vermont, and Wyoming are large enough to squeak into the ACarnegie doctoral-extensive@ category, but they are not large enough to mount broad-based research enterprises. The economies of these states have been strongly connected to agricultural, ranching, or mining activities -- and are not as diversified as the economies of some otherwise

similar states.[26]

Large Private Universities

Anomalous cases in the private sector are a bit more complex. They come in two types: first, private metropolitan institutions that rival the largest public institutions in the size of their undergraduate enrollments; and, second, small, highly selective undergraduate institutions that have nevertheless been able to mount large graduate programs.

Only three private research universities truly resemble the largest public universities in the size of their undergraduate student bodies: Boston University, New York University, and the University of Southern California. The one factor uniting these institutions is that they are located in very large cities: Boston, New York, and Los Angeles. Their big city locations are attractive to students, and they also have large geographical areas to draw on. Historically, these three institutions charged somewhat lower tuition, and they maintained somewhat lower standards of selectivity. Together with their attractive locations, this allowed them to draw from a larger pool of potential students. A fourth private institution, George Washington University, has an undergraduate student body nearly as large as these three, and it has arguably succeeded in making the transition to a full-scale research university. It too is located in a big city.

The other anomaly is the Atop-heavy@ private university. A few private universities have been able to build large graduate divisions, even on the unpromising foundation of small, selective undergraduate student bodies. A full-time graduate-level student body of 3500-4000 appears to be the minimum necessary to compete broadly for research eminence. Some 27 public research universities have graduate student populations of this size. (Indeed, three B

UCLA, the University of Michigan-Ann Arbor, and the University of Texas- Austin B have graduate student populations of 10,000 or more.) By contrast, only 12 highly selective private universities have been able to mount graduate-level programs that approach or exceed the 4000-student mark.[27]

These 12 include the three large undergraduate institutions discussed above: Boston University, New York University, and the University of Southern California. Of the remaining nine, three (Chicago, Harvard, and MIT) operate graduate programs that are actually larger than their undergraduate programs. Four others (Columbia, Johns Hopkins, Stanford, and Yale) are close (within 1000 students) to operating graduate and undergraduate programs of equal size. Chicago and Hopkins began as graduate oriented universities. For the others, graduate programs on this scale have required conscious administrative decisions, the hiring of a research faculty capable of obtaining high levels of external support, and generous donations in aid of graduate education from alumni and others.

The niche space in which these decisions and capacities converge is evidently small. Many eminent private institutions, including the California Institute of Technology, Carnegie-Mellon University, Dartmouth University, and Princeton University, have made conscious choices to compete in a more limited way as research institutions. Presumably this is due to the expense of fielding a large, broadly competitive research faculty on the foundation of a small, selective undergraduate student body.

## The Convergence of Business Models

We hear very frequently now about the Aprivatization@ of public research universities (see, e.g., Slaughter and Leslie, 1997; Geiger, 2003; and Kirp, 2003). But private research

universities have started to realize the problems in their business model as well, and some of the most successful are now beginning to resemble public research universities, at least more than they have in the past. On both sides, these changes reflect efforts to correct for weaknesses characteristic of their respective business models.

The weakness of the public research university model is clear; it is State-dependent to an unhealthy degree at a time when legislators and citizens no longer have the will to subsidize public higher education at historic levels (Breneman and Finney, 1997). I would not want to minimize the problems facing public research universities. They are severe. Those able to adapt have begun to do so in two ways: One is through the launching of fund-raising campaigns that rival or even surpass those found in the private sector. The most recent University of Michigan campaign is for $2.5 billion, roughly the level of the largest private university campaigns. The other is through annual increases in tuition and fees that are larger, proportionately, than those found in the private sector. So far, these increases have hit out-of-State students hardest. Out-of-State students attending the University of Michigan, the University of Virginia, and Pennsylvania State University now pay tuition nearly as high as they would pay at moderately selective private liberal arts colleges or university (Geiger, 2003:48). In-State students have seen their educational costs increase much faster than the rate of inflation over the last 25 years, with no signs of slowing ahead. As Roger Geiger (2003: 42-50) shows, state tuition ranges widely depending on state traditions and policies. In 2001-02, in-state tuition ranged from $2,500 in Arizona, Florida, and Utah to $7,500 in Pennsylvania. In 1980, the range was $500 to $1500. Many states have greatly augmented their student financial aid programs, but not enough to limit the shift in the composition of student bodies -- and especially those who graduate -- toward the upper end of the income distribution (Fitzgerald and Delaney, 2002: Mortenson, 2004).

What about the Apublic@ side of private institutions? One way to look at the Apublic@ dependence of private institutions is to focus on their revenue streams. Private research universities have been highly dependent on State funding since the beginning of what Clark Kerr (1962) called Athe federal grant university@ during World War II. Indeed, of the 12 recipients of federal research and development grants totaling over $300 million in FY 2001, half were private institutions. Federal student loan and opportunity grant programs apply as much to students attending private institutions as to those attending public institutions. Truly, we have had hybrid institutions for more than 60 years, in which the public universities depend on private funds for tuition revenues and donations, and private universities depend on public monies to support their research and student financial aid expenditures. Indeed, private universities have been leaders in one of the less fortunate outcomes of escalating competition for federal funds: the hiring of lobbyists to ensure the earmarking of federal research funds for university projects.[28]

Recent changes in research policy have enhanced private university engagement with public sources of funds. The most important of these is the trend toward joint State-corporate-university projects for new technology development. Cornell and the University of Rochester are, for example, major recipients of New York Star funds, along with some campuses of the State University of New York system. Similarly, Emory University has been one of the chief recipients of funds connected with the Georgia Research Alliance (GRA) and the technology development activities that have spun off GRA (Brint 2005a; Geiger and Sa 2005). The Ainvisible colleges@ of scientific researchers know no institutional boundaries along public and private lines, and these informal networks of collaborating scholars and scientists are becoming more numerous and more formalized in our age of jointly-funded, multi-site projects.

If revenue streams are converging, so too are the size dimensions of the organizations. This is an equally important, but often neglected impact of the success of the public university business model. Size, the main advantage of the public university model, is becoming a more important factor for private universities that want to compete in the research arena. Two of the more dynamic private universities of the last decades are also two of the largest, New York University and the University of Southern California. These institutions have increased selectivity and improved their scholarly reputations beginning from a large, but not highly selected undergraduate base (combined with some highly-regarded professional programs). Some other leading private universities also have relatively large undergraduate student populations B notably Columbia University and the University of Pennsylvania whose undergraduates now number above 7,500.[29] The days of the highly exclusive 5,000-person undergraduate student body would appear to be ending. Even historically small Princeton University is making plans to increase the size of its freshman class by 500. The apparent preference of top students for a university (rather than a liberal arts college) education is a factor contributing to this growth (McPherson and Schapiro 1998: chap. 5). The growth is slow, however, because among the chief attractions of elite education are precisely its intimacy and exclusivity.

Nevertheless, enrollment trends suggest movement toward a convergence of a common human resources model for competitive research universities. The human resources model will be based on undergraduate student bodies of at least 7,500 (and many more than that in public sector), graduate student bodies of 4,000 or more, and research faculties of 800 to 1000 (at a minimum). These enrollment and staffing levels provide the manpower and support necessary to field research operations in a broad array of fields for institutions seeking to compete at the

highest level.

Some continuing differences will, of course, remain in the sources and distribution of revenues. Tuition and state appropriations together will cover more than half of educational and research expenditures in the public sector (with a slow shift toward tuition), grants and contracts about 30 percent; and gifts, endowment earnings, and investments the remaining 15 percent. By contrast, net tuition alone will cover approximately 40 percent of educational and research expenditures in the private sector; grants, and contracts another 30 percent; and gifts, endowment earnings, and investments the remaining 30 percent. Institutions in both sectors will try to take the pressure off tuition by increasing their revenues from donations and earnings on investments.

Because gifts and earnings from investments cannot rise fast enough to cover costs, pressures to raise tuition will remain strong in both sectors. Although some limit on tuition must exist, we have, surprisingly, not yet reached it. Tuition hikes are particularly problematic in the State-aided sector, however, given the expectation that public institutions will serve society at large, rather than the higher-income strata exclusively. Consequently, important debates about the State's role in higher education lie ahead, assuming that tuitions continue to climb and the proportion of low-income students admitted continues to drop. Will new social compacts be reached to protect educational opportunities for students from low-income backgrounds, or will these students be priced ever more completely out of the market? At some public institutions, students from the bottom-quarter of family income already represent fewer than five percent of the total.

Unless a new social compact is reached, differences between public and private research universities may disappear at some distant point on the horizon. We are not yet close to this

vanishing point; most public universities still receive a substantial proportion of their annual educational and research budgets from State appropriations. But we are witnessing glimpses of the future in the recent efforts of the Dean of the Boalt Hall School of Law at Berkeley to increase independence from the State (Mangan, 2005), and the independence of the Business and Law Schools of the University of Virginia (Kirp, 2003: chap. 7), soon to be followed, perhaps, by the independence of the university as a whole.

## Conclusion

Some leaders of public research universities are pessimistic about the future of their institutions. They feel that they are failing to persuade the public of their institutions= value, failing to hold on to top faculty, trying to educate too many students, juggling too many activities, and perpetuating organizations that are unmanageable to boot!

A more balanced view suggests that public research universities are based on a high volume/low cost business model that remains viable and successful. Size -- student body size and its covariate, faculty size -- is the main factor contributing to the viability and success of this model. Public research universities educate the great majority of students, including most students in key areas of science and technology. They produce many of the people who go on to run businesses, non-profit organizations, and government agencies in their states, and they publish the great majority of new research. They do all this while at the same time providing substantially more opportunities for students from less-privileged backgrounds.

To my colleagues in public research universities, let me suggest that we therefore adopt a more sanguine view of our institutions. Public research universities cannot gain prestige as easily as their wealthier and more selective counterparts in the independent, non-profit sector.

They will not prepare as many national leaders per capita. They certainly will not win every faculty recruitment battle. But their total societal contribution, measured as human capital and research produced, is much greater. Public research universities are the true engines of our system of higher education and advanced research. Perhaps this will seem but cold comfort to public university professors and students who naturally strive to be the best in their fields, and desire to be located at those institutions widely considered to be "the best."

If we grow envious of our colleagues in the wealthier private institutions, we might wish to recall the words of the historian Allan Nevins. In 1962, Nevins wrote a history of the land grant institutions to commemorate the centennial of the first Morrill Act. Justin Morrill=s legislation, was remarkable, Nevins wrote, Aas a profession of faith in the future in the midst of civil war..." But it was "still more memorable..." for its Avision of the families of bright children, springing up by the million over prairie, plain, and foothill ... with (an) appetite for knowledge, wisdom, and inspiration. (These children) could no longer be properly served by the small endowed colleges ... They needed a new education for a new society, lustier, more practical, more energetic, than any ... that had previously appeared on earth" (Nevins, 1962: 22).

More than 40 years later, as we approach the sesquicentennial of the Morrill Act, we can take pride in the continuing ability of our public research universities to respond to the aspirations of millions, while enlisting those aspirations to the service of a great cause: the dissemination and further development of science and culture. At the same time, it is clear that the public research universities must work to renew their social compacts with the States to keep these promises alive into the next decades.

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**Notes**

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2. Over a ten-year period, among states with relatively large populations, few private colleges or universities, and significant population growth, the following states ranked below Colorado in the percentage change of appropriations for higher education: Alabama, Arizona, Missouri, New Jersey, Ohio, Oregon, Pennsylvania, South Carolina, Washington, and Wisconsin. In FY 2003, the bottom ten states in per capita spending on higher education were (in order): New Hampshire, Vermont, Missouri, Rhode Island, Montana, Pennsylvania, Arizona, Nevada, Oregon, and Florida. Colorado was 39$^{th}$ (Palmer and Gillilan, 2004: 17).

3. Operating budgets provide a marginal improvement over grants in the prediction of graduate student enrollments. Perhaps this is because larger campuses have more administrative jobs that graduate students can occupy and are also set in larger urban complexes, where graduate students can find employment. However, the differences in adjusted R-square between the two equations are so small as to be hardly worth noting.

4. The 10 percent sample was drawn by counting every person whose last name began with AB.@ I used the letter AB@, not only because it yielded the desired sample size, but also because it is not manifestly influenced by a particular ethnic distribution of names, as might, for example, be the case with such letters as AD@ (perhaps disproportionately Italian and French), AM@ (perhaps disproportionately Scottish and Irish), or AO@ (perhaps disproportionately Irish).

5. Studies using *Who=s Who* for purposes of identifying a national elite are complicated by many factors. Some of of the most accomplished people do not choose to have their biographies included in *Who=s Who*. Some included may not in fact represent the highest levels of achievement in their fields. Studies suggest that business leaders are under-represented, while educators are over-represented (Baltzell, 1953). Other occupations, such as nurses, may also be over-represented. Studies attempting to identify the baccalaureate origins of national leaders included in *Who=s Who* face additional limitations. Some of those who failed to list a baccalaureate institution did graduate from college. Thus, many doctors, lawyers, and judges list only their first professional degree institution. Perhaps half of those listed with no baccalaureate college attained a first professional degree. I took a conservative approach to these cases and coded them as Ano college listed.@

6. I counted all current ACarnegie doctoral-extensive@ research universities as Aresearch universities.@ I counted all other institutions either as Aother private@ or Aother public@ institutions, depending on control. I judged that an effort to determine which institutions fit the label of Aresearch universities@ at the time each person graduated from college would be prohibitively time consuming. Some current private research universities, such as the University of Miami and Lehigh University, were not research universities at the time that people listed in *Who's Who* attended. Similarly, some current public research universities, such as the University of South Florida and the University of California-Santa Cruz, have been identified as research universities only very recently. This introduces a certain amount of error into the estimates, but the amount of error is not great because the new research universities tend to account for a relatively small number of people in the sample. In addition, it is worth noting that Aother public" institutions@ include the national military institutes (U.S. Army Academy, U.S. Naval Academy, and U.S. Air Force Academy) that are not supported by any of the 50 states, but rather by the federal government.

7. These estimates are based on NCES data for the distribution of students in public and private degree-granting institutions (including community colleges). These estimates show that the distribution between the two Asectors@ were approximately even in the 1940s and 1950s, shifted to a 60-40 split by 1960, moved to a 75-25 split by 1970, an 80-20 split by 1980, before moving

back in the direction of a 75-25 split in the 1990s. The group represented in the study attended college between approximately 1940 and approximately 1980, with the majority attending in the 1960s and 1970s. Community colleges did not become a large part of the Apost-secondary education@ system until the end of the 1960s. Most of the shifting balance toward the public sector from that point on can be contributed to the growth of community colleges. Thus, for most of the sample, the likely public-private proportion is approximately 60-40. We know that the proportion of students attending Aother public@ institutions has risen over time, while the proportion attending private research institutions has declined. Current proportions, according to NCES, are seven percent private research universities, 27 percent public research universities, 28 percent Aother private@ institutions, and 38 percent Aother public@ institutions (NCES, 2002: 254). I estimate that all of the movement over time has been toward the Aother public@ category, with each of the three other types of institutions losing approximately equal share to the public Aother@ institutions. A smoothed distribution would, therefore, yield a 10-30-30-30 split. The proportion from private research universities could easily be a little lower, however. Even a one percent change (from 10 to nine percent) would mean that the over-representation of these institutions among *Who=s Who* biographical listings is closer to 3:1 than 2.5:1.

8. Selectivity level is undoubtedly a larger influence on career recognition as measured by *Who=s Who* than the type and control of the college or university attended. According to one recent study, between 15 and 20 percent of American college graduates listed in *Who=s Who* for the years 1950, 1970, and 1992 graduated from just 12 selective private colleges and universities (Pyle, 1996: 79). Thus, highly selective private colleges, such as Amherst, Dartmouth, and Williams contributed many graduates to *Who=s Who* in my study, as did selective public colleges and universities, such as the U.S. Naval Academy, Miami University of Ohio, and the College of William and Mary. With the notable exception of City University of New York, less selective private colleges, including, for example, bible colleges and seminaries, and less selective public universities, such as teacher=s colleges and regional master=s granting institutions, contributed many fewer graduates to *Who=s Who* (Brint 2005b).

9. Through 2002, 68 of 115 large gifts (over $50 million) went to private research universities, 10 to private liberal arts colleges (many of these to Christian colleges), and 37 to public research universities.

10. This calculation does not include gifts for the purposes of establishing a new institution. Nor does it include scholarship gifts to be distributed over a wide range of institutions (such as the "Gates Millennium Scholars" program or the Annenberg gift to the United Negro College Fund).

11. As one moves from the top to the bottom ranks of the two sectors, private endowment per student consistently exceeds public endowment per student by between 15 and 10:1. Thus, Washington University of St. Louis, 26$^{th}$ on the private list, had an endowment per student of over of over $330,000 in 2002, while the University of Minnesota, 26$^{th}$ on the public list, had an endowment per student of under $26,000 (NACUBO, 2003).

12. For discussions of the many flaws in *U.S. News and World Report* methodology, see

Ehrenberg (2002), McPherson (2000), and Thompson (2000). For a discussion of the influence of the ratings, see Monks and Ehrenberg (1999).

13. In recent editions, the *USN* rankings have been based on seven factors: academic reputation, student retention, faculty resources, student selectivity, financial resources, graduation rate performance, and alumni giving. At least six of the seven B graduation rate performance is questionable B are based directly on selectivity and wealth, or highly correlated with selectivity and wealth.

14. The Princeton Review (2004) cites 19 private colleges and universities and one service academy as providing the Abest overall academic experience.@ It cites 18 private colleges and universities and two public universities as Atoughest to get into.@ It cites 18 private colleges and universities and two service academies as places where students Astudy hard.@ It cites 20 private liberal arts colleges as places where professors Abring the material to life,@ and 18 private liberal arts colleges and two service academies as places where professors Aare accessible.@

15. In my sample of research universities, the correlation between selectivity (as measured by average SAT scores of incoming freshmen) and wealth (as measured by market value of endowment assets per student) is .71. Because of this high correlation, introduction of a wealth measure into regressions on *USN* rank leads to potential problems of multi-collinearity. With this proviso in mind, it is nevertheless notable that, once selectivity is controlled, the wealth measure is significantly and negatively related to *USN* rank. Thus, it would appear that those wealthy institutions that do not convert wealth into high levels of selectivity are penalized in rank, while the majority of wealthy institutions are rewarded, because they succeed in making the conversion of wealth to high selectivity.

16. *USN* would not release ranks of universities below the Atop 50@ for reasons of confidentiality. I therefore estimated the rank for the institutions in my sample below the Atop 50.@ I was able to obtain measures of all but one used by *USN* in computing their rankings. Where I could not find a value for a particular variable, I assigned the midpoint. I used a procedure of weighting by rank on each variable. I grouped institutions with similar scores on the 13 variables I analyzed. These groupings no doubt fail to replicate exactly those used by *USN*. In addition, my formula for computing scores may have differed in other minor respects from the formula used by *USN*. For these reasons, my rankings for second through fourth-tier institutions do not exactly replicate the *USN* (2002) rankings. I could not, for example, precisely reproduce the ranks for Athe top 50 public national universities-doctoral@ reported by *USN* (*U.S. News*, 2002: 77). However, with a handful of exceptions (notably, the University of Minnesota, the University of Arizona, and the University of Kansas), my rank order of Atop 50 public national universities@ is very close to the rank order reported by *USN*. Rather than repeat the laborious collection of data for the relatively few third and fourth-tier institutions in my sample, I assigned the midpoint of quartile ranks for these institutions, based on analysis of data reported by *USN* (ibid.: 75-77). My estimate of the variance explained by average SAT score could be slightly inflated. Nevertheless, I am convinced that a true replication, based on *USN*

ranks for tiers 2 through 4 would definitively establish the extraordinary dependence of the *USN* rankings on selectivity and wealth, the key attributes of the private university Abusiness model.@ Indeed, one reason why *USN* may refuse to report all of the data necessary to reproduce their rankings is that they would rather researchers and administrators not discover that their elaborate formula, based on more than a dozen measures, could be replaced, without too much loss of Aprecision,@ by a single input variable: average SAT/ACT scores.

17. The 1989 *College and Beyond* cohort from selectivity level 3 (average SATs of below 1150) included University of Miami (Ohio), University of Michigan, Ann Arbor, University of North Carolina, Chapel Hill; and Pennsylvania State University (Bowen and Bok, 1998: 339).

18. The 1989 *College and Beyond* cohort from selectivity level 1 (average SATs over 1300) includes students from Bryn Mawr College, Duke University, Princeton University, Stanford University, Williams College, and Yale University. The 1989 cohort from selectivity level 2 (average SATs between 1300 and 1150) included Kenyon College, Oberlin College, University of Pennsylvania, Vanderbilt University, Washington University, Wellesley University, and Wesleyan University (Bowen and Bok, 1998: 339).

19. The advantage shifts to the private institutions in relation to production of doctors, lawyers, and ministers (first professional=s degrees). Private institutions produce nearly three out of five of these first professional degrees (NCES, 2003: 315).

20. In 2003, the median family income in the United States was approximately $43,500 (U.S. Census Bureau 2003: Table 3). In fall, 2003 only about 11 percent of students from the most selective private universities reported family incomes of $40,000 or less. In the most selective public universities, 17 percent reported family incomes at this level (HERI, 2003: 78). These figures are for purposes of illustration only. The national median includes many people on fixed incomes who are well beyond the age at which most families send children to college.

21. It is conventional (and undoubtedly correct) to assume that a higher quantity of work does not necessarily translate into higher quality work. At the same time, no warrant exists for making the opposite assumption: that low levels of quantitative output reflect high quality, or more stringent standards. Studies of academic publishing show that quantity and quality are not inversely related; most of the top publishers in a field are also generally influential leaders in the field (Ladd and Lipset 1975: 142-6). In recent years, studies of the relationship of productivity to prestige have shifted to the departmental level. Scholars find that productivity can be a less important influence on prestige than factors such as size and centrality in Ph.D. exchange networks (Burris, 2004; Han, 2003).

22. Interestingly, having a medical center was not statistically associated with higher publication counts, once research faculty size and total research grants were controlled.

23. The Institutional Data Archive contains financial data at five-year intervals. I therefore used 1990 data in the analysis of the 1993 NRC program evaluations. Unfortunately, average SAT

data is available for 1982 and 1999 only. However, this is not quite as severe a problem as might be imagined, since the correlation between average SATs in 1982 and 1999 are very high (.924).

24. In truncated regression models, where y is regressed on x using the positive observations on y only, the OLS estimator will be biased. The appropriate method to estimate the tobit model is maximum likelihood. See Tobin (1958).

25. Honors colleges may be one additional attraction for "super students" enrolled in public universities. As Geiger (2002) observes, honors colleges allow for the reproduction of learning environments similar to those found at selective private institutions. In this way, public institutions can reproduce the Apeer effects@ of private institutions.

26. The state universities in a few other low population agricultural and mining states -- such as Alaska, Montana, North Dakota, and South Dakota -- do not grant enough doctoral degrees to place into the ACarnegie doctoral-extensive@ ranks.

27. By size of graduate population, the top 10 private institutions are: Columbia University, Harvard University, the University of Southern California, New York University, the University of Pennsylvania, Stanford University, the University of Chicago, Boston University, Northwestern University, and Yale University. Johns Hopkins University and Duke University have graduate student populations approaching 4000.

28. Robert M. Rosenzweig provides a useful history of developments during his tenure as director of the Association of American Universities. He dates the modern era of lobbying for earmarked appropriations to 1983, when Catholic University and Columbia University both appeared in an energy department appropriation for building funds. He holds Columbia accountable for the most serious breach, both because of its high prestige and because it retained a lobbying firm to help in its efforts: AHad only Catholic been involved, the appropriation would no doubt have been deplored but then dismissed as another favor to the Speaker (Tip O=Neill, who was known to have a special fondness for Catholic universities). Columbia, however, was different. Here was an Ivy League university, with great prestige and a distinguished faculty that had judged this an acceptable way to obtain federal funds. Suddenly, the color of legitimacy had been given to what had previously been a marginal, slightly disreputable practice@ (Rosenzweig 2001: 38-9).

28. These figures include undergraduate enrollments in engineering and other undergraduate degree-granting units outside of Columbia College. The figures include undergraduate enrollments in the engineering and business schools at Penn, as well as other degree-granting units outside the College of Penn.