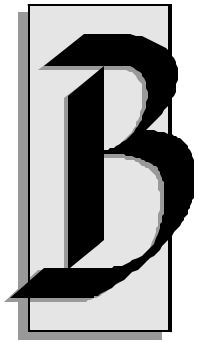

Funding Restrictions at Public Universities: Effects and Policy Implications

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Brookings Institution Working Paper

September 2003

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Over the past two decades, state financing of higher education has declined as a share of personal income. State appropriations have fallen from an average of roughly $8.50 per $1,000 in personal income in 1977 to an average of about $7.00 per $1,000 in personal income in 2002. Tuition increases have only partially offset the decline in state appropriations in allowing public institutions to keep up with private ones. As a result, educational spending per full-time equivalent student has declined at public institutions relative to private institutions, from about 70 percent in 1977 to about 58 percent in 1996.

In Kane, Orszag, and Gunter (2003), we examine the causes of the decline in state higher education appropriations, with particular attention to expansions in Medicaid costs and interactions with the business cycle. The purpose of this paper is to document the troubling signs that the resultant relative decline in spending per student at public universities may be exerting an adverse effect on the quality of faculty, students, and education delivered at public institutions. Various observers of higher education have noted a decline in the perceived and real quality of public higher education in recent years.[1]

Since roughly three-quarters of college students are enrolled at public institutions, any decline in the quality of the nation's public universities could have troubling implications. Indeed, to the extent that the quality of public higher education affects macro-economic performance, income inequality, and social well-being, the consequences may be considerable. Recent media reports have also started to identify the broader consequences of funding restrictions at public universities as a substantial concern.[2] We discuss alternative ways of financing public higher education to attenuate such adverse consequences.

[1] See, for example, Selingo (2003)..
[2] See, for example, Symonds (2003).

A reduction in spending need not translate into a proportional reduction in quality, if institutions were somehow becoming more efficient (that is, were able to maintain the same absolute level and quality of educational services delivered at lower cost). As a result, it is difficult to draw any conclusions about the absolute quality of higher education in the United States. In this paper, we focus instead on the relative quality of public and private institutions. Our approach is to examine a wide variety of indirect proxies for "quality," in the hope that a consistent story from a number of admittedly imperfect indicators will prove to be insightful.

This paper has five sections. In the first section, we document the reduction in relative spending per student and explore some broad indicators of the implications for quality at public universities. In the second section, we examine trends in faculty conditions at public and private universities. In the third section, we explore data on the relative selectivity of public universities. In the fourth section, we present survey data from faculty on their perceptions of the quality of undergraduate education at their institutions. In the fifth section, we discuss projected trends in state appropriations, the implications for public universities, and policy responses.

I. Trends in higher education appropriations and popular indicators of "quality"

The decline in state support for higher education over the past several decades manifests itself in several common measures, which are documented in Kane, Orszag, and Gunter (2003). As just one example, Figure 1 shows state appropriations for higher education relative to personal income. State appropriations have fallen from an average of roughly $8.50 per $1,000 in personal income in 1977, to an average of about $7.00 per $1,000 in personal income in 2002. Since personal income amounted to $8.8 trillion in 2002, state appropriations would have been about $13 billion higher -- or about 20 percent higher than their actual level -- in 2002 if appropriations had been maintained at the ratio to personal income obtaining in 1977.

Tuition increases have not been sufficient to offset the reduction in appropriations and allow public universities to keep pace with private ones. The reason presumably is that tuition is not set in a political vacuum. As of the mid-1990s, the state legislature directly set tuition at

public institutions in ten states. In most other states, a higher education coordinating board or a governing board sets tuition.[3] These boards, however, are also subject to political constraints. Most importantly, the legislature could simply adjust the amount it appropriates to higher education if it objects to the tuition level set by the board. State politicians are thus (perhaps not surprisingly) involved at least to some extent in the process of setting tuition at public colleges and universities, with the intensity of involvement varying across the states.

The political context in which tuitions are set imposes limits on the degree to which tuition increases can offset appropriations reductions. As Ehrenberg (2002) has argued, "in many states governors and state legislatures firmly are committed to the belief that in-state tuition should be kept low, which limits another major source of revenue for public higher education initiatives." Experience from the early 1990s suggests substantial voter backlash to tuition increases.[4]

The combination of the decline in state appropriations and political restrictions on raising tuition at public institutions has produced a marked decline in educational and general spending per full-time equivalent student at public schools relative to private schools. Figure 2 shows that the ratio has fallen from about 70 percent in 1977 to about 58 percent in 1996.[5]

These differential spending trends raise the concern that the quality of public universities may be declining relative to private universities. As emphasized above, quality in higher education is difficult to measure, and reductions in spending need not translate into proportional reductions in quality. For example, Volkwein (1987) finds that increases in state appropriations raise administrative expenditures, suggesting that reductions in appropriations could be offset by reductions in administrative overhead. Robst (2001) finds, however, that institutions experiencing larger declines in state appropriations increased efficiency by *less* than institutions that experienced smaller declines in state appropriations. As Robst concludes, "Based on these results, states need to be cautious about simply reducing appropriations and altering universities'

[3] Kane (1999), page 39.
[4] Callan (2002).
[5] Ehrenberg (2002) also finds such a decline. The ratio of *total* (as opposed to educational and general) spending per full-time equivalent student at public institutions relative to private institutions fell from 63 percent in 1977 to 53 percent in 1996.

revenue structure as a reaction to perceived inefficiency." Volkwein (1986) similarly finds that increased appropriations are associated with higher institutional quality, suggesting that any offsetting efficiency improvements are insufficient to change the basic conclusion that reduced appropriations are likely to reduce quality.

In any case, it would be surprising if steep declines in relative spending per student at public universities compared to private universities did *not* manifest themselves in at least some decline in the relative quality of higher education at public universities over time. Several indirect measures suggest such a decline may be occurring, and the decline may be more substantial than currently perceived.

Figure 3 shows the decline in the share of public universities among the top 25 highest ranked national universities, according to *U.S. News and World Report*. Public universities had represented 7 of the top 26 schools in 1987 (ties are allowed, so the "top 25" includes more than 25 schools); by 2002, they represented 4 of the top 27 schools. If the standings are weighted by rank, the share of public universities declined more markedly; see the solid line in Figure 3.[6] For example, in 1987, both Berkeley and Michigan were ranked within the top 10 schools. By 2002, the top-ranked public university (Berkeley) was ranked 20th. Although the *U.S. News* series is a very imperfect indication of a school's relative quality, this is a troubling trend.

II. Faculty

The relative decline in spending per student at public universities is likely to affect the quality and morale of the faculty. Indeed, reductions in the quality or morale of a university's faculty may be one of the most important channels through which spending reductions adversely affect the quality of education received by students.[7] We explore several related dimensions of the effects of spending restrictions on faculty members using different data sources.

[6] To weight by rank, the top ranked institution among the 25 schools was given a value of 25, the second a value of 24, the third a value of 23 and so on. Therefore, the top ranked schools among the 25 were given a higher rank.

[7] As Volkwein (1986) emphasizes, the "quality of the faculty is widely believed to be the most important component of a university's quality." Volkwein (1986), page 516.

Faculty Salaries

Faculty salaries represent a substantial share of public university expenditures: In 1997-1998, expenditures for instruction represented 34.7 percent of educational and general expenditures at public research institutions and 37.6 percent at public bachelor's institutions.[8] It is therefore not surprising that faculty salaries reflect the trends in overall spending per student at public relative to private institutions, and several recent papers have documented a decline in faculty salaries at public universities relative to private ones.[9] For example, using data from the American Association of University Professors, Zoghi (2003) finds that salaries were roughly two percent lower at public schools in 1975, but more than 12 percent lower by 1997.

To examine this issue, we obtained data from the HEGIS/IPEDS data system, maintained by the U.S. Department of Education, which is essentially a census of colleges and universities each year. We also obtained data on faculty salaries and student enrollment for research and doctoral institutions from the American Association of University Professors (AAUP). The AAUP data are based on surveys of four-year universities and two-year colleges; the survey collects data on the number of faculty in different classifications (full professors, associate professors, assistant professors, non-tenure track faculty), on salaries in the various classifications, and on basic information about the university (including enrollment). The mean salary of various salary ranks was highly correlated in the AAUP and HEGIS/IPEDS data. In the results in this paper, we use the HEGIS/IPEDS data, although the results are similar using the AAUP data.

We limit our analysis to Research I and II institutions, as identified by the Carnegie classification system. (The results are similar for other doctoral institutions as well.) Figure 4 portrays the ratio of public salaries to private salaries, by rank and by year. There are at least three facts worth noting in Figure 4. First, ratios were close to 1 (except for full professors, who

[8] "Chapter III: Revenues, Expenditures, and Prices at Public Institutions," Tables 6 and 10, in National Center for Education Statistics, "Study of College Costs and Prices: 1988-1989 and 1997-1998," U.S. Department of Education, Office of Education Research and Improvement, NCES 2002-157, December 2001.

[9] In addition to the Zoghi paper, see, for example, F. King Alexander, "Disparities in State Tax Effort for Financing Higher Education," paper presented at the Cornell Higher Education Research Institute conference on "Financing

earned 4-6 percent less at public institutions) and quite stable before 1980. In other words, prior to 1980, salaries were basically comparable in the two sectors. Second, beginning in the early 1980s, salaries began declining at public institutions relative to private institutions at all academic ranks. The public/private ratio of average salaries fell to .82, .88 and .84 for full professors, associate professors and assistant professors respectively by 1998. Third, the decline seems to have accelerated in the early 1980s and early 1990s, which were times when public institutions were facing budget cut-backs due to recessions.

We also used the faculty salary data to examine changes in salaries on a school-by-school basis. In particular, we regressed the average salary by school in each year on a fixed effect for each school, year dummies and the previous year's unemployment rate (reflecting the lag in the effect of the business cycle on state budgets). The sample included faculty salaries from 1978 through 1998. For public institutions, we also included an interaction with the long-term trend and an interaction with the lagged unemployment rate:

$$s_{it} = a_i + d_t + b_1 ur_{t-1} + b_2 Public * ur_{t-1} + b_3 Public * (t-0) + e_{it}$$

where s is the natural log of average faculty salary at school i in year t, α_i is the fixed effect for the school, δ_t are the year dummies, ur_{t-1} is the lagged unemployment rate in the state, t represents year and "public" is a dummy variable that equals one if the university is public. We ran regressions separately by rank of faculty (full professors, associate professors, and assistant professors). Table 1 presents the results. The results underscore both a long-term decline and a cyclical component in relative salaries for faculty at public institutions. As the interaction between the public dummy variable and the time trend shows, salaries at public institutions were declining by 0.8 to 1.0 percentage point per year (compared to private salaries) over this period.[10] Moreover, for each 1 point increase in unemployment rates in the prior year, the gap between public and private salaries increases by an additional 0.6 to 1.0 percentage point. Interestingly, the results also suggest that private institution salaries are not affected by the business cycle. These findings seem consistent with Hamermesh (2002), whoalso noted that the widening of the

Higher Education in the 21st Century," May 2001; and Daniel Hamermesh, "Quite Good—For Now," *Academe* 88, March/April 2002.

public/private salary gap seemed to accelerate during the recessions of the early 1980s and early 1990s.

Salaries are a limited measure of faculty compensation. There may be other ways in which faculty are compensated: in the quality of living conditions, quality of students, etc. One measure that provides insight into these other factors for faculty members is the student-faculty ratio, which may affect both the attractiveness of a faculty position conditional on salary and may also affect the quality of instruction provided to students. Figure 5 reports the trend in the number of full-time equivalent students per faculty member at Research I and Research II universities. As the figure indicates, students per faculty member have fallen at private universities (from 17.3 in 1971 to 15.7 in 1997) but risen slightly at public universities (from 21.1 in 1971 to 21.5 in 1997).

For at least one major nonpecuniary aspect of employment at a university -- namely, the student-teacher ratio -- the public private gap thus exacerbated rather than attenuated the effect of the decline in relative salaries at public universities. Our results are consistent with Zoghi (2003), who concludes, "in fact, not only have relative wages fallen at public institutions, nonpecuniary benefits have also decreased for the public faculty. The results suggest that we should indeed be concerned about possible effects on the supply of high-quality labor to public universities." Zoghi (2003) also studies trends in fringe benefits, such as the value of pension plans, medical/dental benefits, life insurance, and tuition and housing benefits -- and finds that for all of these factors, public university faculty fell behind faculty at private institutions.

National Study of Postsecondary Faculty data

An alternative source of data on trends affecting faculty is the Department of Education's National Study of Postsecondary Faculty (NSOPF). The NSOPF is a comprehensive study of faculty in postsecondary educational institutions. The survey covered both full- and part-time faculty and collected information regarding backgrounds, responsibilities, workloads, salaries, benefits, attitudes, and future plans. Three cycles of NSOPF surveys have been conducted (in 1987-1988, 1992-93, and 1998-99). We focus on the 1992-1993 and 1998-99 data because of

[10] Since the dependent variable is in log units, the coefficients approximate percentage point changes per year.

their larger samples and higher quality surveys. The NSOPF data are available to researchers on a restricted basis, and we were granted access to the data for this project.

We begin our analysis of the NSOPF data with compensation data. Table 2 shows the ratio of compensation at public universities relative to private universities at different points in the compensation distribution. (That is, the figure for the 10th percentile shows compensation at the 10th percentile for public universities divided by compensation at the 10th percentile for private universities.) We restrict the sample to faculty at research and doctoral universities who worked full-time. Table 2 shows that compensation for all faculty at public universities declined from an average of 91 percent of compensation at private universities in 1992 to 82 percent in 1998.

The results varied somewhat by faculty classification, however. The relative mean compensation for tenured faculty declined from 93 percent in 1992 to 84 percent in 1998. There was little change in the relative mean compensation for assistant professors (defined as tenure-track faculty who are not tenured), but a particularly marked decline at the higher end of the salary scale. For example, relative compensation at the 90th percentile for assistant professors declined from 81 percent in 1992 to 66 percent in 1998. Relative compensation also declined significantly for non-tenure-track instructors at public universities; the mean compensation for such instructors declined from 82 percent of that at private universities in 1992 to 72 percent in 1998. In contrast to the results for assistant professors, the decline in this category was somewhat more concentrated lower in the salary distribution.

The NSOPF in 1993 and 1999 also included questions regarding changes in faculty workload. Faculty respondents were asked to classify the change in faculty workload into one of several categories. Table 3 shows the coefficient on a public university dummy variable in an ordered probit and ordered logit regression of the responses to those questions. In 1993, the categories were defined so that increases meant that pressure to increase workload had "improved"; the negative coefficient on the public dummy variables for 1993 therefore implies that, relative to faculty at private universities, faculty at public universities felt that pressure to increase workload had worsened. In 1999, the categories were defined so that increases meant

that faculty workload had increased; the positive coefficient on the public dummy variables for 1999 therefore again means that, relative to faculty at private universities, faculty at public universities felt that workload had risen. Including a variety of other control variables does not materially affect these results; Appendix Table 1 presents the results.

The NSOPF data thus suggest that non-pecuniary aspects of faculty positions had, if anything, worsened at public universities relative to private universities – so that the compensation trends *understate* the decline in the relative attractiveness of teaching at a public relative to a private university.

Summary

We would expect reductions in spending per student at public universities relative to private universities to affect faculty quality and morale, at least over time. Kerlin and Dunlap (1993), for example, survey faculty members at the University of Oregon following restrictions in state financing. They conclude that "inadequacy of financial resources has negatively affected faculty morale, collegiality, and allegiance to the University of Oregon."[11] Public university administrators are apparently increasingly concerned that resource constraints limit their ability to compete for top faculty members.[12]

Using data from IPEDS and the NSOPF, we find that salaries have declined, and student-faculty ratios and workloads have increased at leading public universities relative to private universities. The decline in salaries and increase in workload per faculty member at public universities relative to private universities raises concerns both about teaching loads at public schools and about the relative quality of instruction delivered.

III. Students

We also studied changes in the academic qualifications of students enrolling at public institutions over time. The relative declines in spending per student at public universities may

[11] Kerlin and Dunlap (1993), page 369.

affect the type of student attracted to public universities (including indirectly, by reducing the quality or morale of the faculty over time). And the declines in the academic qualifications of students entering public institutions, in turn, could lead to a decline in the quality of education delivered at the institutions. For example, the academic credentials of one's peers may have direct effects on the quality of one's own education (Sacerdote, 2001 and Zimmerman, 2003). As fewer top students attend public institutions, such schools could become even less desirable to the top students. Moreover, a loss of the top students could make it more difficult for public institutions to attract star faculty, who are eager to work with bright students. In other words, a decline in quality could both cause and be caused by a decline in the quality of students entering the institution.

This section uses data from the College Board to examine the quality of the student body at public universities relative to private universities. In its Annual Survey of Colleges, the College Board surveys approximately 1900 four-year colleges and universities in the U.S., collecting data on the characteristics of each institution's entering class. The survey receives responses from 80 to 85 percent of the four-year institutions in the United States each year. We use the results of those surveys in 1986, 1990, 1992, 1996, and 2000 to study changes over time in the characteristics of students attending public and private institutions. We merged the College Board data with information regarding the schools' *Barrons'* rankings in 1984; the schools included were limited to those ranked "3 stars" or higher by *Barron's* in 1984. Appendix Table 2 lists the schools.

Table 4 shows the results from a wide variety of regressions of the form:

$$X_{i,2000} = a + X_{i,1986} + \sum_k Z_{ik,1986} + public + e_i$$

where X is some measure of "quality" (such as math or verbal SAT scores), Z is a set of control variables (including other measures of quality and, for SAT scores, polynomials in $X_{i,1986}$), and public is a dummy variable equal to one for a public university. Table 4 shows the coefficient on

[12] See Greenberg (2003) for one example.

the public dummy; Appendix Tables 3 through 5 provide additional regression results, including more information about the regressions presented in Table 4 and additional specifications.

Table 4 shows that after adjusting for measures of the "quality" of the student body in 1986:

- The 75th percentile of Math SAT scores declined by 12 to 13 points between 1986 and 2000 at public universities relative to private universities;

- The 25th percentile of Math SAT scores declined by 12 to 18 points between 1986 and 2000 at public universities relative to private universities;

- The 75th percentile of Verbal SAT scores declined by 16 to 23 points between 1986 and 2000 at public universities relative to private universities; and

- The 25th percentile of Math SAT scores declined by 17 to 23 points between 1986 and 2000 at public universities relative to private universities.

All of these changes were statistically significant. Table 4 also shows that other changes were not generally statistically significant:

- The yield rate (the share of accepted students who enrolled) increased at public universities relative to private universities, although the results were statistically significant in one regression and not in the other;

- The acceptance rate (the share of applicants who were accepted) did not change in a statistically significant way; and

- The share of enrollees in the top 10 percent of their high school class declined at public universities relative to private universities, but the change was statistically significant in some specifications and not in others.

The results suggest that incoming SAT scores dropped significantly at public universities relative to private universities between 1986 and 2000, even though other indicators of relative quality -- such as yield rates, acceptance rates and the proportion of youth in the top tenth of their high school class -- did not show statistically significant trends between 1986 and 2000. Although merely suggestive on their own, the possible decline in the quality of incoming studies at public universities is certainly consistent with the data on widening gaps in expenditures per student and faculty salaries between public and private institutions.

IV. Faculty survey opinion on quality of undergraduate education

The final piece of evidence on the decline in the quality of public institutions compared to private institutions is derived from the NSOPF data. In 1993 and 1999, faculty respondents were asked questions about the quality of undergraduate education at their institutions. In 1993, the question asked whether the quality of undergraduate education at the institution had worsened or improved in recent years; higher numbers indicated an improvement. In 1999, the question asked whether the quality of undergraduate education had declined, higher numbers indicated that quality had indeed deteriorated.

Table 5 presents summary results from ordered probit and ordered logit regressions of the responses to these quality questions. The coefficients on the public university dummy variable are negative and highly statistically significant in 1993, indicating that public university faculty disproportionately believed that the quality of their institutions had deteriorated. In 1999, the coefficients are positive and statistically significant for tenured faculty and tenure-track faculty; these results also suggest that public university faculty disproportionately believed that the quality of their institutions had deteriorated. Appendix Table 6 provides additional related results.

Figures 6 and 7 depict the responses to these questions graphically. In both years, the distribution of responses among public university faculty members are more skewed toward a deterioration in the quality of undergraduate education than the distribution of responses among

private university faculty members. Figures 8 and 9 show the responses among tenured faculty only; the pattern is similar, with public tenured professors more inclined to indicate a deterioration in quality at their universities.

The results in Table 5, along with Figures 6 through 9, provide yet another piece of evidence – and for some readers, perhaps the most convincing piece of evidence – that the relative decline in spending per student at public universities is manifesting itself in a relative quality of education delivered at such universities. To be sure, responses to survey questions like the ones presented in Table 5 are not conclusive, since various biases could affect the survey responses. Nonetheless, especially in combination with the other evidence above, the results strike us as grounds for significant concern that the relative quality of public institutions has declined in recent years.

V. Policy Suggestions

The data presented above suggest that significant reductions in higher education appropriations, combined with political constraints on tuition increases, may be leading to a deterioration in the quality of public higher education institutions relative to private institutions. In this section, we briefly examine several policy steps that could attenuate this trend.

Medicaid reform

State budgets are likely to come under continued pressure from the Medicaid program in the future. Much of this growth in costs is likely to be associated with the elderly, both because the baby boomers will swell the ranks of the elderly and because of ongoing increases in the relative cost of health care for the elderly. The population age 65 and over is expected to increase from 35 million in 2000 to 70 million by 2030.[13] The low-income elderly are eligible for Medicaid, suggesting that the number of elderly beneficiaries will rise rapidly in the future. Furthermore, it is reasonable to expect ongoing increases in the relative cost of health care for the elderly, which will put additional pressure on the Medicaid program.

[13] Bureau of the Census projections as reported in *Statistical Abstract of the United States 2001*, Tables 11 and 13.

Given the evidence that Medicaid has been crowding out higher education appropriations, reform of that program may help to reverse the decline in higher education funding. Medicaid reform is substantively and politically complicated, however, and significant reform does not seem likely in the near future.[14]

Higher education trust funds

Since demand for higher education increases during recessions, when state funding is under most pressure, reforms to smooth higher education spending over the business cycle seem sensible. For example, states could create dedicated trust funds for higher education appropriations. The trust funds would build up during economic booms and then be drawn down during recessions.

An interesting question involves whether smoothing funding for higher education over the business cycle would affect the *trend* in higher education appropriations. If state legislatures have long time horizons and are budgeting over the medium and long-term, smoothing out the short-term fluctuations in higher education spending should have little effect on the long-term commitment to higher education. For example, state legislatures may have been eager to cut higher education spending, and would have eventually reduced such spending even without the excuse of a recession to implement the reductions. On the other hand, it is at least conceivable that the excuse of a recession is a necessary condition for implementing reductions. Furthermore, to the extent that there is a lot of inertia in budget items due to the political economy of state budgets, any reductions made during a time of recession may have a tendency to become permanent. It is possible that protecting appropriations for higher education during recessions could thus prevent a permanent "ratcheting down" in public higher education expenditures. Regardless of whether the trend is affected, smoothing funding over the business

[14] Orszag (2003) discusses Medicaid and other state budget reforms.

cycle would be desirable: by lessening the adjustment costs for institutions as well as families attempting to finance a college education for their children.

Higher tuition coupled with increased means-tested aid

For years, researchers have been concerned that the implicit subsidies embodied in state appropriations for higher education may not be well-targeted. Hansen and Weisbrod (1969), for example, argued that state subsidies were likely to accrue to middle-income and higher-income families, because children from such families were both more likely to attend college and more likely to attend the flagship university in the state.[15] One possible response to the reduction in appropriations is to reduce these implicit subsidies for higher-income students by increasing tuition levels and then offsetting the increased tuition costs for lower-income students through increased means-tested financial aid.

The high tuition-high financial aid model is an attractive one, especially given the increasing financial pressure being exerted on state budgets. Despite its attractiveness, however, several concerns demand attention.[16] For example, the political economy of both pieces of the strategy -- the tuition increases and the means-tested financial aid – is unclear. The higher-income families who would bear higher tuition costs tend to have disproportionate political voice, raising questions about whether the tuition increases could be implemented.

A more significant concern is that the tuition increases could be implemented without offsetting means-tested aid for lower-income students (or the means-tested aid could be enacted but then reduced over time). The risk is that tuition increases seem to have a disproportionate effect on low-income students: A $1,000 increase in tuition decreases the attendance rate of low-income youth by an estimated 5.2 percentage points more than middle- and high-income youth.[17] Tuition increases unaccompanied by increased means-tested aid thus pose a substantial danger of

[15] The Hansen-Weisbrod analysis was criticized by Pechman (1970), who argued that it did not take into account how the subsidy was financed.
[16] Mumper (2001) discusses the high tuition-high aid strategy in more detail.
[17] Kane (1994).

further widening differentials in enrollment rates by income, which have been increasing in any case.[18]

A related concern is whether, even if the required expansion in means-tested financial aid occurred, lower-income students would be deterred by the "sticker price" of higher education. Many students seem unaware of some or all of their college aid opportunities. If so, the higher sticker price associated with increased tuition levels could reduce enrollment rates even among the lower-income populations that would, despite their perceptions, be insulated from the increased tuition through higher aid (and thus potentially experience no increase in the net price of enrollment). To minimize this possibility, state policy-makers would have to aggressively advertise the existence of financial aid.

Federal matching on means-tested grant aid

To encourage states to expand means-tested grant aid, the Federal government could offer matching funds to states based on their means-tested grant aid. (Two Federal programs – the Leveraging Educational Assistance Partnership (LEAP) and Special Leveraging Educational Assistance Partnership (SLEAP) programs – already do this to some extent.) The purpose would be to encourage states to retain and expand means-tested grant aid, especially if they were raising tuition levels, by changing the marginal incentives for expansions or reductions. In particular, states that reduced means-tested grant aid would lose Federal matching funds, making the means-tested grant aid programs less attractive sources of budgetary savings at the state level.

Increased tuition for out-of-state students or for students who leave the state

Another possible response to reductions in state appropriations is to increase tuition for out-of-state students. Higher tuition for out-of-state students may be motivated purely by political considerations, since out-of-state students and their parents are not likely to be major political constituencies within the state itself. A policy motivation is that out-of-state students

[18] Kane (1995).

are more likely to leave the state after graduation, so that the state is less likely to capture the social benefits associated with educating them. For example, Groen (2001) finds that in the College and Beyond database, roughly half of the students from a state who attended college in that state were still living in the state 15 years later. By contrast, only 10 percent of out-of-state students who attended college in the state were still living in that state 15 years later.

Differential tuition rates, however, are a relatively blunt instrument for addressing migration differentials between out-of-state and in-state students. Many in-state students do not remain in the state after graduation, and at least some out-of-state students do remain in the state. A more targeted approach would tie any subsidy to subsequent locational choices. For example, states could raise tuition and offer access to loan programs to alleviate any liquidity problems associated with the increased tuition. The loans could then be partially forgiven for students who subsequently work in the state, with the share of the loan forgiven depending on how long the student remains in the state.

It is also worth noting that this policy takes as given the state-based framework for financing public higher education in the United States. Yet especially given the structural budget deficits facing many states, that framework may need to be revisited. Indeed, it could be argued that the existing system of location-based subsidies is inefficient both because states have insufficient incentives to subsidize education (since those receiving the subsidies can move to other states) and because any subsidies that are tied to the state of residence create distortions regarding where students attend school.

Buy more loan eligibility from the Federal government

Under the federal subsidized loan programs, students can borrow at subsidized rates. The main subsidy comes in the form of government payment of interest while the student is in school. To control costs and to preserve students' incentives to find the best bargain, borrowing under the subsidized programs is subject to annual limits. For example, dependent students can currently borrow $2,625 during their first year, $3,500 during their second year and $5,500 during subsequent years under the subsidized terms. (A dependent students' parents can borrow

more, but payments on such loans begin immediately, as would be true with other sources of financing such as a home equity loan.) When added to room and board and living expenses, virtually every state is currently charging more than these limits for a year of college. So, when a state raises tuition, students are often paying 100 percent of the additional cost. To help cover family's liquidity problems, states could be allowed to "buy" more loan eligibility for their residents, by raising the limits that students can borrow under the subsidized loans and reimbursing the federal government for the additional costs.

Conclusion

The relative decline in spending per student at public universities over the past two decades appears to be exerting a noticeable adverse effect on the quality of those institutions. Using a variety of data, we find that salaries at leading public universities relative to private universities have declined. At the same time, relative student-faculty ratios and workloads have increased. Incoming SAT scores dropped significantly at public universities relative to private universities between 1986 and 2000 (although indicators of relative student quality did not show statistically significant trends between 1986 and 2000). Finally, faculty members at public universities are much more likely to believe that the quality of undergraduate education at their institutions has declined than are faculty members at private universities.

Taken together, the results suggest a startling and troubling deterioration in the relative quality of public universities. The most recent set of state budget cut-backs, if anything, will accelerate this trend. Since roughly three-quarters of college students are enrolled at public institutions, the implications could have substantial negative effects on the overall quality of higher education in the United States.

The trends shown here raise major questions about the entire structure of financing higher education in the United States. Traditionally, the federal government has taken the role of providing means-tested grant and loan subsidies, while state governments shoulder the lion's share of the costs through subsidies which keep tuition low for all students. That system has become vulnerable as states face increasing Medicaid obligations. Moreover, the labor market

prospects of those without post-secondary training have dimmed considerably over the past two decades, leading to an increase of more than a third (from 26 percent to 36 percent) in the proportion of 18-24 year olds enrolled in college since 1980. States have only begun to feel the effects of the rapid increase in the proportion of college-age youth choosing to enter college, because reductions in the college-age population have partially offset the increase in the enrollment rate. The demographic trend has now reversed, however, as the children of the baby boom are increasingly reaching college age. As a result, the traditional model of higher education finance in the U.S., with large state subsidies to public higher education and modest means-tested grants and loans from the federal government, is becoming increasingly untenable.

We delineate a variety of potential policy responses. Sound reforms are unlikely to be undertaken, however, before the problem is more broadly appreciated and understood. In this paper, we have reported a number of provocative trends, but we realize that our efforts are just a first step. There is much more work to be done in documenting and analyzing the effects of funding restrictions on the system of public higher education in the United States and thinking through alternative policy options.

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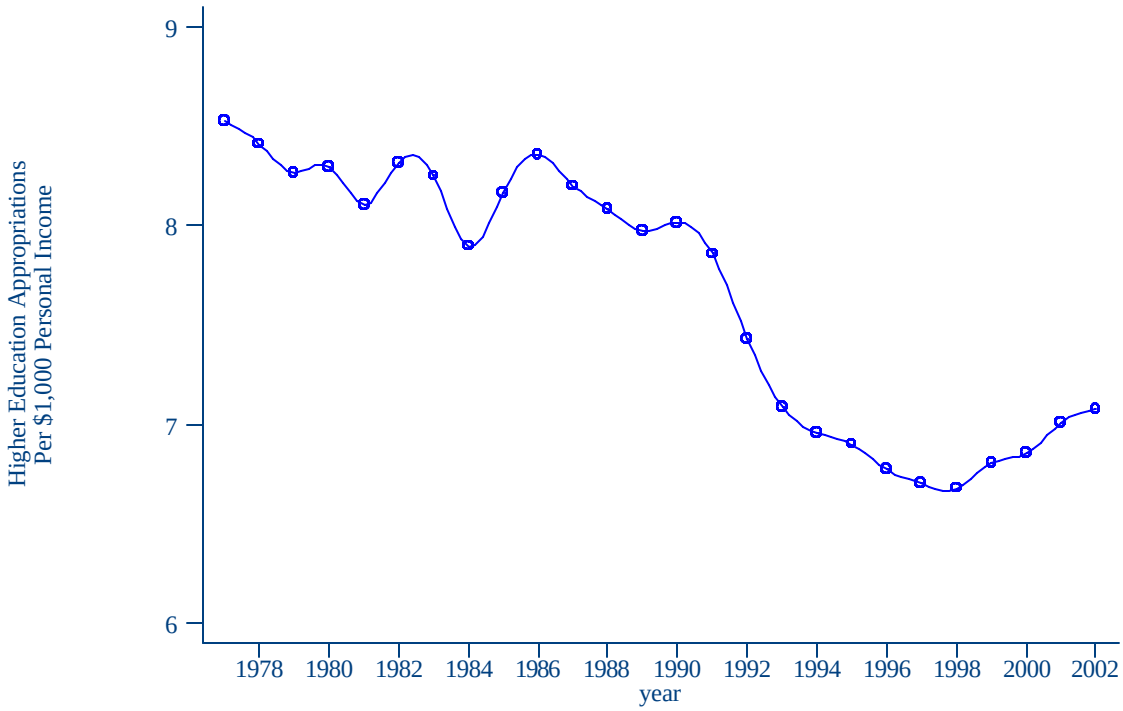
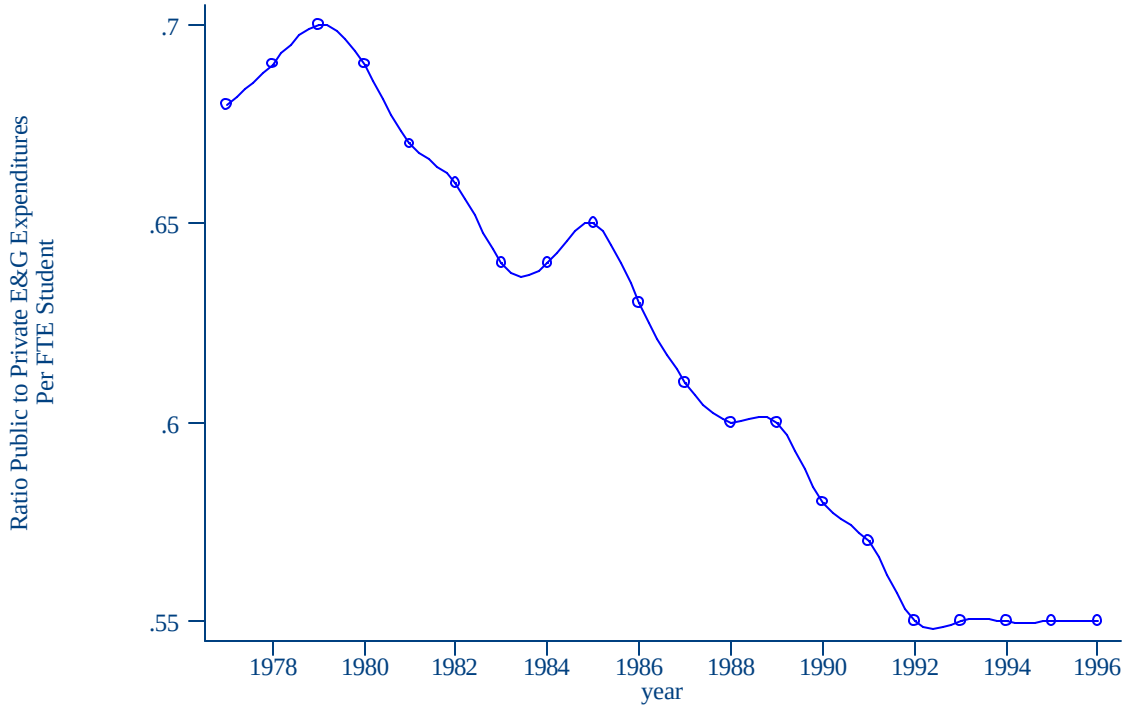
Figure 1: State appropriations for higher education per $1,000 of personal income



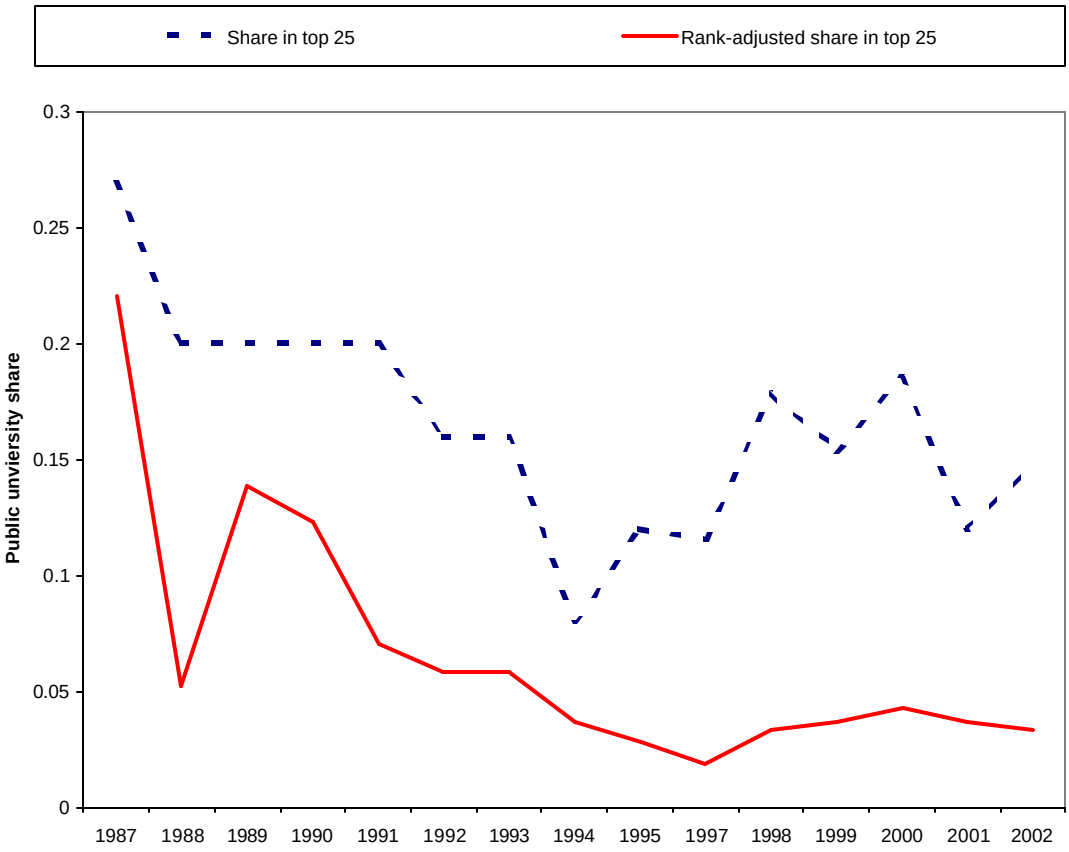
Source: Authors' calculations based on data from Center for Higher Education and Educational Finance and Bureau of Economic Analysis, Department of Commerce.

Figure 2: The Ratio of Expenditures per Student at Public and Private Institutions



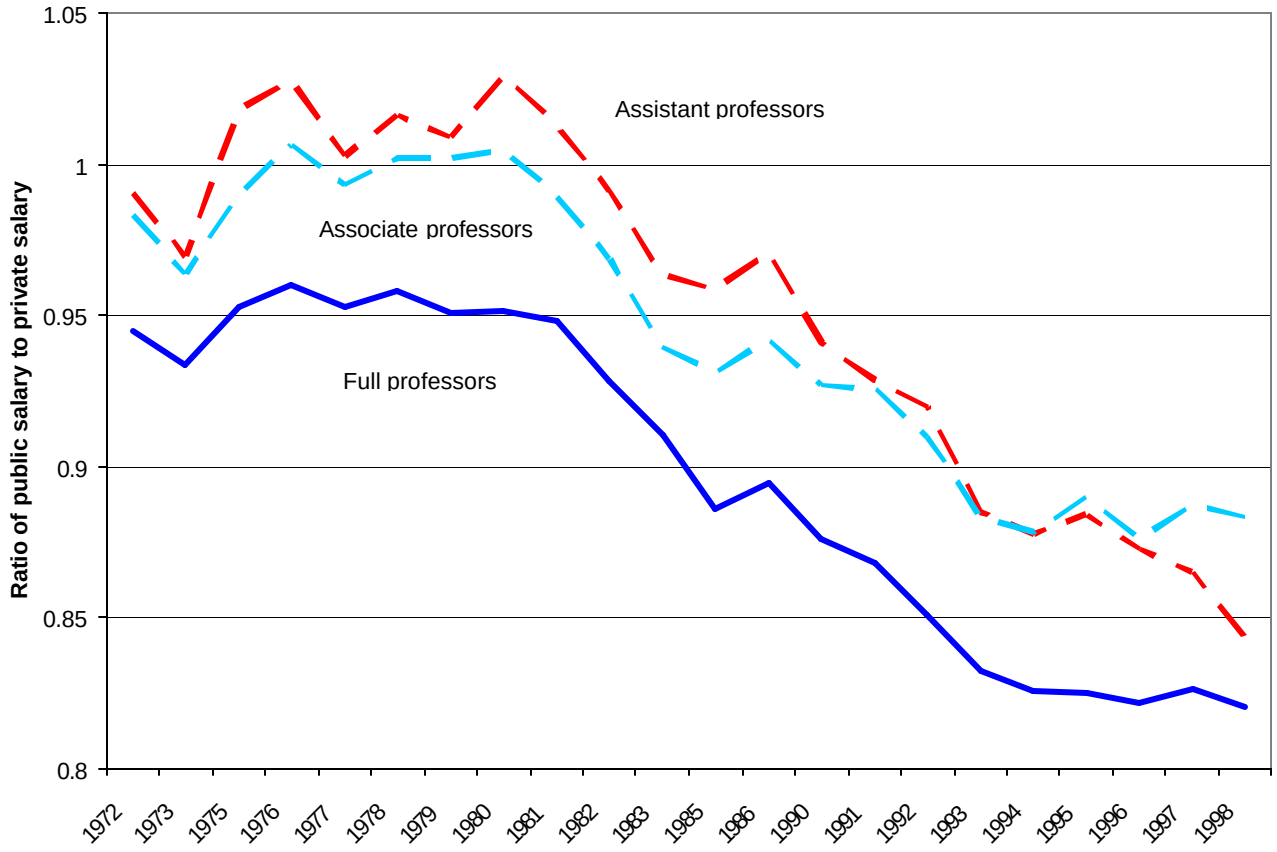
Source: Authors' calculations based on data from Department of Education, National Center for Education Statistics

Figure 3: Share of Public Universities in U.S. News and World Report "Top 25" Rankings



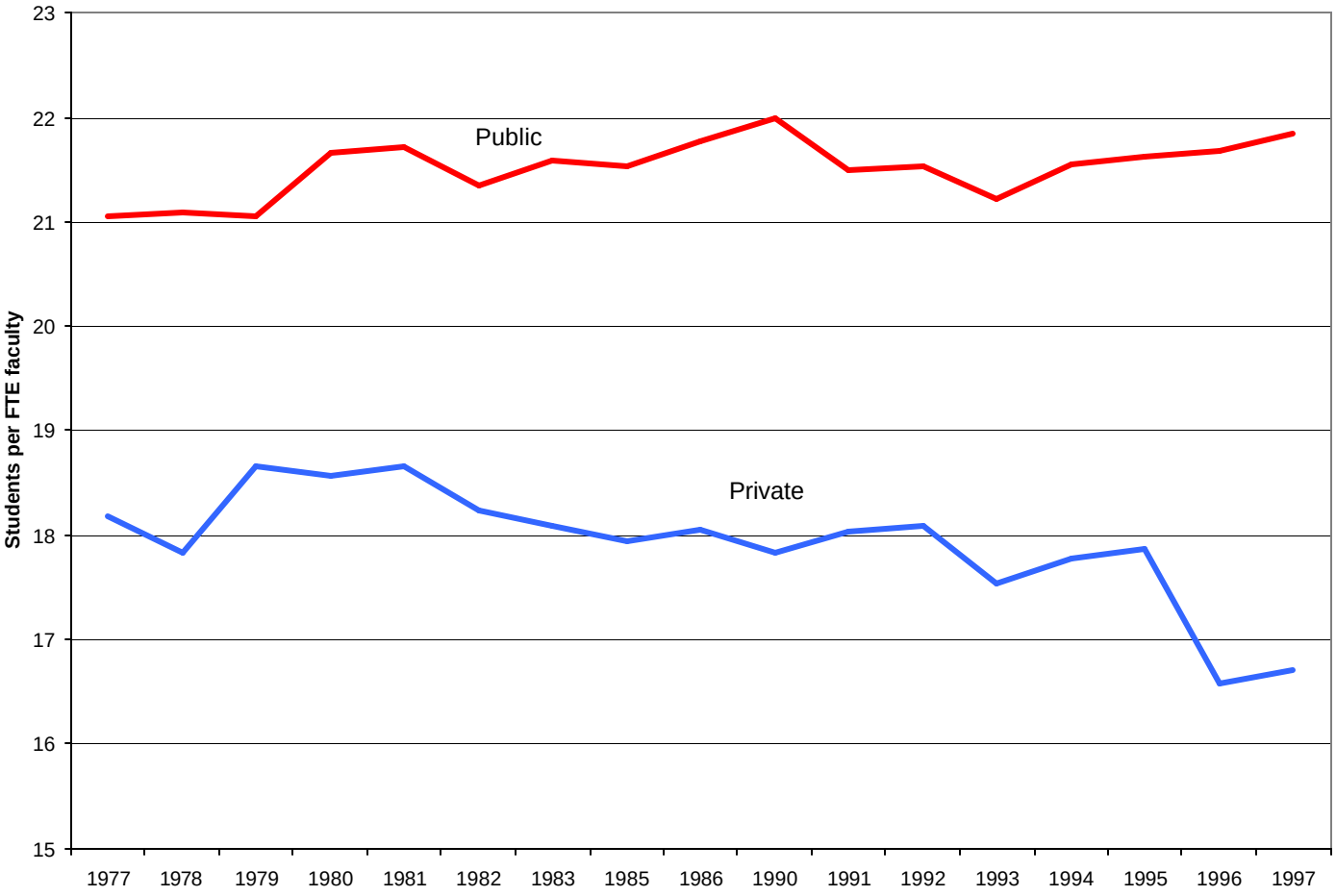
Note: "Rank-adjusted" figures assign a value of 25 to the top school; 24 to the second-ranked school; and a rank of 1 to the 25th ranked school.

Figure 4: Ratio of Public to Private Research University Salaries



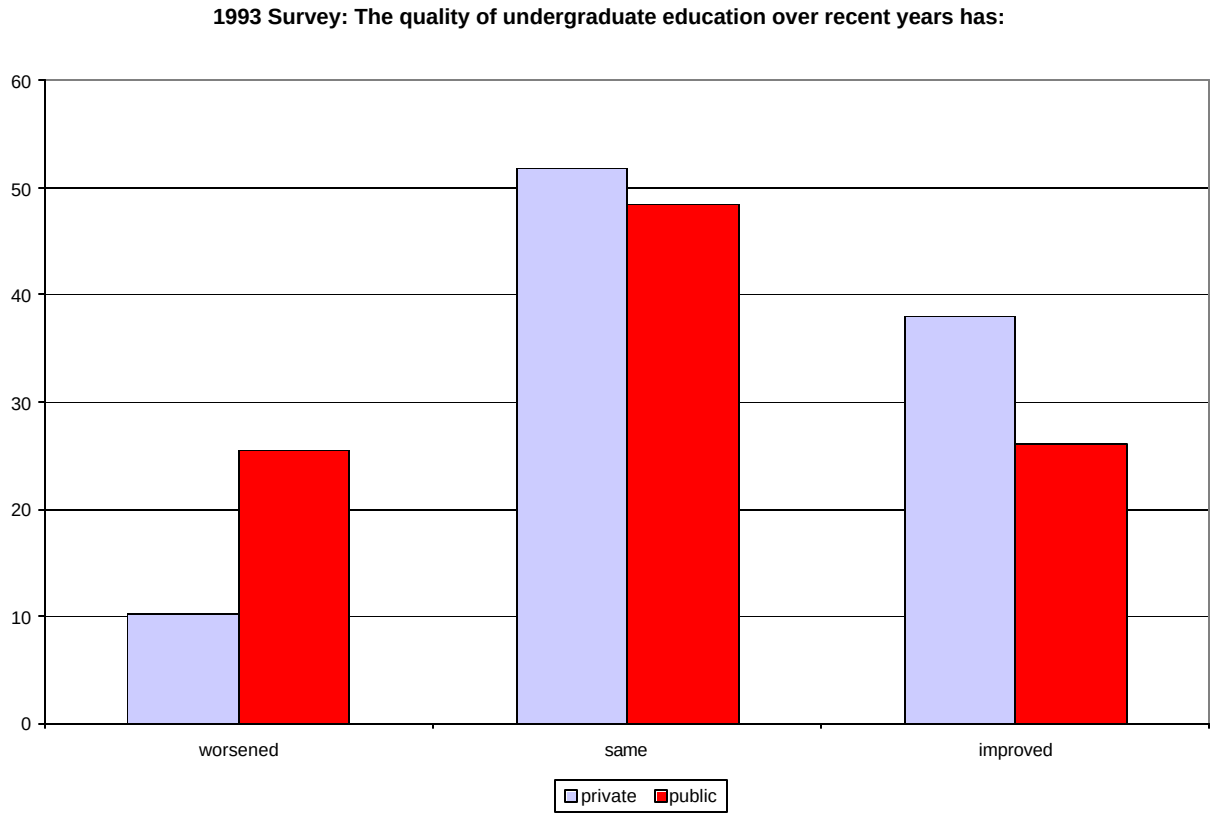
Source: Authors' calculations based on HEGIS-IPEDS data

Figure 5: Student/Faculty Ratios at Public and Private Research Universities



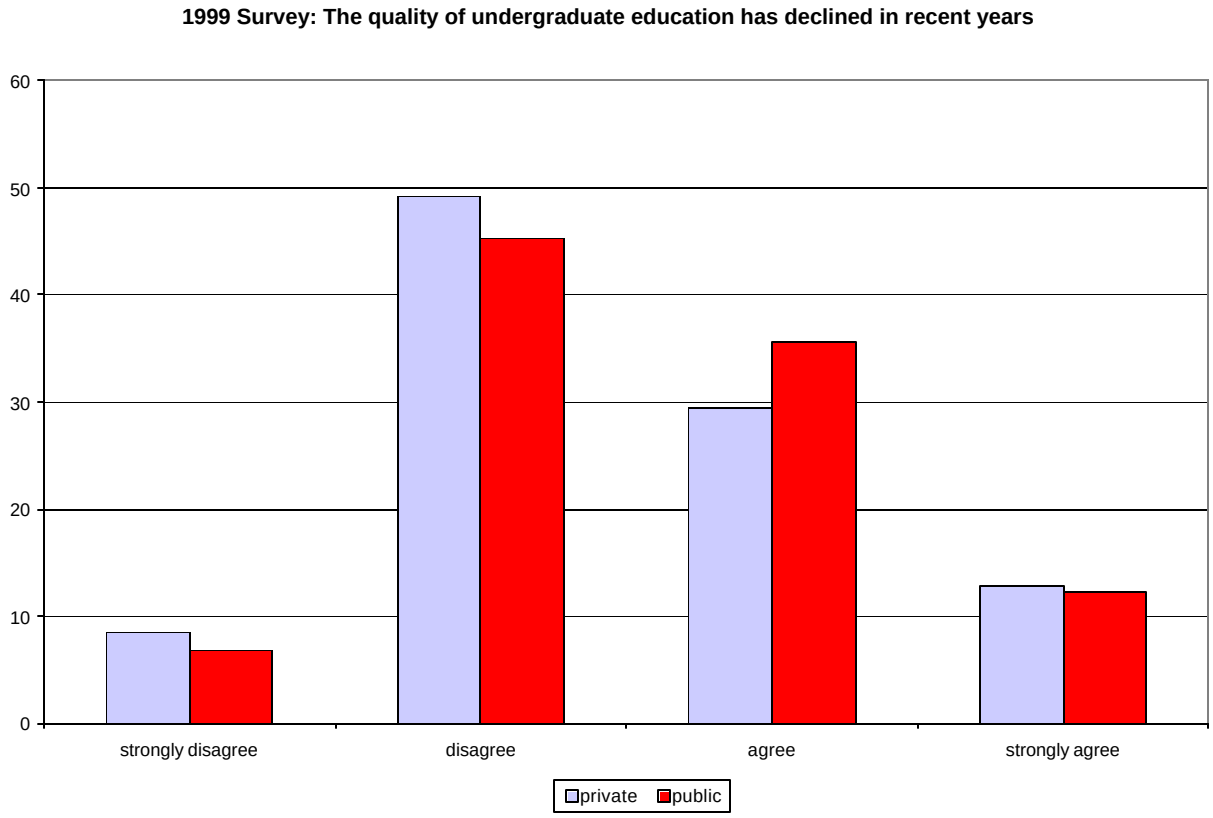
Source: Authors' calculations based on HEGIS-IPEDS data

Figure 6: Faculty views regarding change in undergraduate education quality, 1993



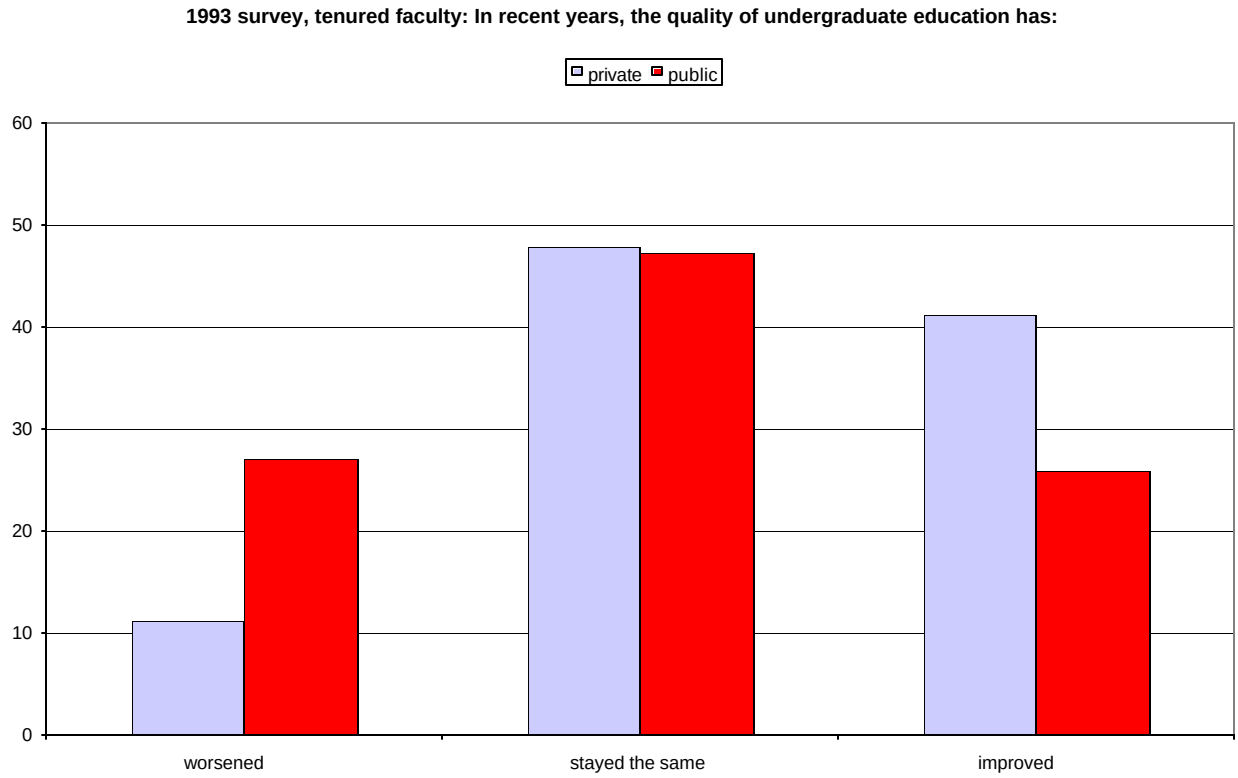
Source: Authors' analysis of National Survey of Post-Secondary Faculty

Figure 7: Faculty views regarding change in undergraduate education quality, 1999



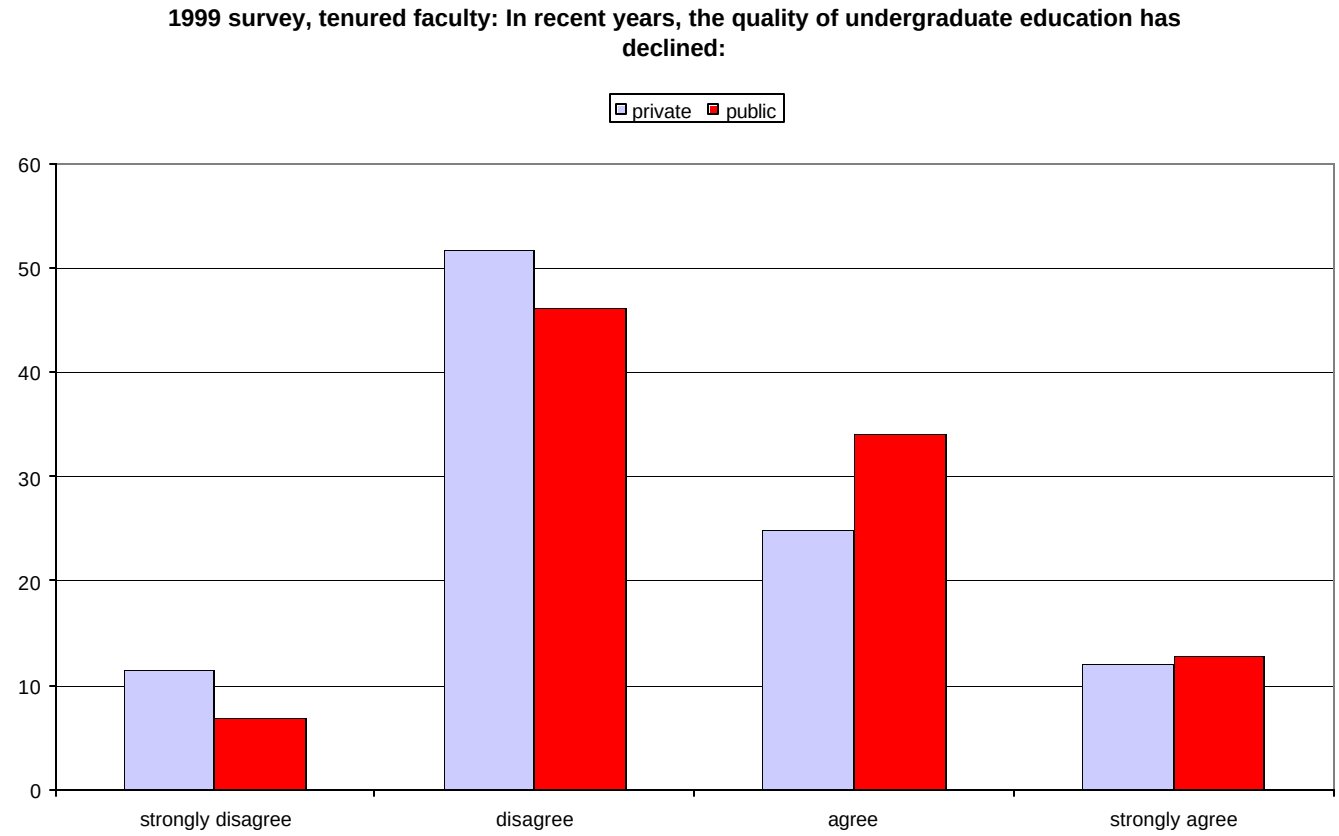
Source: Authors' analysis of National Survey of Post-Secondary Faculty

Figure 8: Tenured faculty views on change in undergraduate education quality, 1993



Source: Authors' analysis of National Survey of Post-Secondary Faculty

Figure 9: Tenured faculty views on change in undergraduate education quality, 1999



Source: Authors' analysis of National Survey of Post-Secondary Faculty

Table 1. Public and Private Faculty Salaries:

Differences in Trend and Business Cycle Effects

Dependent Var: Ln(Salary)	All Full-Time Instructional Faculty	Full Professors	Associate Professors	Assistant Professors
Public* Time Trend	-0.0089 (.0012)	-0.0099 (.0011)	-0.0084 (.0010)	-0.0096 (.0007)
State Unemployment Rate (Year-1)	-0.0018 (.0021)	-0.0027 (.0019)	-0.0001 (.0024)	0.0003 (.0018)
Public* Unemployment Rate (Year-1)	-0.0060 (.0020)	-0.0062 (.0016)	-0.0101 (.0017)	-0.0079 (.0019)
Observations	1898	1898	1898	1898
# of Institutions	112	112	112	112
R-squared	0.99	0.94	0.92	0.93

Note: Faculty salary data were drawn from HEGIS/IPEDS database. The dependent variable in each column was the natural log of full-time instructional faculty salaries for 1977 through 1998. Only Research I or II institutions in the Carnegie classifications were included. Each specification also included fixed effects for the institution and year dummies. Heteroskedasticity-robust standard errors are reported, allowing for correlated errors within states.

Table 2: Ratio of total institutional compensation at public universities to private universities

All faculty

	1992	1998
10th Percentile	0.938	0.897
50th Percentile	0.917	0.871
90th Percentile	0.836	0.774
Mean	0.906	0.823

Tenured faculty

	1992	1998
10th Percentile	0.927	0.920
50th Percentile	0.909	0.873
90th Percentile	0.847	0.787
Mean	0.930	0.842

Assistant professors (tenure track but not tenure)

	1992	1998
10th Percentile	0.871	1.000
50th Percentile	0.874	0.847
90th Percentile	0.811	0.662
Mean	0.792	0.801

Non-tenure track professors

	1992	1998
10th Percentile	0.854	0.710
50th Percentile	0.854	0.712
90th Percentile	0.720	0.704
Mean	0.818	0.721

Faculty universe: NSOPF respondents who worked full-time and had instructional duties. Respondents who report compensation greater than $1,000,000 are omitted.

Institution universe: For the 1988 survey, research, doctoral, or medical universities, as classified by the Carnegie Foundation. For the 1993 and 1999 survey, only research or doctoral universities.

Table 3: Faculty opinions on change in workload

(Coefficient on public dummy variable in ordered probit and ordered logit models of survey answers)

Universe	*Ordered Probit*		*Ordered Logit*	
	1993	1999	1993	1999
All faculty	-.4080	.1951	-.7519	.3236
	(.0568)	(.0624)	(.0953)	(.1096)
Tenured	-.3806	.1482	-.7261	.2487
faculty	(.0622)	(.1010)	(.1125)	(.1778)
"Regular"	-.3920	.1602	-.7423	.2687
faculty	(.0600)	(.0714)	(.1010)	(.1259)

Notes: The survey questions are scaled differently in 1993 and 1999, and the substance of the questions also varies slightly between the two years.

1993 Survey: Respondents were given the statement: "pressure to increase faculty workload at this institution" and chose responses scaled from "worsened" (1) to "improved" (3). Respondents could also choose "don't know"; these observations were ignored.

1999 Survey: Respondents were given the statement: "faculty workload has increased" and chose responses scaled from "strongly disagree" (1) to "strongly agree" (4).

The time horizon for the change in quality is "over recent years."

Regular faculty are tenured or tenure-track. The specification for the regular faculty universe includes a dummy variable equal to one for tenured professors. Observations are clustered by broad research fields.

Table 4: Student measures, 1986-2000

Summary of coefficients on public dummy variables in regressions of changes in quality indicators, 1986-2000

(robust standard error in parenthesis)

	Linear Functional Form		Logarithmic Functional Form	
	Simple Model	Full Model	Simple Model	Full Model
75th Percentile Math	-11.56	-13.14	-0.01691	-0.01987
	(5.89)	(6.68)	(0.00893)	(0.01008)
25th Percentile Math	-12.23	-18.08	-0.01976	-0.03166
	(6.52)	(7.39)	(0.01177)	(0.01331)
75th Percentile Verbal	-16.34	-22.58	-0.02533	-0.03504
	(6.00)	(5.99)	(0.00946)	(0.00917)
25th Percentile Verbal	-17.13	-23.04	-0.03037	-0.04209
	(6.99)	(6.27)	(0.01334)	(0.01118)
Yield	0.465	4.026	0.031	0.141
	(1.650)	(1.560)	(0.041)	(0.050)
Acceptance Rate	1.617	-0.287	0.013	-0.001
	(2.257)	(2.875)	(0.043)	(0.053)
Top 10% of High School Class	-5.703	-3.446	-0.207	-0.157
	(3.362)	(4.265)	(0.078)	(0.110)

Simple model includes the following independent variables: the 1986 level of the dependent variable (1st, 2nd, and 3rd order terms for SAT scores) and a public dummy variable.

Full model includes the same variables as the simple model plus the 1986 levels of the other 6 quality indicator variables.

Table 5: Faculty opinions on the change in quality of undergraduate education

(Coefficient on public dummy variable in ordered probit and ordered logit models of survey answers)

Universe	*Ordered Probit*		*Ordered Logit*	
	1993	1999	1993	1999
All faculty	-.4336	.0930	-.7091	.1817
	(.0386)	(.0605)	(.0616)	(.1084)
Tenured faculty	-.4855	.2134	-.7967	.3941
	(.0849)	(.0755)	(.1445)	(.1354)
"Regular" faculty	-.4281	.1765	-.7023	.3213
	(.0587)	(.0699)	(.1001)	(.1285)

Notes: The survey questions are scaled differently in 1993 and 1999.

1993 Survey: Respondents were given the statement: "the quality of undergraduate education at this institution" and chose responses scaled from "worsened" (1) to "improved" (3). Respondents could also choose "don't know"; these observations were ignored.

1999 Survey: Respondents were given the statement: "the quality of undergraduate education has declined" and chose responses scaled from "strongly disagree" (1) to "strongly agree" (4).

The time horizon for the change in quality is "over recent years."

Regular faculty are tenured or tenure-track. The specification for the regular faculty universe includes a dummy variable equal to one for tenured professors. Observations are clustered by broad research fields.

Appendix Table 1: Faculty opinions on change in workload

	public	tenured	tenured or tenure track?	year received highest degree	year began working current job	satisfaction with job
ordered probit						
1993	-.3841	-.0281	-.1145	-.0086		
	(.0517)	(.0918)	(.0514)	(.0028)		
	-.3839	-.0325	-.1146	-.0083	-.0008	
	(.0517)	(.0884)	(.0516)	(.0033)	(.0008)	
	-.3532	-.0588	-.1047	-.0055	-.0006	.2630
	(.0529)	(.0875)	(.0465)	(.0034)	(.0031)	(.0302)
1999	.1493	.0170	.2485	.0083		
	(.0593)	(.0735)	(.0649)	(.0019)		
	.1491	.0436	.2473	.0066	.0038	
	(.0596)	(.0718)	(.0645)	(.0024)	(.0032)	
	.1250	.0581	.2286	.0046	.0037	-.2027
	(.0589)	(.0691)	(.0560)	(.0023)	(.0032)	(.0221)
ordered logit						
1993	-.7093	-.0370	-.2217	-.0156		
	(.0869)	(.1531)	(.0810)	(.0048)		
	-.7090	-.0466	-.2220	-.0149	-.0017	
	(.0869)	(.1476)	(.0813)	(.0056)	(.0046)	
	-.6567	-.0917	-.2135	-.0104	-.0009	.4694
	(.0893)	(.1464)	(.0735)	(.0059)	(.0052)	(.0576)
1999	.2416	.0422	.4261	.0139		
	(.1061)	(.1257)	(.1126)	(.0033)		
	.2411	.0734	.4248	.0119	.0045	
	(.1069)	(.1209)	(.1121)	(.0043)	(.0055)	
	.1965	.0994	.3864	.0086		
	(.1039)	(.1158)	(.0947)	(.0042)		

Notes: The survey questions are scaled differently in 1993 and 1999, and the substance of the questions also varies slightly between the two years.
1993 Survey: Respondents were given the statement: "pressure to increase faculty workload at this institution" and chose responses scaled from "worsened" (1) to "improved" (3). Respondents could also choose "don't know"; these observations were ignored.
1999 Survey: Respondents were given the statement: "faculty workload has increased" and chose responses scaled from "strongly disagree" (1) to "strongly agree" (4).
The time horizon for the change in quality is "over recent years."
For the variable "satisfaction with job," and higher number indicates greater overall satisfaction with job.
Observations are clustered by broad research fields.

Appendix Table 2: Barron's Rankings for 1984

Barron's Selectivity Ratings

5 Star

Amherst College
Bowdoin College
Brown University
Bryn Mawr College
California Institute of Technology
Dartmouth College
Georgetown University
Georgia Institute of Technology
Grinnell College
Hamilton College
Harvard University/ Harvard and Radcliffe Colleges
Massachusetts Institute of Technology
Princeton University
Rice University
Stanford University
Swarthmore College
The Cooper Union for the Advancement of Science and Art
United States Air Force Academy
University of Chicago
University of Notre Dame
University of Pennsylvania
Webb Institute of Naval Architecture
Williams College
Yale University

4 Star

Babson College
Bates College
Boston University
Brandeis University
Bucknell University
Carelton College
Carnegie-Mellon University
Case Western Reserve University
Clark University
Clarkson College
Colby College
Colgate University
College of the Holy Cross
College of William and Mary
Colorado College
Colorado School of Mines
Columbia University/ Barnard College
Connecticut College

Cornell University
Davidson College
Duke University
Emory University
Haverford College
John Hopkins University
Kalamazoo College
Kenyon College
Lafayette College
Lehigh University
Macalester College
Middlebury College
Mount Holyoke College
New College of the University of South Florida
Northwestern University
Oberlin College
Occidental College
Reed College
Rensselaer Polytechnic Institute
Rutgers University/ Rutgers College
Smith College
St. John's College
State University of New York at Binghamtom
Trinity College
Trinity University
Tufts University
Union College
University of California/ Berkeley
University of Illinois at Urbana-Champaign
University of Michigan/ Ann Arbor
University of Rochester
University of Virginia
Vanderbilt University
Vassar College
Wake Forest University
Washington and Lee University
Washington University
Wellesley College
Wesleyan University
Worcester Polytechnic Institute

3 Star

Albion College
Albright College
Alfred University
Allegheny College
Augustana College
Bard College
Baylor University
Bennington College
Boston College

Bradley University
Brigham Young University
Catholic Universtiy of America
Centre College
Clemson University
Creighton University
Depauw University
Dickinson College
Drew University/ College of Liberal Arts
Drexel University
Earlham University
Fairfield University
Florida Institute of Technology
Franklin and Marshal College
Furman University
George Washington University
Gettysburgh College
Gustavus Adolphus College
Hampshire College
Hobart College/ William Smith College
Hofstra University
Illinois Institute of Technology
Illinois Wesleyan University
Knox College
Lake Forest College
Lawrence University
Le Moyne College
Loyola College
Luther College
Manhattan College
Miami University (OH)
Michigan Technological University
Mills College
Muhlenberg College
New Mexico Institute of Mining and Technology
New York University
North Carolina State University
Polytechnic Institute of New York
Purdue University
Randolph-Macon Woman's College
Rochester Institute of Technology
Rutgers University/ Douglas College
Saint John's University (MN)
Saint Joseph's University
Simon's Rock of Bard College
Skidmore College
Southern Methodist University
Southwestern at Memphis (Rhodes College)
St. John's College (NM)
St. Olaf College
State University of New York at Albany

State University of New York at Buffalo
State University of New York at Stony Brook
Stetson University
Stevens Institute of Technology
The University of the South
University of California/ Irvine
University of California/ Los Angeles
University of California/ Riverside
University of California/ San Diego
University of California/ Santa Barbara
University of California/ Santa Cruz
University of Colorado at Boulder
University of Connecticut
University of Dallas
University of Florida
University of Iowa
University of New Hampshire
University of North Carolina at Chapel Hill
University of Pittsburgh
University of Puget Sound
University of Richmond
University of Santa Clara
University of Southern California
University of Texas at Austin
University of Vermont
University of Washington
Ursinus College
Valparaiso University
Villanova University
Virginia Polytechnic Institute and State University
Wabash College
Washington and Jefferson College
Wells College
Wheaton College (IL)
Wheaton College (MA)
Whitman College
Yeshiva University

Appendix Table 3: Student "quality" regressions

Summary of coefficients on public and selectivity dummy variables in regressions of changes in quality indicators, 1986-2000
(robust standard error in parenthesis)

Linear Functional Form

	Simple Model					Full Model				
	public	4 Star	5 Star	4 St*Public	5 St*Public	public	4 Star	5 Star	4 St*Public	5 St*Public
75th Percentile Math	-8.983	24.532	46.038	6.814	3.156	-16.545	21.172	27.953	7.624	15.922
	(7.258)	(8.037)	(12.816)	(11.020)	(11.256)	(8.368)	(10.569)	(14.775)	(10.981)	(14.586)
25th Percentile Math	-7.880	35.783	61.850	-3.640	-16.064	-21.463	29.010	42.553	6.721	12.780
	(8.324)	(9.378)	(11.161)	(12.510)	(10.011)	(9.445)	(11.318)	(14.232)	(11.592)	(14.859)
75th Percentile Verbal	-23.573	15.348	36.653	15.278	21.127	-28.096	18.002	28.093	11.366	23.664
	(7.176)	(7.417)	(8.946)	(9.703)	(10.216)	(7.125)	(10.153)	(14.145)	(10.068)	(11.604)
25th Percentile Verbal	-24.421	18.757	41.775	12.104	21.862	-26.186	23.806	29.773	3.464	29.325
	(8.468)	(11.057)	(10.657)	(14.750)	(11.977)	(7.331)	(12.275)	(15.303)	(10.870)	(12.839)
Yield	2.767	2.616	13.073	1.339	-7.777	4.531	0.476	5.275	-0.547	-2.994
	(2.005)	(1.219)	(2.255)	(2.542)	(2.728)	(2.352)	(1.874)	(3.260)	(3.244)	(3.407)
Acceptance Rate	-0.858	-8.994	-17.341	-0.635	16.659	0.020	-5.708	-10.796	-2.070	12.962
	(2.903)	(3.007)	(4.069)	(5.437)	(4.656)	(3.494)	(3.890)	(5.931)	(6.498)	(6.299)
Top 10% of High School Class	-3.965	7.562	7.462	1.079	-6.372	-5.646	3.555	1.690	5.169	3.789
	(4.500)	(2.633)	(4.263)	(6.954)	(5.650)	(5.946)	(3.957)	(6.325)	(7.042)	(7.067)

Logarithmic Functional Form

	Simple Model					Full Model				
	public	4 Star	5 Star	4 St*Public	5 St*Public	public	4 Star	5 Star	4 St*Public	5 St*Public
75th Percentile Math	-0.0131	0.0375	0.0669	0.0102	0.0062	-0.0246	0.0331	0.0437	0.0116	0.0237
	(0.0112)	(0.0123)	(0.0184)	(0.0164)	(0.0163)	(0.0126)	(0.0154)	(0.0207)	(0.0155)	(0.0204)
25th Percentile Math	-0.0131	0.0619	0.1034	-0.0056	-0.0261	-0.0365	0.0566	0.0802	0.0118	0.0207
	(0.0155)	(0.0176)	(0.0198)	(0.0223)	(0.0179)	(0.0169)	(0.0210)	(0.0255)	(0.0197)	(0.0248)
75th Percentile Verbal	-0.0370	0.0237	0.0526	0.0249	0.0361	-0.0436	0.0255	0.0404	0.0194	0.0385
	(0.0115)	(0.0113)	(0.0130)	(0.0150)	(0.0153)	(0.0109)	(0.0149)	(0.0196)	(0.0148)	(0.0164)
25th Percentile Verbal	-0.0456	0.0324	0.0722	0.0278	0.0447	-0.0481	0.0432	0.0505	0.0074	0.0553
	(0.0166)	(0.0216)	(0.0188)	(0.0292)	(0.0219)	(0.0131)	(0.0208)	(0.0244)	(0.0190)	(0.0212)
Yield	0.0901	0.0916	0.3063	0.0241	-0.1719	0.1482	0.0595	0.1682	-0.0076	-0.0504
	(0.0525)	(0.0369)	(0.0460)	(0.0695)	(0.0633)	(0.0746)	(0.0657)	(0.0923)	(0.0980)	(0.1001)
Acceptance Rate	-0.0207	-0.1256	-0.3584	-0.0298	0.3649	-0.0061	-0.0561	-0.2799	-0.0521	0.3633
	(0.0498)	(0.0520)	(0.0952)	(0.1152)	(0.1021)	(0.0583)	(0.0637)	(0.1178)	(0.1323)	(0.1358)
Top 10% of High School Class	-0.1903	0.1993	0.1730	0.1106	0.0384	-0.2395	0.1734	0.0737	0.1811	0.2038
	(0.1082)	(0.0652)	(0.0835)	(0.1383)	(0.1183)	(0.1433)	(0.0897)	(0.1268)	(0.1583)	(0.1562)

Simple model includes the following independent variables: the 1986 level of the dependent variable (1st, 2nd, and 3rd order terms for SAT scores) and a public dummy variable.

Full model includes the same variables as the simple model plus the 1986 levels of the other 6 quality indicator variables.

Dummy variables refer to two variables for the Barron's selectivity rating (4 star or 5 star) and interaction terms of these two variables and the public dummy variable.

Appendix Table 4: Student "quality" regressions

Regressions of changes in quality indicators, 1986-2000
Linear Functional Form
Schools rated "very competitive (3 stars)" or above by Barrons, 1984

	Simple			Full Model		
Dependent Variable: 2000 level	public	R^2	obs	public	R^2	obs
75th Percentile Math	-11.56185 (5.893)	0.6265	128	-13.13985 (6.679)	0.7301	98
25th Percentile Math	-12.23393 (6.524)	0.6323	131	-18.08386 (7.394)	0.7331	98
75th Percentile Verbal	-16.33669 (5.999)	0.6835	128	-22.58138 (5.987)	0.7361	98
25th Percentile Verbal	-17.13162 (6.990)	0.5214	131	-23.04329 (6.266)	0.7538	98
Yield	0.465 (1.650)	0.554	160	4.026 (1.560)	0.697	98
Acceptance Rate	1.617 (2.257)	0.656	168	-0.287 (2.875)	0.724	100
Top 10% of High School Class	-5.703 (3.362)	0.697	129	-3.446 (4.265)	0.699	97

Simple model includes the following independent variables: the 1986 level of the dependent variable (1st, 2nd, and 3rd order terms for SAT scores) and a public dummy variable.

Full model includes the same variables as the simple model plus the 1986 levels of the other 6 quality indicator variables.

Appendix Table 5: Student "quality" regressions

Regressions of changes in quality indicators, 1986-2000

Logarithmic Functional Form

Schools rated "very competitive (3 stars)" or above by Barrons, 1984

	Simple			Full Model		
Dependent Variable: 2000 level	public	R^2	obs	public	R^2	obs
75th Percentile Math	-0.01691 (0.009)	0.6077	128	-0.01987 (0.010)	0.7135	98
25th Percentile Math	-0.01976 (0.012)	0.608	131	-0.03166 (0.013)	0.7043	98
75th Percentile Verbal	-0.02533 (0.009)	0.6655	128	-0.03504 (0.009)	0.7247	98
25th Percentile Verbal	-0.03037 (0.013)	0.4446	131	-0.04209 (0.011)	0.7466	98
Yield	0.031 (0.041)	0.537	160	0.141 (0.050)	0.620	98
Acceptance Rate	0.013 (0.043)	0.741	168	-0.001 (0.053)	0.778	100
Top 10% of High School Class	-0.207 (0.078)	0.633	129	-0.157 (0.110)	0.599	97

Simple model includes the following independent variables: the 1986 level of the dependent variable (1st, 2nd, and 3rd order terms for SAT scores) and a public dummy variable.

Full model includes the same variables as the simple model plus the 1986 levels of the other 6 quality indicator variables.

Appendix Table 6: Faculty opinions on the change in quality of undergraduate education

	public	tenured	tenured or tenure track?	year received highest degree	year began working current job	satisfaction with job
ordered probit						
1993	-.4216	-.0796	.0392	-.0021		
	(.0352)	(.0596)	(.0524)	(.0018)		
	-.4233	-.0540	.0406	-.0041	.0047	
	(.0355)	(.0664)	(.0523)	(.0019)	(.0033)	
	-.3832	-.0948	.0619	-.0001	.0047	.3699
	(.03989)	(.0732)	(.0540)	(.0018)	(.0032)	(.0306)
1999	.1027	-.0619	-.0101	-.0011		
	(.0607)	(.0646)	(.0604)	(.0021)		
	.1033	-.1268	-.0071	.0031	-.0093	
	(.0596)	(.0747)	(.0621)	(.0019)	(.0033)	
	.0756	-.1134	-.0316	.0008	-.0096	-.2283
	(.0578)	(.0738)	(.0569)	(.0020)	(.0032)	(.0226)
ordered logit						
1993	-.6891	-.1262	.0632	-.0035		
	(.0569)	(.1022)	(.0880)	(.0030)		
	-.6922	-.0832	.0644	-.0068	.0078	
	(.0572)	(.1139)	(.0881)	(.0033)	(.0059)	
	-.6202	-.1578	.0959	-.0007	.0081	.6346
	(.0648)	(.1216)	(.0889)	(.0030)	(.0057)	(.0526)
1999	.2015	-.1188	-.0220	-.0025		
	(.1092)	(.1095)	(.1037)	(.0037)		
	.2007	-.2358	-.0151	.0052	-.0167	
	(.1080)	(.1263)	(.1063)	(.0036)	(.0056)	
	.1468	-.2098	-.0520	.0013	-.0175	-.4044
	(.1032)	(.1259)	(.0984)	(.0038)	(.0054)	(.0401)

Notes: The survey questions are scaled differently in 1993 and 1999.
1993 Survey: Respondents were given the statement: "the quality of undergraduate education at this institution" and chose responses scaled from "worsened" (1) to "improved" (3). Respondents could also choose "don't know"; these observations were ignored.
1999 Survey: Respondents were given the statement: "the quality of undergraduate education has declined" and chose responses scaled from "strongly disagree" (1) to "strongly agree" (4).
The time horizon for the change in quality is "over recent years."
For the variable "satisfaction with job," and higher number indicates greater overall satisfaction with job.
Observations are clustered by broad research fields.