

# U.S. News Rankings and College Reactions \*

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## Abstract

This paper convenes evidence on how colleges and universities react to being included in the (undergraduate) rankings of the U.S. News & World Report (USNWR). In 1990, the USNWR started to cover all the national colleges in addition to its traditional top 25 lists. This allows us to compare the behavior of the newly added-in schools versus the schools that were included in the rankings before 1990 and the schools that never appeared in the rankings.

We consider two mechanisms through which the USNWR rankings may affect college behavior: in the first mechanism, the USNWR rankings may help students choose colleges and such demand response motivates colleges to improve along the USNWR-defined dimensions; in the second mechanism, the USNWR rankings may change the information exchange between a college and its high-level governance, thus motivating changes inside a college.

Using college level data from enrollment year 1986 to 1995, we have three main findings: first, most improvements occur in the resource inputs of public colleges, and these improvements are supported by a significant increase of state appropriations. In contrast, not only did the private added-ins lack improvements in inputs and outputs, they enrolled lower-quality students despite little change in price and enrollment. For both public and private colleges, no evidence suggests that exposure to the USNWR rankings cause extra gaming in the suspected targets.

These findings suggest that the USNWR rankings are more likely to motivate improvements through colleges' internal governance than through student willingness to pay for quality in the admission market. This is consistent with the facts that only 11% of freshmen assign significant importance to college rankings (McDonough et al. 1997) but 76% of college presidents consider the USNWR rankings very or somewhat important to their institutions (AGB 2001).

JEL: D80, I23, I22, L15.

# 1 Introduction

In theory, better information about product quality may help consumers make informed choices and encourage firms to improve quality. In the context of for-profit firms, the motivation comes from consumer willingness to pay for quality.<sup>1</sup> Does the logic apply to non-profit firms? Intuition suggests two additional considerations. On the one hand, non-profit organizations tend to arise in the areas where quality is difficult to observe or measure (Hansmann 1980, James and Rose-Ackerman 1986, Easley and O'Hara 1983).<sup>2</sup> If a non-profit firm already aims to maximize quality, disclosing quality information to the public does not necessarily affect its drive for quality. On the other hand, the disclosed statistics may provide new information to the governing body of the firm, and help it reorganize operations inside the firm. Under this mechanism, a non-profit firm (with other sources of funding) may improve quality even if consumer willingness to pay for quality does not justify the cost of quality improvement.

College rankings provide a perfect setting to explore these issues. In the U.S., many four-year colleges and universities (henceforth "colleges") are non-profit organizations with an explicit mission for quality. The undergraduate rankings published by the U.S. News & World Report (USNWR) are most popular measure of college quality, but their impact is controversial. Some argue that the rankings have converted applicants into active consumers, generated a competitive environment in higher education (Morse 2005), and created a new class of elite schools (Samuelson 2004). But many commentators, including university presidents, education scholars, news reporters, and high school counselors, blame USNWR rankings for college gaming behaviors, the rise of tuition, and the increased frustration in the admission market.<sup>3</sup>

The trends mentioned in these arguments indeed coincide with the introduction of USNWR rankings, but it is unclear how many of them are attributable to the USNWR rankings rather than other simultaneous factors.<sup>4</sup> The goal of this paper is to quantify the causal effect of

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<sup>1</sup>Although better information about product attributes (price or quality) usually promotes competition along the informed dimensions (e.g. cutting price or enhancing quality), these changes are not necessarily welfare enhancing. See Chan and Leland (1982) and Dranove & Satterthwaite (1992) for more details.

<sup>2</sup>In accordance, empirical evidence suggests that non-profit firms may provide higher quality than for-profit firms, although the higher quality comes with higher price and lower cost-efficiency (see Rose-Ackerman 1996 for a comprehensive review).

<sup>3</sup>Section 3 reviews the existing studies on both sides.

<sup>4</sup>Hoxby(2004) documents the increased competition in the market for college education from 1940 to present. She attributes the trend to increased geographic integration, which is partially driven by reduced transportation cost and reduced information cost over time.

USNWR rankings on college inputs and outputs, examine the motivations behind these changes, and detect whether these changes are achieved by (suspected) gaming behaviors. Due to data limitations, we do not focus on a couple of important questions regarding college rankings. For example, we do not examine how to improve the USNWR ranking methodology. Rather, we take the methodology as given and investigate college reactions after being included in the USNWR rankings. Without an explicit model of college behavior, we are also reluctant to draw welfare implications. We believe an empirical account of college reactions is a necessary first step before any welfare arguments are made for or against college rankings.

We face two challenges in determining the impact of college rankings. First, the actual ranking of college is an endogenous outcome reflecting both supply and demand for college quality. If a college chooses to produce a higher quality of education then its ranking will increase at the same time. Thus, the coefficient from a regression of a college's quality indicator on its actual rank will not have a casual interpretation. We are not able to say if the ranking actually increased the colleges' incentive to produce high quality, or if the ranking reflects an endogenous decision to change quality. In the market for higher education, consumers are an important input determining the quality of a college. If higher ability students enroll at a college, its ranking will improve, but this may just reflect an increased demand for quality and have nothing to do with any change in college behavior in supplying quality.

The second challenge is that even education experts cannot agree upon a single measure of college quality. Without a clear definition of quality, it is difficult to define gaming or to quantify the improvement of quality. Given these two difficulties, it is not surprising that most evidence cited in the ranking debate are speculations, anecdotes, or simple summaries from an incomplete survey of colleges.

To circumvent the endogeneity of specific ranks, we exploit a large, exogenous shift in the *scope* of USNWR rankings. Starting 1990, the USNWR covered all the four-year national colleges in addition to its traditional top 25 lists. This expansion represents a first-time exposure of 228 national colleges in the USNWR rankings. If the exposure generates a discrete incentive shift to improve (USNWR-defined) quality, these added-in schools ("added-ins") should behave differently from those that were ranked before 1990 ("previously-ins") and those who never made the rankings ("never-ins"). Essentially, we are looking at the treatment of being newly included in the rankings and comparing it to the control states of already being in the rankings, or of never being in the rankings. Because the ranking expansion was largely a managerial decision within the USNWR and the USNWR defined national colleges by Carnegie Classification, this

comparison allows us to identify the causal impact of a ranking regime from other factors that affect all the colleges.

To address the vague definition of quality, we assume each four-year college has an underlying index of quality. The index is unobservable, but is positively related to many observable inputs and outputs, for example, faculty-student ratio, faculty salary, the quality of faculty, total expenditure per student, student selectivity, freshmen retention rate, graduation rate, starting salary of graduated students, the proportion of students going to professional schools, student experience, etc. The role of USNWR is selecting some variables from this pool and bundling them into one single composite. The variables employed in the ranking algorithm and the weights that the USNWR allocates to these variables are both heavily criticized.<sup>5</sup> However, even critics agree that the USNWR rankings do allow some (imperfect) comparison of educational quality across colleges and over time.

While the USNWR rankings are indeed noisy, we believe they address two information issues. The first is the information asymmetry between a college and its prospective students. After reading the USNWR rankings, students may update their beliefs about college quality and change their choice of colleges accordingly. If the demand response is strong enough, it will motivate the college to improve its USNWR statistics. The second information issue relates to the information asymmetry between the contributors that fund a college and the people that actually run the college. This is essentially a principal-agent problem. If the USNWR rankings provide a benchmark for the principal to monitor the agent, the agent will exert more efforts in improving the USNWR statistics.

Both of these mechanisms imply that exposure to the rankings would change college choices about the quality of education to provide to the market. On this front, we have two main

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<sup>5</sup>NORC(1997) criticized the USNWR for adopting arbitrary weights in the rank calculation, and concluded that the overall rankings were sensitive to relatively small changes in these weights. Clarke (2000) documented the detailed changes in the USNWR ranking criteria from 1995 to 2000. She concluded that the indicators used to create the rankings generally showed a one-dimensional structure, providing support for the use of a single score to summarize a school's performance. However, the amount of error involved in the ranking methodology was so large that it required considerable caution in the use of overall scores to assign discrete ranks. Dichev(2001) studied the predictability of USNWR rankings. He argued that, if rank changes reflected new information, it should not be predictable. The data suggested the opposite: changes in the USNWR rankings had a strong tendency to revert in the next two years and the reversibility accounted for a strikingly large part (70-80%) of total variation in rank changes. Other criticisms focus on the factors that the USNWR failed to include in the evaluation of college quality, including the cost of education, research activity, and measures such as student involvement in the life of college and the academic demands of the curriculum.

findings: first, in almost every measure of input and output, private colleges exhibit no response to being included in the rankings. In fact, the quality of freshmen as measured by their SAT scores declines. This occurs even though the private colleges have no significant change in freshmen enrollment and do not raise tuition in response to being included in the rankings. One possible explanation for this perverse finding is that the USNWR coverage represents a negative shock to the perception of the quality of the private added-ins colleges, and therefore makes it difficult for them to maintain a competitive student profile. It is also possible that all the private colleges have responded to the (potential) coverage of USNWR rankings since early 1980s, and the increased consumer favoritism towards top ranked schools pushes down the student quality in the private added-ins.

The results for private colleges stand in stark contrast to those for public colleges. Exposure to the rankings leads public added-ins to improve significantly on the percentage of faculty with Ph.D. degrees and general expenditure per student. In the meantime, public added-ins have cut enrollment and increased scholarship expenditure per student. Compared with public previous-ins and public never-ins, there is no significant change in listed tuition, freshmen SATs, freshmen retention rate, or six-year graduation rate.

Why are most improvements concentrated in the resource inputs of public colleges? After exploring colleges' financial data, we believe this pattern can be explained by different responses of different funding sources. After the 1990 exposure to the rankings, there is little change in endowment income and private gifts, but state appropriation per student has increased 4.5%. The change of state appropriation is concentrated in public colleges despite that fact that over 20% of private added-ins report positive state funding. Although government grants and contracts also increase (4.1%) in public added-ins, their absolute amount is much smaller than that of state appropriation. These results suggest that exposure to college rankings may affect the state governance of public colleges. If the USNWR coverage does not provide state officials better information about college quality, it at least calls attention to the information issue. It is likely that the USNWR coverage highlights the relative performance of public colleges and therefore justifies more state spending to improve performance.

Relating USNWR rankings to a principal-agent problem is consistent with the 2001 survey of college presidents conducted by the Association of Governing Boards (AGB). The survey indicates that 76% of the respondents considered the USNWR rankings very or somewhat important to the institution, 67% discussed the rankings in board meetings, 50% use the rank as internal benchmarks, and 33% use the rank to gauge their success or progress relative to peers.

The response of state appropriation funding to the USNWR rankings is also consistent with a general trend towards tying college performance with state finance. According to the annual Survey of State Higher Education Finance Officers (SHEFO), 16 states started performance reporting between 1991 and 1995, 7 states considered campus performance as one factor in budgeting, and 3 states tied specified state funding directly to performance indicators. As of today, almost all states have adopted at least one of the three practices in allocating state funds to higher education. Combined with the facts that only 11% of freshmen assigns significant importance to college rankings (McDonough et al. 1997) and the improvements observed in the public colleges do not come with a greater tuition rise, these findings suggest that the improvements are more likely motivated through colleges' internal governance than through students' willingness to pay for quality.

Finally, to shed light on the gaming argument, we examine some admission variables that have been frequently cited as gaming targets, including total number of applications, acceptance rate, yield rate, the enrollment of transfer students, the percentage of first-time first-years (FTFY) in total enrollment, and the introduction of early admission programs. No evidence supports with the gaming claim. For example, inclusion in the USNWR rankings leads to a decline in the number of applications in public colleges, and private added-ins have experienced increases in acceptance rate and the percentage of FTFYs in total enrollment. All these patterns are at odds with the gaming claim. Results on other gaming targets are insignificant and sometimes even show a sign opposite to the gaming prediction. Based on these results, we conclude that the 1990 USNWR exposure do not cause the added-ins to engage in extra gaming.

The rest of the paper is organized as follows. Section 2 describes the history of USNWR rankings. Section 3 summarizes theoretical thoughts about the potential impacts of college rankings and reviews existing studies about USNWR rankings. Section 4 describes the data and lays out the econometric specification. Section 5 reports our empirical findings, and Section 6 concludes.

## 2 History of USNWR rankings

Today, more than 100 college guidebooks target the market of undergraduate admission. Although USNWR was not the first national magazine to have a special college issue<sup>6</sup>, it was the first to deliver numerical rank of post-secondary institutions to the wide public.<sup>7</sup> Every year, USNWR sells over 2.2 million copies of its college ranking issue, driving its typical newsstand sales up by 40% and reaching an end audience of 11 million people (Dichev 2001). Plus the annual sale of 700,000 copies of the related college guidebook, the USNWR rankings account for nearly half of the total market of 6.7 million copies of college guide publications.<sup>8</sup>

When the USNWR published the first ranking issue in 1983, it focused on the top 10 schools in four categories: national universities, national liberal arts colleges, regional universities and regional liberal arts colleges. The grouping is based on the Carnegie Classification of Institutions of Higher Education. The later two categories are further classified by region, and therefore the number of schools ranked was much higher in the regional categories than in the national ones. The rankings were derived from an academic reputation survey, in which the USNWR asked the presidents of all four year colleges and universities to name the five best undergraduate schools that belonged to the same Carnegie Classification as their own institution. The same structure continued in 1985.

In 1987, USNWR expanded rankings to include the top 25 national universities and top 25 national liberal arts colleges, while the regional rankings continued to include only the top 10 schools. Starting in 1988, USNWR rankings became an annual event and the ranking coverage expanded to the top 25 schools in all four categories. In the meantime, the ranking criteria started to include self-reported statistics, while the weight on the academic reputation survey was reduced from 100% to 25%. The statistical data included a number of variables measuring school quality based on inputs, such as student selectivity and faculty/financial resources, and outputs, such as freshmen retention rate and graduation rate. If a college does not report its statistics, USNWR used supplemental data from other sources.<sup>9</sup> Variable definitions and the

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<sup>6</sup>Rolling Stone began its College Guide issue in 1982. See Bogue and Hall (2003) Chapter 3 for a more detailed history of college rankings before 1982.

<sup>7</sup>Before USNWR rankings, national rankings of academic institutions were little known outside of academic circles.

<sup>8</sup>This is likely a conservative estimate, since it does not include the 8 million hits the USNWR website generates each year (Smith 2001).

<sup>9</sup>Other sources include the American Association of University Professors, the College Board, the National Collegiate Athletic Association, the Council for Aid to Education and the U.S. Department of Education.

corresponding weights have changed over time, but the framework of the ranking criteria has remained stable since 1988.<sup>10</sup>

Most changes after 1988 are in terms of the *scope* of rankings. In 1989, the regional rankings expanded from the top 25 across all regions to the top 15 regional universities and the top 10 regional liberal arts colleges in North, South, Midwest and West separately. A greater change for the national categories occurred in 1990. In that year, USNWR rankings covered *all* the national universities and *all* the national liberal-arts colleges. According to the latest Carnegie classification, if a school belonged to these two national categories but failed to make the top 25, it was classified into one of the four quartiles in its respective category. The four quartiles were ranked from the best (the 1st quartile) to the worst (the 4th quartile), but there were no numeric ranks within each quartile.

Including national quartiles constitutes a major change in the scope of the USNWR rankings: it covered 295 national universities and liberal arts colleges in addition to the top 25 lists. This structure remained unchanged until 1995.<sup>11</sup> In 1995, national schools in the first quartile were given specific ranks, expanding the rank list from top 25 to top 50. Compared to the 1990 change, this did not expand the school coverage at all. Rather it gave more detailed information about the relative quality within the first quartile of the two national categories. Along the same direction, after 2000, USNWR has expanded the rank list from top 50 to top 100, providing more detailed information into the second quartile.

To summarize, Figure 1 describes the structural changes in the USNWR rankings from 1983 to 2000. This paper focuses on the largest change in the ranking scope, namely, the inclusion of national quartiles in 1990. To the best of our knowledge, this change was driven by a USNWR managerial decision, and does not reflect underlying changes in the market for higher education.

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<sup>10</sup>The biggest exception is that USNWR stopped using yield rate in 2003, largely in response to college complaints.

<sup>11</sup>In the magazine issue, the rankings of regional schools have always been restricted to top 15 or top 10 by region. The related USNWR college guidebook started to report regional quartiles in 1993. Because the magazine issue reaches much broader audience, we focus on the changes in the magazine issue.

### 3 Theoretical thoughts and literature review

Today's colleges have very complex functions: they not only provide post-secondary education, but also engage in research, local economic development, and community services. The complexity results in many features unique to higher education. For example, in many colleges, the cost of educating an undergraduate student is much larger than what they pay in tuition and fees, with the rest covered by government appropriations, endowment earnings, private gifts, and research grants. Moreover, most colleges are non-profit institutions and have an explicit mission to maintain and enhance quality.<sup>12</sup> They strive for better quality not only because their direct consumers (i.e. students and their parents) are willing to pay for quality, but also because their services may generate monetary and non-monetary benefits that don't materialize in the admission market. These features suggest that the USNWR rankings, though focusing on undergraduate programs, may have impacts far beyond undergraduate admission.

To complicate the matter, the undergraduate admissions market is quite different from a regular market. Because students are both inputs and outputs in the production of human capital, colleges have incentives to select high ability students. As a result, the final match of students and colleges are not only determined by consumer choices but also driven by selective admission.<sup>13</sup>

Given these special features, we consider colleges as maximizing a weighted sum of prestige and quantity under the constraint that total expenditures do not exceed total revenue. Prestige may depend on the actual quality of a college as well as the public perception of such quality. Quantity, often in reflection of access to higher education, is defined as the amount of higher education received by the enrolled students. Different colleges may aim for different balances between prestige and quantity, our discussion does not require any specific functional form. Whatever the objective function is, a college maximizes it by choosing faculty hiring policies, student admission policies, tuition and fees, financial aid policies, curriculum, student services, etc. The final realization of the objective does not only depend on college policies, it also relies

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<sup>12</sup>For example, according to Harvard University Statement of Values (August 2002), Harvard University aims to "provide education and scholarship of the highest quality." (accessed at <http://www.president.harvard.edu/speeches/2002/values.html> on Feb. 17, 2006.) According to the University of Maryland Mission Statement (October 2000), the University of Maryland "is committed to achieving excellence" in research, graduate programs, and undergraduate education.

<sup>13</sup>See Rothschild and White (1993) for optimal pricing in a model of peer effects, Epple et al. (2002) for the impact of peer effects into student stratification, and Hoxby (2004) for the impact of increased competition on student sorting.

on the types of students enrolling in the college and how the information of college quality reaches the public.

The USNWR rankings may affect a college's maximization in three ways: first, their high visibility affects public perception of college quality, thus the college's objective function. Depending on the extent to which the public perception enters the objective function, this may motivate a college to reallocate its resources towards the areas emphasized by the USNWR rankings, and away from the items that do not appear in the rankings. This is the common "gaming" argument. Aside from the gaming effects, the USNWR rankings may affect student belief of college quality<sup>14</sup> and therefore their choices of where to apply and where to enroll. Expecting these changes, a college may change admission, tuition, financial aid, faculty, and non-faculty resources in an attempt to enhance rankings and attract better students. We refer to these changes as "consumer effects." In addition, the USNWR rankings may also affect the information asymmetry between the contributors who fund a college and the people that run the college. With the rankings, contributors may change the amount and nature of contributions, and the way in which they monitor college performance. All of these will redefine the college's maximization problem and motivate colleges to change inputs and outputs. We refer to these changes as "contributor effects."

In reality, the gaming, consumer and contributor effects are likely to coexist and reinforce each other. While it is difficult to identify the strength of each effect, we aim to derive testable predictions and use the empirical evidence to infer whether each effect does exist. Keeping this in mind, we now discuss each in more detail.

### 3.1 Gaming effects

The word gaming has a vague definition: one extreme view is that a college may manipulate statistics on paper and does not incur any real change. At the other extreme, a college may incur many real-world changes so that the statistics reported in the USNWR look better but they do not reflect the intended element of quality. The gaming arguments examined in this

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<sup>14</sup>It is also possible that the USNWR rankings do not change student perception of the actually learning that occurs in a specific college. Rather, the rankings provide a coordinating device for students to signal their ability to the job market. For example, if attending a college ranked #1 has a more positive signaling effect than attending a college ranked #2, students will prefer the #1 college even if they can learn exactly the same knowledge from both colleges. We thank Michael Katz for pointing out this possibility. However, empirically we cannot distinguish this argument from a real shift in student beliefs.

paper cover both extremes.

Table 1 summarizes the USNWR ranking methodology as of 1998. Every variable employed in the rankings is a potential gaming target. Some gaming behaviors are supported by anecdotes (Hunter 1995, Stecklow 1995, Ehrenberg 2000), some are more likely speculations (Ehrenberg 2001, 2003). Here we list a number of claims that can be tested in our data.

To enhance the reported student selectivity, a college may engage in an aggressive admission campaign that increases the total number of applications and therefore lowers the acceptance rate. A college may also adopt an early admission program to lock in students thus increasing the yield. If these gaming behaviors are widely adopted, a comparison before and after 1990 should reveal more applications, lower acceptance rate, higher yield, and more early admission programs for the schools that were added to the USNWR rankings in 1990.

Since the USNWR measures focus on FTFY full time students that enroll as of September, a college may reclassify some freshmen (especially those with lower SAT scores) to enroll in January so that they are not counted in the USNWR measures of freshman selectivity. This implies that a college may have lower FTFY enrollment but experience no decline in the total enrollment. The same motivation could encourage a college to substitute freshmen for community college transfers, which implies an increase in the transfer rate.

Besides student selectivity, the USNWR rankings also emphasize resource spending. This may motivate a college to spend more on the included items such as faculty salary and general expenditure, and less on the excluded items. We can examine a college's financial statement to detect this change.

### **3.2 Consumer effects**

Asymmetric information between producers and consumers has been examined intensively in the economic literature, but usually considered in profit maximizing firm context on the production side. If public disclosure, say automobile ratings published in Consumer Reports magazine, allows consumers to better distinguish good quality from bad quality, the adverse selection problem is alleviated (Akerlof 1970), and consumer preference for quality will motivate producers to produce high quality. The exact choice of quality depends on consumer prior belief, consumer willingness to pay for quality, the cost of quality, and the amount of competition within each

quality level.<sup>15</sup>

The demand-driven incentives are magnified in the undergraduate admission market: an input or output improvement initiated by a college, if published in college rankings, may attract better students; better students result in better rankings; and better rankings attract even better students in the year after. Such positive feedback does not only provide extra incentives for colleges to improve quality, but also accelerates the stratification of students (Cook and Frank 1993).

Assuming consumers do respond to the USNWR rankings, we have four testable predictions. First, a college has incentives to improve quality after it is included in the USNWR rankings. Second, better quality allows a college to charge a higher price, enroll better students, or increase enrollment without sacrificing in student quality. Third, student stratification becomes finer among the schools that are newly added into the rankings. And fourth, if consumer willingness to pay is the most important driver for quality, the greatest quality improvements should appear in the schools that rely most on tuition revenue.

One may argue that the positive feedback between rankings and student selectivity motivates every college to improve student selectivity regardless of its reliance on tuition revenue. However, enhancing the student profile is not the only way to improve rankings. Equally important are resources available for faculty and students. If consumer willingness to pay is more sensitive to rankings than the other funding sources, a sensible strategy is to improve some USNWR statistics to justify tuition rise, and use the increased tuition to further enhance the standing in the USNWR rankings. Apparently, this strategy is most effective if a college receives most revenue from tuition and fees.

Conditional on colleges that report financial data to the Department of Education from 1987 to 1995, tuition and fees account for 49% of total revenues in private colleges, but only 20% for public colleges.<sup>16</sup> This difference suggests that private colleges should have greater incentives to improve quality after being included in the USNWR rankings. By a similar logic, the response of private colleges should increase with the fraction of tuition and fees in total revenue.

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<sup>15</sup>Milgrom (1981) and Grossman (1981) examined quality disclosure and its impact on a monopolist's choice of quality. Chan and Leland (1982) and Dranove and Satterthwaite (1992) examine consumer information and quality choices in monopolistic competition.

<sup>16</sup>Data source: the Integrated Postsecondary Education Data System (IPEDS) 1987-1995. To calculate the fraction, we divide (total tuition and fee revenue - total institutional scholarships) by (total revenue - total institutional scholarships).

Strictly speaking, the observed changes in college inputs and outputs may reflect both student choices and college responses to student choices. Without individual data, our ability to disentangle the two is quite limited. We have to rely on indirect inferences or extra assumptions. For example, if we observe input and output decline in a college after it is covered by the USNWR rankings, we may infer two possibilities: either a negative consumer response dominates the school's intention to improve certain statistics, or the school is unable to improve more than its competitors and therefore suffers from unfavorable student choices.

There is some empirical evidence on consumer responses to the USNWR rankings, but most of them ignore the role of college behavior in admission outcomes. Survey results suggest that about 11% of freshmen respondents took college rankings as a very important factor in their decision to attend a particular school and these responsive students were usually A-students from high-income, college-educated families (McDonough et al. 1997).<sup>17</sup>

In a more recent study, Monks and Ehrenberg (1999) tracked the numerical USNWR ranks of 30 very high quality private colleges (1987-1997) and associated them with a number of admission outcomes in the following enrollment year. They found that one-rank decrease in the USNWR ranking corresponded to significant increase in admission rate, decrease in yield rate, decline in the average freshmen SAT scores, and reduction in aid adjusted tuition. As Monk and Ehrenberg noted, the study is subject to a number of caveats: first, by the USNWR ranking criteria, there is a mechanical relationship between one year's enrollment outcome and the next year's USNWR rank. Therefore, changes in the USNWR rank aren't exogenous over time. Moreover, schools may change tuition and financial aid policies in response to the USNWR rankings. As a result, the admission outcomes may reflect responses from both students and colleges. Third, because the studied schools compete against each other, the observed admission outcomes are played out based on all rankings. This suggests that schools with no change in the USNWR rankings may not be the perfect control group.

Pope (2005) overcomes the endogeneity problem by exploiting the explicit weight changes in

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<sup>17</sup>In addition, 40% of freshmen checked college rankings as somewhat important. The study is based on a 1995 national freshmen survey conducted under the Cooperative Institutional Research Program (CIRP) by the Higher Education Research Institute at UCLA. The sample used in McDonough et al. (1997) consists of 221,897 first-time, full-time freshmen from 432 four-year colleges and universities in the U.S. In the survey response, rankings trail behind college reputation (55.1%), visit to the campus (37.6%), offers financial assistance (32.9%), wanting to go to college of this size (32.9%), the reputation for social activities (27.8%), special education programs offered (21.2%), low tuition (20.6%) and wanting to live near home (16.8%) as reasons that students choose a certain school.

the USNWR ranking methodology. Specifically, he focuses on top 25 universities listed in the USNWR magazines from 1990 to 2001, and predicts how a school would have been ranked should the USNWR continued the same methodology from the year before. The difference between the actual rank and the predicted rank is completely driven by USNWR weight changes, and therefore is a valid instrument for the actual rank. The instrumental variable results suggest that one rank down in the USNWR leads to fewer applications and higher acceptance rate, but no significant changes in yield and the SAT distribution of incoming freshmen. In a different study, Amanda Griffith and Kevin Rask (2005) focus on more than 4,000 students that have been admitted by Colgate University and find that USNWR rankings have an important and expected impact on the yield.

All these studies suggest that consumer response, if it exists, is likely to concentrate at the high end of the quality distribution, which corresponds to the national schools that have been ranked in the USNWR before 1990. These studies do not indicate how consumers would respond to the expansion of USNWR rankings on the added-ins. If the expanded rankings do not meet consumer expectation, they could be a negative shock to the added-ins and consumer favoritism towards top schools will have a negative spillover on the student quality of the added-ins. Alternatively, if the revealed quality of the added-ins is better than what consumers thought, students may move down from top schools thus enhancing the student profile in the added-ins. Which scenario is more representative of the reality is an empirical question.

### **3.3 Contributor effects**

Many people believe that higher education generates positive externalities so that the social benefits are larger than the private gains of education. Even if contributors to a college, either taxpayers or private donors, do not benefit directly from a quality increase in undergraduate teaching, they may obtain indirect benefits such as better colleagues and a safer community. To the extent that contributors care about college quality in a broader sense than the earning ability of college graduates, we believe the impact of USNWR rankings on contributors is not necessarily limited to its impact on the undergraduate admission market.

If a contributor intends to use her contribution to realize certain outcomes in a college and such ideology differs from the college's own objective function, the contributor faces a principal-agent problem. As principal, the contributor does not observe the effort of students, faculty and administrators. Instead, she observes one or more noisy measures of college performance, which

depend on the effort of the agent (college) as well as many other random factors. Performance comparison against other colleges may help the contributor filter out the factors common to higher education, and therefore form more precise beliefs about the agent's effort. With better information, the contributor can redesign the contract, solicit more effort from the college, and achieve outcomes more in line with the contributor's interests.<sup>18</sup> To the extent that USNWR coverage provides an opportunity to conduct such peer comparison, the contributor may respond to the USNWR coverage by (1) changing the amount of contribution, (2) strengthening the link between contribution and relative performance measures, and (3) monitoring campus performance more closely. In response, the college may devote more effort to meeting the contributor's demand.<sup>19</sup>

The college-contributor relationship goes beyond the classical principal-agent theory, because contribution is not only a reward to the agent but also a direct input in the college's production function. Any increase in education and general expenditures (including faculty salary) could make the college look better in the USNWR, even if there is no change in the effort of students, faculty or administrators. It is possible that the head-to-head comparison highlights a need to improve, and a natural response is to contribute more for the college to spend. Like the principal-agent theory, this predicts better (worse) USNWR statistics along with more (less) contribution. However, it does not predict any change in effort, thus no improvement in the performance measures that entail greater efforts. Moreover, it does not predict any change in monitoring, or any additional ties between contribution and the college's absolute or relative performance. These differential predictions may help us distinguish the principal-agent theory from a simple shift in the amount of contribution.

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<sup>18</sup>Note that a principal-agent contract can be explicit or implicit. In an explicit contract, relative performance measures are informative to the principal if the amount of noise in the common error is greater than the amount of noise specific to the comparison group (Milgrom and Roberts 1993, pp. 220). Since the principal can always discard information, any adoption of relative performance measures in an explicit contract should lead to greater efforts from the agent and better outcomes for the principal. In an implicit contract that hinges on reputation concerns or ratchet effects, the prediction is less clear. See Meyer and Vickers (1997) for more details.

<sup>19</sup>A priori, it is not clear which direction the contributor response would take. One possibility is that the USNWR rankings substitute the regular information exchange between contributors and the college, hence contributors demand fewer reports from the college after it is included in the rankings. However, the opposite direction is equally likely: contributors may realize the importance of information after the USNWR rankings and therefore demand more information exchange with the college. Similarly, contributors may decrease contribution because the revealed quality is not as high as expected, or increase contribution in an attempt to improve quality. Contributors may also increase or decrease monitoring efforts, depending on how good they think the information exchange is and how feasible it is to tie college performance with the amount of contribution. Empirical evidence on contribution amount, reporting requirements, and governing structures may help resolve the uncertainty.

The college-contributor relationship differs greatly across public and private colleges. Compared to private colleges, public colleges have one more layer of governance, namely the state government. For an average four-year college that reports finance data to the Department of Education from 1987 to 1995, state government accounts for 44% of total revenue.<sup>20</sup> Since this fraction is higher than that of any other source of funding, it is not surprising that state government plays a leading role in monitoring the performance of public colleges (ECS 1994, 1997, 2002, Duderstadt and Womack 2005). If the USNWR rankings have any impact on the agency relationship between a public college and its contributors, it is most likely to appear in state funding and state governance. Assuming major private donors contributing to private colleges are better informed than state governments, the sudden exposure of USNWR rankings may have a greater impact on public than on private colleges.

Survey results suggest that the USNWR rankings did have some importance for the governing boards of colleges. In 2001, the Association of Governing Boards (AGB) conducted an email survey of 694 college presidents, asking how they and their boards regard the USNWR rankings (Levin 2002). Among the 241 respondents, 76% reported that the USNWR rankings was very or somewhat important to the institution, 67% discussed the rankings in the board meeting, 50% of the respondents used the rank as internal benchmarks, 36% announced their rankings in press releases, 32% used the rankings to measure progress relative to peers, and 51% had ever attempted to improve the rankings.

The conjectured impact on college governance is also supported by the increasing emphasis of performance and accountability among public colleges. Based on the annual Survey of State Higher Education Finance Officers (SHEFO 1997-2003 as reported in Burke & Minnassians 2001-2003), Figure 2 plots a general trend towards performance reporting, performance budgeting, and performance funding.<sup>21</sup> Before 1990, only 4 states had one of the three practices (AL, HI, IL, and TN). Between 1991-1995, 16 states started performance reporting, 7 states adopted performance budgeting, and 3 states initiated performance funding. As of today, almost all states have adopted at least one of the three practices in the allocation of state funding, with a

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<sup>20</sup>Data source: the Integrated Postsecondary Education Data System (IPEDS) 1987-1995. To calculate the fraction, we divide state appropriations by total revenue.

<sup>21</sup>According to the survey, performance funding means tying specified state funding *tightly and directly* to the performance of public campuses. Performance budgeting means the state government considers campus performance as *one factor* in determining state funding. In comparison, performance reporting is least restrictive. It requires periodic reporting of campus performance to the state government (and sometimes to the public). Performance reporting relies on information and publicity rather than funding or budgeting to encourage colleges to improve performance.

growing preference for performance reporting. One empirical exercise we could do is to detect whether the expansion of USNWR rankings has any power explaining the adoption time of any of the three programs.

The Education Commission of States collects detailed information on the governance structure between each state government and the public colleges in the state (ECS 1994, 1997 and 2002). Assuming certain governance structures entail closer monitoring than others (Lowry 2001), we can check whether the level of monitoring change with the fraction of public colleges covered by the USNWR rankings. Even if the governance structure does not change, we can detect whether the amount of state funding to a specific public college is sensitive to the coverage of USNWR rankings, and whether such sensitivity varies with state monitoring.

To summarize, both mechanisms – consumer response and agency relationship – generate incentives to improve quality, but the improvement patterns are different. If most impacts of the USNWR rankings work through the consumer effects, we should observe greater improvements in private colleges, and these improvements should lead to consistent shifts in admission outcomes, namely higher tuition, fewer financial aid, and better students. Alternatively, if most influence of USNWR rankings arises from the agency relationship between a college and its contributors, the quality improvements should be funded by non-tuition contributions, and such impact may differ between public and private colleges depending on how public and private contributors respond to the USNWR rankings. Gaming speaks more to the methods used to achieve quality than to the incentives to improve quality. Empirical evidence for or against certain gaming patterns does not lend more or less support to either mechanism.

## **4 Data Summary and Econometric Specification**

### **4.1 Data**

We combine three main data sets: the USNWR magazines, the Integrated Postsecondary Education Data System (IPEDS), and the College Board Annual Survey of Colleges (CBASC). Collected by the Department of Education, IPEDS is a census of all the colleges operating in the U.S. It provides basic institutional information such as degrees offered, private/public status, tuition, enrollment, faculty resources, endowment, and total expenditure. In comparison, CBASC is an annual survey of four-year colleges conducted by the College Board. It intends to

cover all the four-year colleges, with average response rate around 85%. CBASC collects detailed information on college admission policies, the number of applications received, the number of admissions granted, the number of transfer students, the 25 and 75 percentiles of SAT scores of the freshmen class (henceforth SAT25 and SAT75), the number of students receiving financial aid, graduation rate, etc. These variables complement the basic information in IPEDS and help us gather a more complete picture about the decisions colleges may have made in association with USNWR rankings.

Since CBASC data did not start to be collected until 1986, we merge IPEDS and CBASC data for enrollment years 1986 to 1995. Note that USNWR rankings are published in September, so rankings published in year  $t$  are applicable to enrollment year  $t + 1$ . For this reason, the 1990 USNWR regime shift started with enrollment year 1991, not 1990. IPEDS and CBASC data are further merged with the ranking issues of USNWR by year and institution name.<sup>22</sup>

Our initial sample consists of 2,880 schools that have a record in at least one of the three data sources. Since USNWR focuses on four-year colleges, we first limit the sample to four-year colleges that offer at least one Bachelor's degree. A few schools failed to report public/private status, they are excluded from the sample. Further cleaning limits the sample to a balanced panel so that each school in the sample has a record in every enrollment year between 1986 and 1995. This generates a sample of 1,262 schools, accounting for 93% of all the full time four-year college enrollees as of 1986.

From USNWR rankings and the IPEDS records, we group these 1,262 schools into five groups national previously-ins (63), regional previously-ins (187), added-ins (228), never-ins (695), and sometimes-ins (89). Groups 1 and 2 denote national/regional schools that had been included in the USNWR rankings before 1990. Group 1 includes prestigious national universities such as Harvard and Yale, and top national liberal arts colleges such as Amherst College. Group 2 includes top regional colleges such as Villanova University and Berry College.

Upon the 1990 expansion, all the national schools that didn't make the USNWR rankings before 1990 were included in the rankings. We label them "added-ins." By definition, an added-in must be a national school, and a national school is either a previously-in or an added-in. Strictly speaking, all the national schools were treated in 1990, because the probability of being covered was below one before 1990 but equal to one after 1990. Of course, this change is smaller

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<sup>22</sup>By ranking issues, we mean the annual Best Colleges issue of the USNWR weekly magazine in years 1983, 1985, 1987, 1988, 1989, 1990, 1991, 1992, 1993, and 1994.

for the previously-ins than for the added-ins. Since our goal is to estimate the effect of being covered by the USNWR rankings, we focus on the added-ins. Another reason for ignoring national previously-ins is because they have small overlapping with other schools in terms of average student expenditure and average freshmen SATs<sup>23</sup>

Most regional schools of medium or low quality never made the USNWR rankings in our sample period. We call them "never-ins." By definition, they are all regional. The residual group "sometimes-ins" captures the regional schools that first appeared in the USNWR sometime between 1990 and 1994. They were probably right below the ranking cutoff before 1990, but somehow rose above it after 1990. At the boundary, they had strong incentives to improve and therefore using them as a control group tends to understate the impact of USNWR coverage. For this reason, our main specification only uses regional previously-ins and never-ins as controls. Including sometimes-ins does not change any conclusion, but coefficients decline slightly in the third decimal place.

In short, we compare (national) added-ins with regional previously-ins and (regional) never-ins before and after 1990. Table 2 reports their basic characteristics. Three patterns are worth mentioning. First, schools were systematically different even before USNWR rankings became a major information source about quality in higher education. Measured by 1986 data, the national added-ins had similar students (in terms of SAT scores) as the regional previously-ins, but charged lower tuition and enrolled more students. This is because the added-ins are more likely to be public (50% versus 17%). In comparison, never-in schools had the lowest tuition, the worst students and the smallest enrollment, although the public percentage among the never-ins (43%) is higher than that of the previously-ins.

Despite the obvious sorting of students, the SAT score distribution also displays large overlapping across groups. For example, the average SAT75 of the never-ins were significant higher than the average SAT25 of the added-ins and the regional previously-ins. This suggests that the matching between students and schools depends on many factors orthogonal to SAT scores.

Since public and private colleges face different financial constraints, engage in different governance structures (Duderstadt and Womack 2003), and follow different time trends (Goldin and Katz 1998), we suspect the 1990 USNWR regime shift would have different impacts on public and private schools. For this reason we always compare public versus public and private ver-

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<sup>23</sup>We don't have data on average SATs by school. Instead, we use the average of the 25 and 75 percentiles of freshmen SAT as a proxy.

sus private schools. Such comparison does not imply any assumption of who competes against whom. In fact, many colleges in our sample are classified as national, and public and private colleges often compete in a common market.

Given the systematic school differences before 1990, we are concerned that our treatment and control groups may follow different trends over time. One strategy is to select some control schools and make sure they follow the same pretreatment trends as the added-ins. Since we examine a number of dependent variables and the comparability of pretreatment trends varies by variables, it is difficult to construct a large enough sample that satisfies all the pretreatment tests. Another strategy is to use all the schools in our sample but control for group-specific time trends. We follow the second strategy and conduct a number of robustness checks to ensure that our results are driven by the UNSWR expansion instead of time trends.

## 4.2 Data Summary

For school groups before and after 1990, Table 3 reports summary statistics on three sets of variables. To ensure meaningful comparison, the summary statistics are organized by public status.

The first set of variables focuses on college inputs and outputs, including faculty-student ratio, % of faculty with doctoral degrees, general expenditure per student, freshmen SAT25 and SAT75<sup>24</sup>, freshmen retention rate, and the 6-year graduation rate. All of them have positive weight in the USNWR ranking algorithm.

The second set relates to undergraduate admission, including in- and out-of-state tuition, percentage of freshmen receiving financial aid<sup>25</sup>, freshmen enrollment<sup>26</sup>, total undergraduate enrollment, the total number of undergraduate applications, acceptance rate, yield rate, as well as the percentage of transfer students and the percentage of FTFYs in total enrollment. Among

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<sup>24</sup>For schools reporting ACT scores, we convert them into SAT scores according to "SAT-ACT Score Comparisons", which is constructed from the following source references: "Concordance Between ACT Assessment and Recentered SAT I Sum Scores" by N.J. Dorans, C.F. Lyu, M. Pommerich, and W.M. Houston (1997), *College and University*, 73, 24-31;"Concordance between SAT I and ACT Scores for Individual Students" by D. Schneider and N.J. Dorans, *Research Notes (RN-07)*, College Entrance Examination Board, New York: 1999;"Correspondences between ACT and SAT I Scores" by N.J. Dorans, *College Board Research Report 99-1*, College Entrance Examination Board, New York: 1999; *ETS Research Report 99-2*, Educational Testing Service, Princeton: 1999.

<sup>25</sup>Here financial aid includes all need-based and merit-based aid received by freshmen from all sources.

<sup>26</sup>Defined as the total number of FTFY full time enrollees.

these variables, only the number of applications, acceptance rate and yield rate are used in the USNWR rankings. The rest are examined because their changes could affect the variables used in the rankings.

The third set focuses on financial variables. On the revenue side, we group college funding by sources, including endowment earnings, private gifts (including private contracts and grants), government grants and contracts, government appropriations (state and all governments), tuition and fees, and total revenue. None of them are included in the USNWR rankings. However, assuming colleges break even, the spending variables included in the USNWR rankings must be funded by at least one of these sources. Source of funding is also the biggest difference between private and public colleges. On the expenditure side, we report expenditures in instruction, research, public services, and scholarships. Although the USNWR does not decompose educational and general expenditures into finer categories, some expenditures aren't excluded in the USNWR rankings (say research) and these expenditure details may help us understand changes in the allocation of financial resources within a college.

There is a data issue: although every school in the analysis sample has a record in all years from 1986 to 1995, it may not report valid data in all variables, and some variables such as state appropriations won't apply to all schools. Statistics shown in Table 3 (mean and the standard error of the mean) reflect the rawest data. In other words, if a school has reported valid data on variable  $x$  in year  $t$ , the data point is included in the summary of  $x$ , no matter whether the school reports other variables in the same year, or reports  $x$  in other years. In formal regressions, we address the concerns of sample selection and conduct robustness check in various sub-samples. Roughly speaking, results are similar no matter how we cut the sample.

In terms of inputs and outputs, both the added-ins and the control group have improved in the percentage of faculty with doctoral degrees, general expenditure per student, and freshmen SATs. In particular, the SAT distribution moves up in both 25 and 75 percentiles, while the inter-quartile ratio (defined as the ratio between SAT75 and SAT25) declines. This echoes a national trend towards more competitive admission and finer student stratification (Hoxby 2004). The increase in student expenditure is also impressive, roughly 38-42% in private schools and 28-31% in public ones. This is consistent with funding variables: every funding category (per student) has improved after 90, although the added-ins are always better funded than the control schools. No obvious patterns occur in freshmen retention rate and six-year graduation rate.

Turning to admission variables, both treatment and control groups show an increase in tuition, a higher percentage of financial aid recipients, and a reduction in FTFY enrollment after 1990. Except for private added-ins, all the other groups have experienced some expansion in the total undergraduate enrollment, suggesting that there might be some reclassification of FTFYs. In terms of admission outcomes, the added-ins increase in acceptance rate and decrease in yield rate, and receive fewer applications. These trends run counter to the gaming argument. If USNWR coverage encourages gaming, the added-ins should have pursued more applications, lower acceptance rate, and higher yield. Consistent with gaming are the increased adoption of early admission programs and a slight increase of transfer percentage. But these increases appear in the control group as well, so it is unclear whether it is attributable to college rankings.

Table 3 highlights the difference between public and private schools. The public-private difference is huge in almost every variable. Cross-sectionally, public colleges are short of resources, worse in student quality, and under-perform in both freshmen retention and graduation rate. Over time, public added-ins seem to improve more than their private counterparts in freshmen retention and graduation rate, but the magnitude warrants more rigorous tests.

The public-private difference is even more conspicuous in funding sources. Although some private colleges receive government appropriations, the magnitude is much smaller. Distribution-wise, most funding of public colleges comes from state appropriations. In contrast, the funding of private colleges is much more evenly distributed among endowment, private gifts, and government funds.

To summarize, the raw data indicate stable differences among the three school groups. Opposite to our expectation, the added-ins do not show obvious improvements, nor predicted changes on the suspected gaming targets except for reclassification of freshmen. Moreover, there are very notable differences between public and private colleges. This motivates us to only compare schools to the schools with the same public/private status.

### 4.3 Econometric specification

Our main specification is:

$$y_{it} = \alpha_i + \lambda_t + \theta_{group} \cdot t + \beta \cdot D_{addedin} \cdot D_{t \geq 1991} + \epsilon$$

where  $\alpha$  denotes college fixed effects,  $\lambda$  denotes a set of year effects,  $\theta$  denotes group-specific linear trend,  $D_{addedin}$  is a dummy for added-ins,  $D_{t \geq 1991}$  is a dummy for years after the 1990 expansion, and  $\epsilon$  is the error term assumed independent of all the regressors. Since  $D_{addedin}$  does not vary over time, it is absorbed in college fixed effects. Similarly,  $D_{t \geq 1991}$  is absorbed in  $\lambda_t$ . That's why  $D_{addedin}$  and  $D_{t \geq 1991}$  only occur in interaction. Within the regression, we allow  $\lambda_t$  and  $\beta$  to vary by public/private, which effectively restricts the comparison to public versus public, and private versus private. The standard errors are estimated with an arbitrary covariance matrix, in an attempt to address the fact that inclusion in the USWNR is a permanent shock and the outcomes we study are likely to be autocorrelated within the same college (Bertrand, Duflo and Mullainathan 2004).

This specification has two caveats. First, we assume schools in each group follow the same linear trends over time. Results are very similar if we allow separate trends for regional previously-ins and never-ins, and/or if we include state-specific trends. In an extreme robustness check, we control for school-specific trends. Since we have over 1000 schools but at most 10 years of data, the inclusion of school-specific trends imposes a significant reduction in statistical power. Nevertheless, our major findings in terms of more state funding in public schools and SAT deterioration in private schools still hold within 90% confidence. This suggests that the effects shown in our main specification are less likely driven by insufficient control of time trends.

The second caveat lies in spillovers across schools. Since colleges compete for students, faculty and contributions, the never-ins and the previously-ins may respond to the 1990 USNWR expansion as well. If this is the case, neither of them constitutes a clean control. More specifically, spillovers are likely to arise when previously-ins and never-ins change quality in response to the added-ins. To the extent that quality responses are strategic complements, our difference-in-difference regression tends to underestimate the actual change of the added-ins. We argue such spillovers can be captured by competition distance. Specifically, we first recover the 1989 USNWR ranking algorithm and use it to predict an overall score for every school. Then we define a school's distance to the added-ins as the difference between the school's predicted score and the average score of the added-ins. If the relative shifts between the added-ins and the comparison schools are due to spillovers, they should vary by competition distance.

Because the reporting rate differs by year and by variable, we run into a sample selection issue. At one extreme, we could use all the non-missing data points in each regression. This maximizes the precision of estimates, but runs the risk of an unbalanced panel. To give a simple example, if one half of the schools only report  $y$  before 1990 and the other half only report  $y$

after 1990, the before-after comparison could be very misleading. At the other extreme, if we restrict analysis to the schools that report every variable in every year, we end up with very few schools. Conditioning on this small sample is likely to misrepresent the average impact of USWNR rankings.

Given the disadvantages on both ends, we choose a middle ground. Specifically, for each variable we run regressions conditional on a balanced sample, but we don't require these balanced samples to be identical across variables. For a few variables that have relatively low responding rate (for example SAT25, SAT75, graduation rate, and faculty salary), the sample is conditional on schools that report non-missing values for at least three years before 1990 and at least three years after 1990. For the other variables, the sample is conditional on valid reporting in all years. All the regression results reported in tables reflect this sampling criterion<sup>27</sup>.

## 5 Results

### 5.1 Input and Output Measures

Our first task is examining whether exposure in the 1990 USNWR rankings has generated improvement in the input and output measures included in the rankings. In Table 4-1, we report regression results on faculty ratio, percentage of faculty with doctoral degrees, student expenditure, freshmen SAT25 and SAT75, freshmen retention rate, and the six-year graduation rate.

Two patterns stand out. First, the private added-ins don't exhibit any significant improvement after 1990. In fact, their SAT25 declines relative to the control group. Their freshmen retention rate and graduation rate drop as well, but the drops are insignificant. Arguably, the fall of retention and graduation rates do not necessarily imply a drop in a college's ability to

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<sup>27</sup>To gauge the potential selection bias, we also rerun each regression on six more samples: (1) the full sample (i.e. all the data of non-missings), (2) a sample conditional on non-missing reporting of the dependent variable and non-missing reporting of SAT scores, (3) the sample of (2) conditional on the schools that report SATs at least three years before 1990 and three years after 1990, (4) the sample of (2) conditional on the schools that report SATs in all years, (5) the sample of (3) conditional on continuous reporting of the dependent variable, and (6) the sample of (4) conditional on continuous reporting of the dependent variable. Overall, the coefficients are similar across different specifications, with smaller standard errors in the full sample and bigger standard errors in the restricted samples. None of them affects our conclusion.

educate students. They could be driven by the deterioration of freshmen quality. Either way, these results reject all of our theories: it seems that the private added-ins don't respond to the market by improving inputs and outputs; the agency problem, if it exists, does not get alleviated after 1990; and the private added-ins don't game the input and output measures more than their comparison schools.

Results are almost opposite for public colleges. Compared with the public schools in the control group, the public added-ins hire more faculties with Ph.Ds and spend more money per student. The impacts on freshmen SATs, freshmen retention rate and 6-year graduation rate are also positive, but the magnitudes are far from significance. This suggests that public added-ins have responded to the USNWR rankings, but the response is concentrated in the input of resources rather than the input or output of students.

The lack of significance in many results of private added-ins is subject to an alternative explanation. If the private added-ins have increased inputs and outputs but the never-ins and previously-in respond by making similar improvements, the reported coefficients will underestimate the actual impact on the added-ins. We argue that these spillover effects, if they exist, should vary by the degree of competition. Following this logic, an estimation that allows the impact to differ by the degree of competition should shed light on the spillover effects.

To quantify the degree of competition, we follow two steps: first, we run a regression to recover the algorithm used in the 1989 rankings. Conditional on the schools that appear in the 1989 USNWR, we regress the overall score (reported in USNWR) on the variables used in the 1989 rankings, namely SAT25, SAT75, freshmen acceptance rate, freshmen yield rate, expenditure per student, and percentage of faculty with Ph.D. We also take into account the fact that USNWR has normalized the overall scores by category.<sup>28</sup> In our regression, we apply the same normalization and minimize the squared distance between the normalized predicted scores and the scores reported in the USNWR. This entails a non-linear model incorporating a full set of category dummies. Among the 150 schools that appear in the 1989 USNWR, 98 have non-missing values in all the variables. Using these 98 observations yields an R-square of 0.74. The estimation precision is reasonable, given the fact that USNWR allocates 25% weight to academic reputation of which we have no data.

In the second step, we used the estimated algorithm to predict an overall score for every

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<sup>28</sup>More specifically, for every category, the USNWR normalizes the best ranked school as 100, and reports the other schools' scores in percentage of the score of the best school.

school, using the data of enrollment year 1990 conditional on non-missing values. For every school in the comparison group, we then compute the absolute distance between its predicted score and the average score of the added-ins. Sorting schools by this absolute distance, we split the private controls into two halves: one has closer distance to the added-ins, and the other half is further away.

In an unreported table, we rerun the input and output regressions, including the effects on the added-ins and the effects on the half sample of the comparison schools that are close in competition to the added-ins (with the far-away half as the omitted default). As we expect, the two effects are always of the same sign, but most of them remain insignificant. This suggests that competition spillover is unlikely to explain the lack of improvements (of private added-ins) in Table 4-1.<sup>29</sup>

## 5.2 Admission variables

In Table 4-1, we treat freshmen SATs as a proxy of college quality. However, they are also equilibrium outcomes and could reflect both student choice and college selection. Is it possible that the change of freshmen allocation is driven by price and enrollment size? For example, private added-ins could have increased enrollment by lowering the SAT criterion, even if there is no perceived or actual change in their quality. To examine this possibility, Table 4-2 reports regression results on in- and out-of-state tuition, percentage of freshmen receiving financial aid, freshmen enrollment, total undergraduate enrollment, the number of applications, acceptance rate, yield rate, the percentage of FTFYs in total enrollment, the percentage of transfer students, and whether the college adopts any early admission program.

**Results on price and enrollment** The added-ins, no matter public or private, experience no significant change in the listed tuition or in the percentage of freshmen receiving financial aid. The total FTFY enrollment does expand in the private added-ins, but it is statistically insignificant and does not seem to account for the significant deterioration of SAT25.

These perverse findings are nevertheless consistent with other studies. For example, Cook and Frank (1993) found that a growing proportion of top students enrolled in a small number of elite schools and this trend grew stronger from 1970s to 1980s. This could have a detrimental impact on other national schools, especially the private ones. Their data also suggests that the

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<sup>29</sup>These result are available from the authors by request.

concentration of top students is unlikely driven by price changes.

Duffy and Goldberg (1998) interviewed 16 liberal arts colleges in Ohio and Massachusetts.<sup>30</sup> They reported how these schools struggled to craft a competitive class and keep it at a reasonable size. The struggle is partly due to the USNWR rankings<sup>31</sup>: while the top-ranked colleges are able to capitalize the favorable rankings in student admission, schools that are not top ranked face the danger of losing their best candidates and have to deal with the daunting tradeoff between enrollment size and freshmen quality.

Surveys also indicate that colleges are well aware of the importance of student selectivity in the USNWR rankings. According to the 2001 AGB survey, 71% of colleges list the SAT scores of incoming freshmen as one of the most important targets to improve. However, we still observe worse student body in the private added-ins and no student improvements in the public added-in after 1990, which suggests that the improvement of student body is probably very difficult to achieve due to the negative spillover from the elite schools and the financial consequence of reducing enrollment in the bottom tail.

**Results on other admission variables** We examine these admission variables largely because they have been frequently cited as gaming targets. We find no evidence in support of the gaming claim: for public added-ins, inclusion in the USNWR rankings leads to 1.4% decline in the total number of FTFYS (insignificant) and 1.8% decline in the total undergraduate enrollment (significant). As a result, the percentage of FTFYs has slightly increased, which is opposite to the predicted reclassification of FTFYs. Moreover, inclusion in the USNWR rankings leads to a significant decline in the number of applications in public colleges, and a significant increase of acceptance rate in the private added-ins. Again, these patterns are at odds with the gaming claim. Results on yield rate, transfer rate and early admission programs are all insignificant. The treatment effect in the transfer rate is even negative. Based on these results, we conclude that the 1990 USNWR exposure do not cause the added-ins to engage in extra gaming.

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<sup>30</sup>All of these schools were classified as Baccalaureate I in the 1994 Carnegie Classification.

<sup>31</sup>Duffy and Goldberg 1998,p. 70-72.

### 5.3 Financial Variables

The results thus far suggest that most improvements are concentrated in the resource inputs of public colleges. This counters the intuition that the agency problem between a college and its contributors is probably less complicated in private colleges and therefore they should be more responsive to the market. It also rejects the prediction that private colleges rely more on tuition revenue and therefore should be more responsive to student choices in the admission market. In an unreported regression, we split the private added-ins into two sub-samples according to the fraction of tuition and fees in their total revenue as of 1987. We find no significant difference in their changes of inputs and outputs after 1990. This reinforces the conclusion that consumer response to the USNWR rankings and consumer willingness to pay for quality are not the key factors driving the observed changes in college inputs and outputs. In this subsection, we turn to the contributor effects. It is possible that the rankings affect college contributors and such impact does not depend on any consumer response in the admission market.

As shown in Tables 3, public and private colleges differ most in funding sources, especially state appropriation. This motivates us to examine how funding sources respond to the USNWR rankings. Another motivation hinges on the finding that public added-ins spend more on faculty and non-faculty resources, but don't increase tuition more than their comparison groups. Which funding source accounts most for the enlarged deficit?

Table 4-3 reports regression results on five funding variables: (1) endowment earnings per student, (2) private gifts, grants and contracts per student, (3) state appropriations per student, (4) government grants and contracts per student, and (5) total revenue per student. We don't examine federal and local appropriations, because the majority of them are zero or missing.

All the significant funding responses to the USNWR coverage are concentrated in public colleges. Within public colleges, state appropriations are much more sensitive to the 1990 USNWR expansion than endowment earnings and private gifts. Relatively to the comparison group, state appropriations per student have increased 4.5% in the public added-ins, while the impact on endowment earnings and private gifts are both negative and insignificant. Government grants and contracts also increase 4.1% in the public added-ins. Because the absolute amount of government grants and contracts are much smaller than that of state appropriations, we believe the biggest funding increases come from state governments. In a robustness check, we include region-year fixed effects in an attempt to control for region specific business cycles. Results are very similar.

Table 4-3 also reports treatment effects on a number of expenditure variables, namely instructional expenditure per student, research expenditure per stud, public service expenditure per stud, and scholarships per student. Since USNWR rankings include instructional expenditure but not the other three, we would expect a significant increase in the instructional expenditure, and zero or negative changes in other expenditures. This prediction is supported for instructional and research expenditures, but violated for public services and scholarships. These violations are quite intuitive: a school may increase scholarships to attract better students thus increasing its USNWR rankings; a school may also increase public services spending to boost its perceived quality among the public.

In short, the financial results support the view that USNWR rankings mainly affect the governance of public colleges. More specifically, it is likely that the 1990 USNWR rankings highlight resource shortage in the public added-ins. The high publicity motivates state governments to care about college performance, and an obvious way to improve performance is increasing state funding and spending them in non-student input measures. In an unreported table, we add the log of state appropriation per student to the right hand side of the main specification. Focusing on public colleges, results are as expected: variables pertaining to expenditures, such as faculty salary, faculty-student ratio (for Ph.D. faculty only), and the general expenditure, are positively correlated with state appropriation. In contrast, tuitions, both- in and out-of-state, are negatively correlated with state appropriation. Results on admission variables are more mixed: more state appropriations are related to better SAT25 and a lower percentage of FTFYs in total enrollment, but unrelated to freshmen retention rate or graduation rate. One explanation is that state funding motivates public colleges to spend more efforts in easy-to-improve dimensions.

The principal-agent theory also predicts changes in the intensity of monitoring and the ties between funding and performance. Do state governments respond to the USNWR coverage along these lines? From the annual Survey of State Higher Education Finance Officers (SHEFO 1997-2003 as reported in Burke & Minnassians 2001-2003), we code the year in which each state adopts performance funding, performance budgeting, and performance reporting. We then implement a duration model to examine whether the percentage of public students covered in the USNWR rankings has any power explaining the adoption time of each program. The model assumes COX proportional hazards. The percentage of public students is defined as the ratio between the total enrollment of all the USNWR ranked public colleges and the total number of students enrolled in all the public colleges at state  $s$  in year  $t$  (four-years only). The time horizon spans from 1980 to 1998, with USNWR coverage starts at 1983.

Table 6 reports the results on each of the three programs. The impact of USNWR covered enrollment only shows up significantly (at a 90% confidence level) for the adoption of performance reporting, and the impact is negative. One interpretation is that USNWR rankings and performance reporting are substitutes. In the states where the USNWR covers a small fraction of public enrollment, the USNWR rankings may highlight the information issues and motivate state governments to seek more information through performance reporting.

The lack of results on performance budgeting and performance funding is hardly a surprise: although many states intend to draw a closer link between funding and accountability, the implementation of performance funding is notoriously difficult. For the few states that employ performance funding, the amount of funds linked to campus performance is no more than 3

Results on changes in state governance of higher education (to be written).

#### **5.4 Placebo tests**

See results in Table 5, text to be written.

To summarize, regression results indicate that the incentive impact of USNWR rankings is concentrated in public colleges. Only the public added-ins show some improvement in inputs and outputs, and most of these improvements are funded by state appropriations. A remaining question is why the admission market does not respond vividly to these improvements. These findings, especially the lack of improvement in the private added-ins, lead us to believe that the 1990 expansion of USNWR rankings affect college incentives more through the state-college relationship than through the matching of colleges and students in the admission market.

## **6 Conclusion**

It is widely believed that the U.S. has the best higher education system in the world. However, some statistics are alarming: despite the rapid rise of tuition and the heavy subsidy from government and private contributors, only 54% of freshmen graduate with a Bachelor's degree within 6 years (NCES 2005). This gives rise to a long-standing question: how to motivate colleges to achieve and maintain quality?

College rankings have the potential to steer colleges towards quality improvement, but does it work? To what extent and through what mechanism does it work? In this paper we attempt to answer these questions by exploiting a large expansion in the scope of USNWR rankings in 1990. We find that the expansion only results in input and output improvements in public colleges, and most of these improvements are funded by state appropriation. Moreover, the expansion is probably a negative shock to the admission market, leading to worse freshmen SAT25 in the private added-ins and no improvements of SAT75 in the public added-ins. These findings suggest that, if college rankings have ever generated any incentives to improve, they probably pull more strings in the state offices than in the admission market.

While every state government associates performance with public funding of primary and secondary education, there is an increasing outcry for performance and accountability in higher education.<sup>32</sup> Does an increase of state funding result in better performance on college campus? To our best knowledge, the only available evidence is based on the SHEFO survey, which asks state higher education financial officers to evaluate the impact of performance funding/budgeting/reporting on campus performance. The 2003 survey reveals that only 11 out of the 46 states that adopted performance reporting used the report to a great or considerable extent, and none of the three programs show desired impact on improving the performance of higher education (Burke & Minassians 2003, 2002). Although our data suggests some output improvements along with the increased resources, it requires a more careful examination before drawing any causal link between the two.

## 7 References

- Arcidiacono, Peter (2005): "Affirmative Action in Higher Education: How do Admission and Financial Aid Rules Affect Future Earnings?" *Econometrica*, 73(5): 1477-1524.
- Arenson, Karen W. (2006): "Panel Explores Standard Tests for Collegees" *New York Times* Feb. 9, 2006.
- Angrist, Joshua D. and Alan B. Krueger (1999): "Empirical Strategies in Labor Economics." *Handbook of Labor Economics*, vol. 3A, edited by Orley Ashenfelter and David Card, Amsterdam Elsevier.
- Baker, George (1992): "Incentive Contracts and Performance Measurement." *Journal of Political Economy*, June 1992.

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<sup>32</sup>Recently, a national panel has been nominated to consider whether standard tests should be adopted to evaluate learning in colleges and to facilitate quality comparison across colleges (Arenson 2006)

- Bertrand, Marianne; Esther Duflo and Sendhil Mullainathan "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 2004, 119(1), pp. 249-75.
- Bogue, E. Grady and Kimberly Bingham Hall (2003) *Quality and Accountability in Higher Education: Improving Policy, Enhancing Performance* Praeger Publishers, Westport Connecticut.
- Burke, Joseph C. and Henrik Minassians (2003) "Performance Reporting: 'Real' Accountability or Accountability 'Lite' Seventh Annual Survey 2003", The Nelson A. Rockefeller Institute of Government, State University of New York.
- Burke, Joseph C. and Henrik Minassians (2002) "Performance Reporting: The Preferred 'No Cost' Accountability Program the Sixth Annual Report", The Nelson A. Rockefeller Institute of Government, State University of New York.
- Burke, Joseph C. and Henrik Minassians (2001) "Linking State Resources to Campus Results: From Fad to Trend The Fifth Annual Survey", The Nelson A. Rockefeller Institute of Government, State University of New York.
- The Carnegie Classification of Institutions of Higher Education* (CCEIHE 2001), published by the Carnegie Foundation for the Advancement of Teaching.
- Chan, Yuk-Shee and Hayne Leland (1982): "Prices and Qualities in Markets with Costly Information" *The Review of Economic Studies* Vol. 49, No. 4, 499-516.
- Clarke, Margaret (2000): "Quantifying quality: technical issues surrounding US News and Work Report's Ranks of US Colleges and Graduate Programs" Dissertation.
- Cook, Phillip J. and Robert H. Frank (1993) "The Growing Concentration of Top Students at Elite Schools" Chapter 4 in *Studies of Supply and Demand in Higher Education*, edited by Charles T. Clotfelter and Michael Rothschild, The University of Chicago Press.
- Dichev, Ilia (2001): "News or Noise? Estimating the noise in the U.S. News university rankings" *Research in Higher Education* 42: 237-266.
- Dranove, David and Mark A. Satterthwaite (1992): "Monopolistic competition when price and quality are imperfectly observable" *RAND Journal of Economics* Vol. 23, No. 4.
- Duderstadt, James J. and Farris W. Womack (2003) *The Future of the Public University in America* The Johns Hopkins University Press.
- Duffy, Elizabeth A. and Idana Goldberg (1998) *Crafting a Class: College Admissions and Financial Aid 1955-1994*, Princeton University Press.
- Easley, David and Maureen O'Hara (1983) "The economic role of the nonprofit firm" *The Bell Journal of Economics* 14(Autumn), p. 531-539.
- Education Commission of the States (1994) *State Postsecondary Education structures Sourcebook* Denver. CO: Education Commission of the States.

- Education Commission of the States (1997) *State Postsecondary Education structures Sourcebook* Denver, CO: Education Commission of the States.
- Education Commission of the States (2002) *Postsecondary Governance Structures Database* accessed at <http://www.ecs.org/clearinghouse/31/02/3102.htm>.
- Ehrenberg, Ronald (2000): *Tuition Rising: Why College Costs So Much?* Cambridge MA: Harvard University Press 2000.
- Ehrenberg, Ronald (2003a): "Ranking Shape the Competitive Environment in U.S. Higher Education" *The Review of Higher Education*, 26(2) Winter 2003.
- Ehrenberg, Ronald (2003b): "Method or Madness? Inside the USNWR College Rankings" Working paper presented at the Advancement of Postsecondary Education Forum on The Use and Abuse of College Rankings, November 20-21, 2003.
- Epple, Dennis; Richard Romano and Holger Sieg (2002) "Admission, Tuition, and Financial Aid Policies in the Market for Higher Education" *Carnegie Mellon University Working Paper*.
- Fellow, James (2001): "The Early-Decision Racket" *The Atlantic Monthly*, September 2001.
- Gater, Denise S. (2002): "A Review of Measures Used in US News and World Report's America's Best Colleges" *working paper*, accessed at <http://thecenter.ufl.edu/Gater0702.pdf>.
- Goldin, Claudia and Lawrence Katz (1998): "The Origins of State-Level Differences in the Public Provision of Higher Education 1890-1940" *American Economic Review*, May, Vol. 88, No. 2, Papers and Proceedings of the Hundred and Tenth Annual Meeting of the American Economic Association, pp. 303-308.
- Griffith, Amanda and Kevin Rask (2005) "The Influence of the U.S. News and World Report Collegiate Rankings on the Matriculation Decision of High-Ability Students: 1995-2004" *Cornell Higher Education Research Institute (CHERI) working paper #76, forthcoming Economics of Education Review*.
- Hansmann, Henry (1980): "The Role of Nonprofit Enterprise" *Yale Law Journal* 89(5) p. 835-901.
- Hoxby, Caroline M. (2003) "School Choice and School Competition: Evidence from the United States" *Swedish Economic Policy Review* 10.
- Hoxby, Caroline M. (2004) "The Effects of Geographic Integration and Increasing Competition in the Market for College Education" it Harvard University Working Paper.
- Hunter (1995): "College Guidebooks: Background and Development" *New Directions in Institutional Research: No. 88. Evaluation and Responding to College Guidebooks and Rankings*, edited by R.D. Walleri and M.K. Moss, Jossey-Bass, San Francisco.
- James, Estelle and Susan Rose-Ackerman (1986): *The nonprofit enterprise in market economies*. Harwood Academic Press.

- Levin, Daniel J. (2002): "The Uses and Abuses of the U.S. News Rankings" *AGB Priorities*, Fall 2002.
- Lewis, Darrell R. and James Hearn (2003) *The Public Research University: Serving the Public Good in New Times* University Press of America.
- Lowry, Robert (2001) "Government Structure, Trustee Selection and Public University Prices and Spending: Multiple Means to Similar Ends." Working paper presented at the Cornell Higher Education Research Institute (CHERI) conference on "Financing Higher Education Institutions in the 21st Century," Ithaca, NY, May 22-23, 2001.
- McDonough, Patricia M., Anthony Lising Antonio, MaryBeth Walpole and Leonor Perez (1998): "College Rankings: Democratized Knowledge for Whom?" *Research in Higher Education* 39: 513-538.
- Meyer, Bruce D. (1995): "Natural and Quasi-Experiments in Economics" *Journal of Business & Economic Statistics* 13(2): *JBES Symposium on Program and Policy Evaluations* (Apr. 1995) 151-161.
- Meyer, Margaret A. and John Vickers (1997): "Performance Comparisons and Dynamic Incentives" *Journal of Political Economy* 105(3): pp. 547-581.
- Milgrom, Paul and John Roberts (1992) *Economics, Organizations & Management*, Prentice Hall, Englewood Cliffs, New Jersey.
- Morse, Robert (2004) "Impact Perceived by the US News" Presentation at the First Meeting of the Working Group of the Project on Higher Education Ranking Systems and Methodologies, 10 Dec 2004.
- Monks, James and Ronald Ehrenberg (1999): "The Impact of US News and World Report College Rankings on Admissions Outcomes and Pricing Policies at Selective Private Institutions" *NBER working paper #7227*.
- National Center of Education Statistics (2005): Almanac Issue, *Chronicle of Higher Education* Aug. 26, 2005, Vol. 52, Issue 1.
- National Opinion Research Center (NORC 1997): "A Review of the methodology for the US News and World Report's Rankings of Undergraduate Colleges and Universities" October 31, 1997.
- Oswald, Andrew (2001): "An Economist's view of university league tables" May 2001, accessed at <http://www2.warwick.ac.uk/fac/soc/economics/staff/faculty/oswald/>.
- Pike, Gary (2004): "Measuring Quality: A Comparison of US News Rankings and NSSE Benchmarks" *Research in Higher Education* 45(2), March 2004.
- Pope, Devin (2005): "College Rankings and Student Recruitment: Evidence from a New Instrument" Working paper, University of California Berkeley.
- Rose-Ackerman, Susan (1996): "Altruism, Nonprofits, and Economic Theory" *Journal of Economic Literature* Vol. XXXIV, pp. 701-728.
- Sanoff, Alvin (1998): "Rankings are here to stay, colleges can improve them"

The Chronicle of Higher Education, 4 Sept. 1998.

Stecklow, S. (1995): "Colleges Inflate SATs and graduation rates in popular guidebooks" *Wall Street Journal* pp. A1, A3, A8, 5 April 1995.

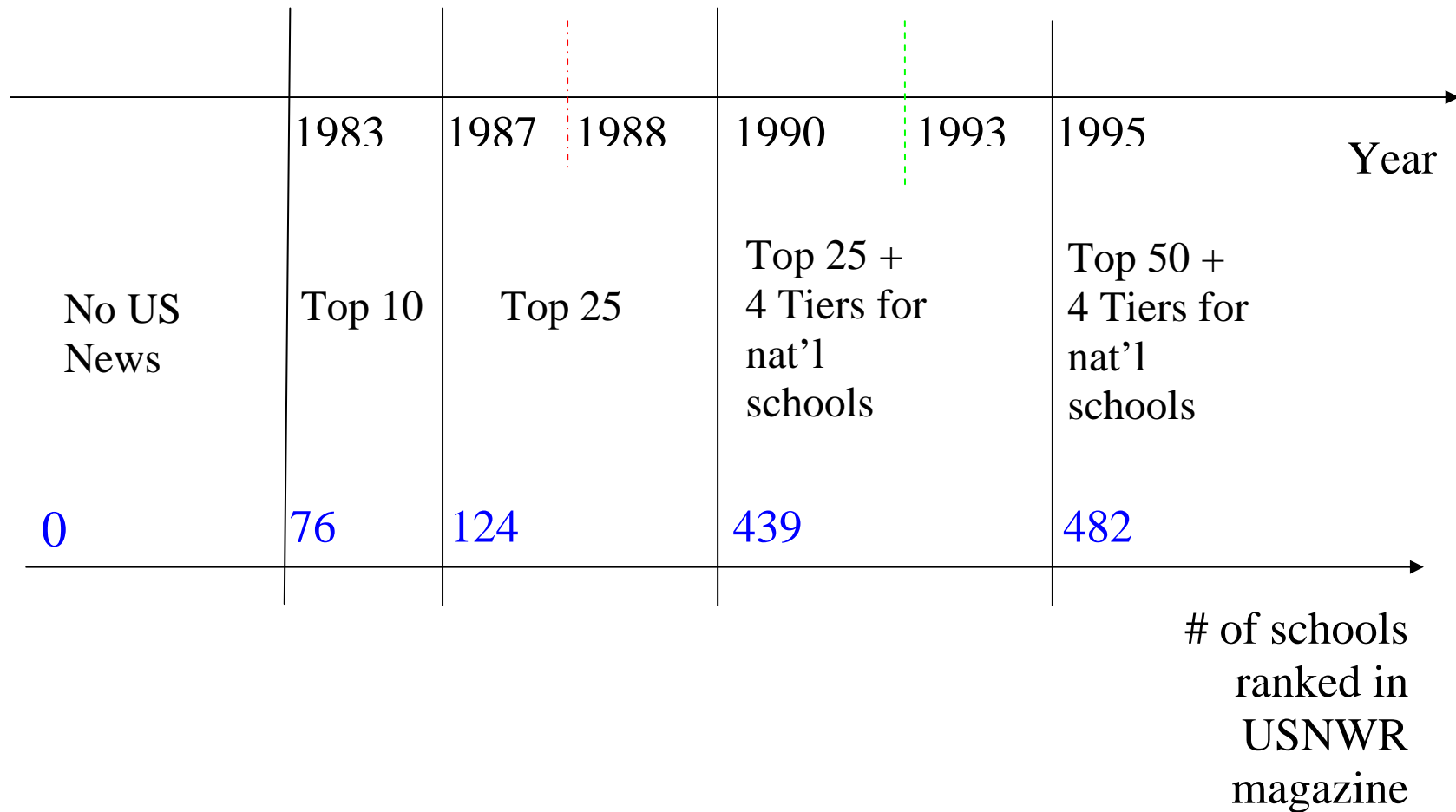
Smith, Chris (2001): "News You Can Abuse" *University of Chicago Magazine* October 2001.

Tirole, Jean (1988): *The Theory of Industrial Organization* The MIT Press.

Thomson, Nicholas (2000): "Playing with numbers: How US News mis-measures higher education and what we can do about it" *Washington Monthly*, 2000.

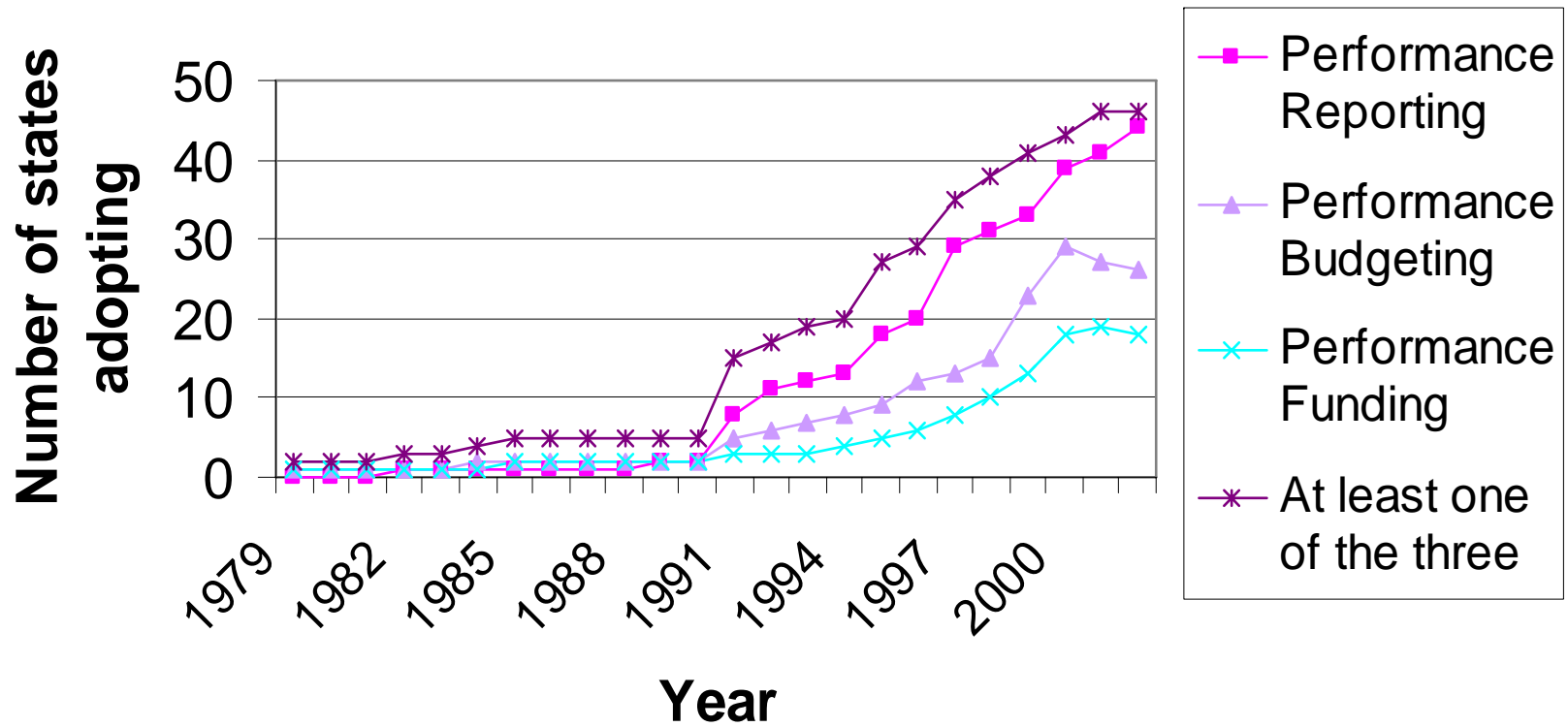
USNWR (2000): "Response to NORC recommendations," *Washington Monthly*, 23 August 2000.

# Figure 1: History of USNWR Rankings



Notes:   
⋮ indicates USNWR started incorporating statistical measures.   
⋮ indicates USNWR started listing 4-tier regional schools in the USNWR guidebook.

**Figure 2: Adoption Time of Performance Reporting, Performance Budgeting, Performance Funding**



Source: "Performance Reporting: The Preferred 'No Cost' Accountability Program the Sixth Annual Report" by Joseph C. Burke and Henrik Minassians, The Nelson A. Rockefeller Institute of Government, State University of New York, 2002. Appendix A Characteristics of Performance Budgeting, Characteristics of Performance Funding, Characteristics of Performance Reporting.

**Table 1: USNWR Ranking Methodology as of 1998**

Academic Reputation	25%			
			acceptance rate <input checked="" type="checkbox"/>	15%
Student Selectivity <input checked="" type="checkbox"/>	15%		yield <input checked="" type="checkbox"/>	10%
			high school class standing	35%
			SAT/ACT scores <input checked="" type="checkbox"/>	40%
Faculty Resources <input checked="" type="checkbox"/>	20%		faculty salary <input checked="" type="checkbox"/>	35%
			faculty with Ph.D. <input checked="" type="checkbox"/>	15%
			full-time faculty	5%
			student-faculty ratio <input checked="" type="checkbox"/>	5%
			class size (0-19)	30%
			class size (50+)	10%
Student retention <input checked="" type="checkbox"/>	20%		graduation rate <input checked="" type="checkbox"/>	80%
			retention rate <input checked="" type="checkbox"/>	20%
Expenditure per student <input checked="" type="checkbox"/>	10%			
Alumni Giving	5%			
Graduation-rate performance	5%			

Note: The USNWR implements some minor differences in the ranking of national colleges and the ranking of regional schools. This table reflects the national algorithm. Graduation-rate performance refers to the difference between actual graduation rate and the graduation rate predicted by student SAT scores. Red ticker indicates that the variable is also included in the IPEDS or CBASC data.

**Table 2: Number and Characteristics of Schools By Group**

	<b>Number of Schools</b>	<b>Fraction Public</b>	<b>Out-of State Tuition (1996 US\$)</b>	<b>Number of Freshman Students</b>	<b>SAT 25<sup>th</sup> Percentile Score</b>	<b>SAT 75<sup>th</sup> Percentile Score</b>
<b><u>Added-Ins:</u></b> Colleges Added to USNWR Rankings in 1990	228	0.50 (0.01)	7753 (240)	2048 (115)	897 (11)	1149 (6.8)
<b><u>All Controls</u></b> (Regional previous-ins + never-ins)	882	0.38 (0.02)	5958 (101)	623 (22)	782 (6)	1042 (5)
<b><u>Regional Previous-Ins:</u></b> Regional Colleges that appear in USNWR Rankings at least once before 1990	187	0.17 (0.02)	8442 (246)	659 (51)	897 (10.6)	1122 (8.7)
<b><u>Never-Ins:</u></b> Regional Colleges Never Included in USNWR Rankings before 1995	695	0.43 (0.02)	5262 (90)	614 (24)	752 (6.1)	1021 (5.7)

Note: The entries in the second column are observation counts, based on USNWR magazine issues in 1983-1994. The entries in the third through seventh columns are means with the standard error of the mean in parentheses. They are based on CBASC and IPEDS data as of 1986, conditional on non-missing reporting. A never-in school is chosen in the analysis sample if its total number of students was over 1500 in 1986 and its SAT scores were not in the bottom 35 percentile for at least one year between 86 and 90.

**Table 3: Sample Statistics Before and After 1990, By Group and Public Status**

	<i>Public</i>				<i>Private</i>			
	<i>Added-ins</i>		<i>Controls</i>		<i>Added-ins</i>		<i>Controls</i>	
	<i>Before</i>	<i>After</i>	<i>Before</i>	<i>After</i>	<i>Before</i>	<i>After</i>	<i>Before</i>	<i>After</i>
<i>Panel A: Input and Output Variables</i>								
# of Faculty per 100 students	6.79 (0.13)	6.85 (0.13)	4.84 (0.04)	4.73 (0.07)	8.43 (0.24)	8.83 (0.24)	6.26 (0.10)	6.19 (0.11)
% of Faculty with PhD	75.01 (0.65)	81.33 (0.64)	63.04 (0.40)	67.20 (0.40)	78.50 (0.65)	83.71 (0.60)	57.60 (0.36)	64.51 (0.36)
Average Faculty Salary	50403 (450)	51209 (334)	44686 (320)	45132 (239)	47246 (622)	49728 (498)	36106 (266)	38367 (203)
General Expenditure per student	12835 (277)	16987 (332)	6584 (89)	8196 (83.2)	17058 (527)	23912 (604)	9836 (206)	14265 (530)
SAT 25 <sup>th</sup> Percentile of Incoming freshmen	864 (4.97)	927 (3.87)	756 (4.02)	834 (3.57)	963 (5.01)	1004 (4.57)	834 (2.85)	891 (2.45)
SAT 75 <sup>th</sup> Percentile of Incoming freshmen	1126 (3.25)	1152 (3.14)	1018 (3.39)	1061 (2.99)	1185 (4.26)	1220 (4.01)	1079 (2.68)	1117 (2.34)
SAT Inter-Quartile Ratio	1.32 (0.06)	1.25 (0.00)	1.37 (0.01)	1.29 (0.00)	1.24 (0.00)	1.22 (0.00)	1.31 (0.00)	1.26 (0.00)
% Freshmen Retention at the end of 1 <sup>st</sup> year	75.20 (0.44)	77.11 (0.38)	68.49 (0.30)	69.37 (0.27)	84.95 (0.33)	84.15 (0.34)	75.01 (0.22)	75.00 (0.21)
% Graduating within 6 years	46.98 (0.83)	47.26 (0.64)	43.27 (0.61)	39.61 (0.45)	67.62 (0.55)	68.50 (0.52)	54.92 (0.40)	55.28 (0.34)
<i>Panel B: Admission Variables</i>								
In-State Tuition	2240 (35)	2885 (46)	1806 (17)	2368 (21)	11819 (138)	14547 (158)	7996 (54)	9796 (63)
Out-Of-State Tuition	5989 (74.0)	7897 (99.6)	4516 (37)	6005 (48)	11819 (138)	14558 (157)	8016 (55)	9799 (63)
% of Freshmen Receiving Financial Aid	55.18 (0.66)	56.27 (0.70)	59.14 (0.55)	61.16 (0.50)	67.79 (0.64)	75.58 (0.61)	77.38 (0.30)	81.53 (0.27)
Number of first-time first-year students	2438 (53)	2249 (49)	933 (16)	901 (14)	695 (34.8)	655 (32.2)	324 (5)	324 (5)

**Table 3 Continued**

	<i>Public</i>				<i>Private</i>			
	<i>Added-ins</i>		<i>Controls</i>		<i>Added-ins</i>		<i>Controls</i>	
	<i>Before</i>	<i>After</i>	<i>Before</i>	<i>After</i>	<i>Before</i>	<i>After</i>	<i>Before</i>	<i>After</i>
Total undergraduate Enrollment	15679 (314)	15807 (288)	6112 (113)	6527 (112)	3666 (213)	3489 (196)	1717 (29)	1848 (29)
Acceptance Rate	0.73 (0.01)	0.75 (0.01)	0.75 (0.01)	0.74 (0.01)	0.71 (0.01)	0.75 (0.01)	0.78 (0.00)	0.78 (0.00)
Yield Rate	0.52 (0.01)	0.48 (0.01)	0.57 (0.01)	0.51 (0.01)	0.41 (0.01)	0.36 (0.01)	0.50 (0.00)	0.44 (0.00)
Number of Total Applications	8290 (31)	7803 (217)	3105 (76)	3213 (66)	2903 (171)	2851 (153)	1175 (27)	1266 (26)
% of Transfer Students	9.22 (0.22)	9.38 (0.17)	9.99 (0.22)	10.52 (0.20)	5.11 (0.19)	4.98 (0.18)	8.08 (0.13)	8.64 (0.14)
Having any early admission program	0.07 (0.01)	0.18 (0.02)	0.08 (0.01)	0.14 (0.01)	0.51 (0.02)	0.62 (0.02)	0.25 (0.01)	0.28 (0.01)
<i>Panel C: Funding Variables</i>								
Endowment	119 (9)	157 (11)	37 (4)	39 (3)	1460 (86)	1862 (92)	601 (28)	786 (57)
Private Gift, Grants and Contracts	700 (30)	1049 (39)	115 (15)	201 (10)	1881 (84)	2364 (87)	1460 (98)	1831 (170)
All Government Appropriation	6513 (153)	7411 (143)	3936 (62)	4207 (52)	311 (87)	299 (87)	131 (23)	111 (26)
State Appropriation	6409 (146)	7271 (137)	3953 (61)	4192 (51)	476 (50)	394 (37)	346 (18)	264 (14)
Gov't contracts and grants	2263 (90)	3317 (113)	905 (21)	1263 (24)	2089 (185)	2762 (201)	1086 (33)	1659 (164)
Tuition and fee revenue	2441 (54)	3824 (76)	1447 (17)	2245 (23)	10014 (225)	14479 (268)	5942 (123)	9002 (206)
Total revenue	16440 (443)	22032 (565)	7756 (100)	9554 (96)	21863 (797)	30236 (987)	11487 (223)	16235 (549)

Source: CBASC and IPEDS data from 1986 to 1995, conditional on non-missing report of each variable. "Never-ins" are restricted to the analysis sample. The entries in the second through sixth columns are means with the standard error of the mean in parentheses. "Before" refers to enrollment years 1986-1990. "After" refers to enrollment years 1991-1995. Tuition, salary, expenditure, and funding variable are deflated as 1996 US\$.

**Table 4-1: the Impact of 1990 USNWR Coverage on Input and Output Variables**

	<i>Public Coeff. (std err)</i>		<i>Private Coeff. (std err)</i>		<i>OBS (R2)</i>	<i>Years covered (# of yrs reporting)</i>
# of Faculty per 100 students	0.081 (0.150)		0.106 (0.236)		9950 (0.759)	86-95 (all)
% of Faculty with PhD	3.382 (1.241)	***	0.311 (1.092)		7970 (0.825)	86-95 (all)
Log (General Expenditure per student)	0.029 (0.010)	***	-0.004 (0.017)		9378 (0.933)	87-95 (all)
SAT 25 <sup>th</sup> Percentile of Incoming freshmen	5.059 (7.234)		-19.224 (5.237)	***	6051 (0.888)	86-95 (>=3 bef >=3 aft)
SAT 75 <sup>th</sup> Percentile of Incoming freshmen	1.211 (4.935)		-6.027 (4.819)		6051 (0.885)	86-95 (>=3 bef >=3 aft)
SAT Inter-Quartile Ratio	-0.004 (0.010)		0.018 (0.007)	***	6051 (0.685)	86-95 (>=3 bef >=3 aft)
% Freshmen Retention at the end of 1 <sup>st</sup> year	0.194 (0.548)		-0.635 (0.534)		8750 (0.833)	86-95 (all)
% Graduating within 6 years	0.453 (1.154)		-0.643 (0.746)		5056 (0.863)	86-95 (>=3 bef >=3 aft)

**Table 4-2: the Impact of 1990 USNWR Coverage on Admission Variables**

	<i>Public Coeff. (std err)</i>	<i>Private Coeff. (std err)</i>	<i>OBS (R2)</i>	<i>Years covered (# of yrs reporting)</i>
Log(In-State Tuition)	0.002 (0.017)	-0.006 (0.006)	8810 (0.980)	86-95 (all)
Log(Out-Of-State Tuition)	0.009 (0.013)	0.001 (0.008)	7820 (0.926)	86-95 (all)
% of Freshmen Receiving Financial Aid	-1.892 (1.258)	1.349 (0.972)	8370 (0.853)	86-95 (all)
Log(Number of first-time first-year students)	-0.014 (0.022)	0.033 (0.021)	10340 (0.957)	86-95 (all)
Log(total undergraduate enrollment)	-0.018 (0.007)	*** -0.012 (0.012)	10500 (0.988)	86-95 (all)
% of first-time-first-year in total undergrad enrollment	0.045 (0.213)	0.996 (0.395)	** 10130 (0.846)	86-95 (all)
% of Transfer Students	-0.500 (0.484)	-0.058 (0.310)	8771 (0.722)	86-95 (>=3 bef >=3 aft)
Log (Number of Total Applications)	-0.053 (0.029)	* 0.024 (0.024)	6677 (0.972)	86-95 (>=3 bef >=3 aft)
Acceptance Rate	0.003 (0.014)	0.022 (0.010)	** 6643 (0.726)	86-95 (>=3 bef >=3 aft)
Yield Rate	0.021 (0.015)	0.001 (0.009)	6607 (0.762)	86-95 (>=3 bef >=3 aft)
Having any early admission program	0.024 (0.024)	0.010 (0.023)	10650 (0.784)	86-95 (all)

**Table 4-3: the Impact of 1990 USNWR Coverage on Financial Variables**

	<i>Public Coeff. (std err)</i>		<i>Private Coeff. (std err)</i>		<i>OBS (R2)</i>	<i>Years covered (# of yrs reporting)</i>
Log (Endowment per stud)	-0.052 (0.110)		-0.018 (0.044)		7200 (0.932)	87-95 (>=3 bef >=3 aft)
Log (Private Gift, Grants and Contracts per stud)	-0.015 (0.064)		0.053 (0.041)		9288 (0.915)	87-95 (>=3 bef >=3 aft)
Log (State Appropriation per stud)	0.045 (0.015)	***	-0.014 (0.085)		4690 (0.969)	87-95 (>=3 bef >=3 aft)
Log(Gov't contracts and grants per stud)	0.041 (0.016)	***	-0.076 (0.037)	**	9493 (0.871)	87-95 (>=3 bef >=3 aft)
Log(Tuition and fee revenue per stud)	0.018 (0.018)		-0.003 (0.016)		9633 (0.966)	87-95 (>=3 bef >=3 aft)
Log(Total revenue per stud)	0.034 (0.009)	***	0.003 (0.016)		9633 (0.936)	87-95 (>=3 bef >=3 aft)
Log(Instructional Expenditure per stud)	0.029 (0.010)	***	-0.005 (0.020)		9631 (0.914)	87-95 (>=3 bef >=3 aft)
Log(Research Expenditure per stud)	0.087 (0.056)		0.003 (0.116)		4890 (0.924)	87-95 (>=3 bef >=3 aft)
Log(Public Service Expenditure per stud)	0.083 (0.043)	*	0.061 (0.132)		5262 (0.877)	87-95 (>=3 bef >=3 aft)
Log(Scholarship per stud)	0.050 (0.018)	***	0.000 (0.022)		9612 (0.919)	87-95 (>=3 bef >=3 aft)

Source: CBASC and IPEDS data from 1986 to 1995. Each row represents one OLS regression with the dependant variable listed in the first column. Reported coefficients are for ">1990\*added-ins" by public status. Regressors also include year fixed effects, year\*public fixed effects, college fixed effects, and linear trends by public and treatment/control group. Standard errors are estimated with an arbitrary covariance matrix. \* p<10%, \*\* p<5% and \*\*\* p<1%.

**Table 5: Placebo Tests – Assume treatment in 87, 88, 89 (Data: 1986-1990)**

	<i>87 Placebo</i>		<i>88 Placebo</i>		<i>89 Placebo</i>	
	<i>Public Coeff. (std err)</i>	<i>Private Coeff. (std err)</i>	<i>Public Coeff. (std err)</i>	<i>Private Coeff. (std err)</i>	<i>Public Coeff. (std err)</i>	<i>Private Coeff. (std err)</i>
% of Faculty with PhD	0.811 (1.497)	-0.887 (1.065)	0.249 (1.131)	0.057 (1.061)	-0.927 (1.410)	1.476 (1.093)
Log (General Expenditure per student)	0.001 (0.010)	0.010 (0.016)	0.003 (0.008)	-0.021 (0.020)	-0.003 (0.010)	0.004 (0.021)
SAT 25 <sup>th</sup> Percentile of Incoming freshmen	7.919 (-7.372)	17.222 (7.263)	-11.423 (6.765)	-2.881 (5.274)	-6.238 (8.076)	-19.216 (5.506)
SAT 75 <sup>th</sup> Percentile of Incoming freshmen	-3.285 (6.204)	11.44 (7.586)	6.281 (5.143)	-7.837 (6.047)	-2.16 (5.70)	-12.465 (4.914)
Log(First-time First Years)	0.040 (0.022)	-0.006 (0.025)	-0.007 (0.021)	0.008 (0.025)	-0.018 (0.023)	-0.023 (0.024)
Log(total undergraduate enrollment)	0.009 (0.008)	0.005 (0.009)	-0.005 (0.006)	-0.002 (0.013)	-0.006 (0.007)	-0.008 (0.013)
Acceptance Rate	0.015 (0.017)	-0.012 (0.011)	-0.004 (0.014)	0.025 (0.013)	0.004 (0.018)	0.026 (0.010)
Log (Number of Total Applications)	0.052 (0.027)	0.031 (0.020)	-0.033 (0.031)	-0.005 (0.022)	-0.049 (0.036)	-0.046 (0.023)
Log (State Appropriation per stud)	-0.015 (0.012)	-0.025 (0.115)	-0.003 (0.010)	0.019 (0.119)	0.017 (0.012)	0.012 (0.132)
Log(Gov't contracts and grants per stud)	0.044 (0.026)	0.049 (0.049)	-0.093 (0.021)	-0.016 (0.043)	0.018 (0.022)	-0.038 (0.041)
Log(Total revenue per stud)	0.000 (0.010)	0.012 (0.017)	-0.014 (0.011)	-0.022 (0.020)	0.009 (0.010)	0.003 (0.022)
Log(Instructional Expenditure per stud)	-0.009 (0.013)	0.003 (0.017)	0.008 (0.010)	-0.013 (0.021)	0.004 (0.013)	0.005 (0.023)
Log(Public Service Expenditure per stud)	-0.086 (.057)	0.060 (0.118)	-0.002 (0.055)	-0.010 (0.128)	0.087 (0.054)	-0.054 (0.117)
Log(Scholarship per stud)	-0.042 (0.018)	-0.019 (0.025)	0.005 (0.019)	-0.003 (0.027)	0.038 (0.015)	0.021 (0.028)

Source: CBASC and IPEDS data from 1986 to 1995. Each row represents one OLS regression with the dependant variable listed in the first column. Sample selection rules and regressors are exactly the same as in Table 4, except that data covers 1986-1990 only. Reported coefficients are for "> presumed treatment year\*added-ins". Standard errors are estimated with an arbitrary covariance matrix. \* p<10%, \*\* p<5% and \*\*\* p<1%.

**Table 6: The Impact of USNWR ranking expansion on state performance programs**

	<b>Performance funding</b>	<b>Performance budgeting</b>	<b>Performance reporting</b>
Percentage of public students covered by the USNWR rankings	0.360 (-0.71)	1.283 (0.18)	0.216* (-1.74)
Observations	725	748	688
Years of data	1980-1998	1980-1998	1980-1998
Log Likelihood	-27.28	-42.63	-80.59
Test of proportional hazard (chi2)	0.01	1.96	0.01

Source of data: (1) IPEDS 1980, 1984-1998, including all four-year colleges, (2) the magazine issues of USNWR rankings 1983, 1985, 1987-1998, and (3) the seventh annual survey of State Higher Education Finance Officers (SHEFO) as reported in Burke & Minnassians (2003), Appendix B. All regressions employ the Cox proportional hazards model with robust standard errors. The dependent variable is the year in which a performance program is adopted in a specific state. The independent variable is the ratio between the total enrollment of all the USNWR ranked public colleges and the total number of students enrolled in all the public colleges at state *s* in year *t* (four-years only). Reported numbers are hazard ratio, with *z* statistics in parentheses. \* indicates *z* statistics significant at 10%, \*\* indicates significant at 5% and \*\*\* indicates significant at 1%.