The Power of Information: Do Rankings Affect the Public Finance of Higher Education?*

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December 21, 2007

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Abstract

The recent growth in the extent and influence of college quality rankings has been extraordinary. While there are now over 100 college guidebooks the market is still dominated by U.S. News and World Report (USNWR), the first annual college ranking. In this paper we study whether public colleges respond to one incentive provided by the USNWR rankings: increasing expenditure per student. To identify the effect of college quality rankings on college expenditure behavior we take advantage of a large, plausibly exogenous shift in the *scope* of the USNWR rankings in 1990. Specifically, in 1990 USNWR extended the number of colleges included in the rankings from only the top 25 to all national universities and colleges. Using college level data from 1987 to 1995 we first find that being included in the USNWR rankings causes colleges to increase educational and general expenditure per student by 3.2%. The increase in expenditure is funded by a 6.8% increase in state appropriation revenue per student, but tuition revenue does not respond. Second, the positive state appropriation response is not primarily driven by the updating of college quality priors from a pre-USNWR college guide. Instead our results are more consistent with the explanation that USNWR rankings generate increased attention to the issue of college quality.

JEL: D7, H7, I2

1 Introduction

The recent growth in the extent and influence of college quality rankings has been extraordinary. Before U.S. News and World Report (USNWR) published its first rankings issue in 1983 there were no explicit numerical rankings of colleges at all. There are now over 100 college guidebooks. However, the market is still dominated by USNWR's annual college ranking issue. 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)). With the annual sales 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.[1] Figure 1 shows clearly the large effect of the college ranking issue on USNWR newsstand sales. Pre-USNWR guidebooks such as Barron's Guide to Colleges provided only descriptive information concerning only some attributes of college quality, and without explicit numerical rankings did not generate nearly the amount of attention amongst students, college administrators, the public and legislators that college rankings do today.[2]

The recent growth in the influence of college rankings has led many to question the incentives they provide for colleges. In this paper we study whether public colleges respond to one specific incentive: increasing expenditure per student.[3] The existence of U.S. News and World Report college rankings provides two motivations for colleges to increase expenditure per student. First, colleges have direct incentives to increase college expenditure because the USNWR ranking places a 20% weight on the total expenditure per full-time equivalent student (FTE). Second, colleges have indirect incentives to increase expenditure, since a college can further improve its rankings by allocating the additional expenditure to other items covered by USNWR rankings (such as faculty salaries or faculty-student ratios). The goal of this paper is to identify whether the existence of USNWR rankings causes colleges to increase expenditure per student, and if so, whether the expenditure increase is funded by state appropriation or tuition revenue. To the best of our knowledge we are the first to explicitly test for this response.[4]

[1] This is likely a conservative estimate, since it does not include the 8 million hits the USNWR website generates each year (Smith (2001)).

[2] 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. Before USNWR rankings, national rankings of academic institutions were little known outside of academic circles.

[3] There are many other widely discussed potential responses to USNWR rankings, for example gaming the ranking system without real changes in college performance. We will leave these responses for further research.

[4] Prior empirical studies of the impact of USNWR college rankings have focused on the impact on the admissions market (see Monks and Ehrenberg (1999) and Pope (2006)). The analysis in Rezende (2007) is most closely related

At the same time as college rankings have become a force in higher education we have witnessed significant changes in the public finance of higher education.[5] Public education has become increasingly funded by student tuition revenue, leading to significant increases in the price students pay to attend a public college. Since 1980 real tuition prices have grown by over 100%, yet direct subsidies have increased by only 55% at public four year colleges (Fortin (2006)). This increase in tuition has generated concern among policy makers and commentators about access to college (Baum and Ma (2007)) and been shown to contribute to the recent increases in inequality (Fortin (2006)). While much of the reduction in state support for public higher education is a result of growth of state expenditures on other programs such as Medicaid (Kane, Orszag and Apostolov (2003)), others have argued that the incentives provided by rankings to increase expenditure are partly responsible (Ehrenberg (2000)).

The key issue we face in measuring a college expenditure response to the existence of USNWR college rankings is one of identification. Typically, only higher quality colleges are included in college rankings and these colleges spend more per student. This feature of college rankings makes it difficult to make causal statements about the effect of college rankings on college expenditure from the cross-section alone. To identify the effect of the existence of college quality rankings on expenditure behavior we take advantage of a large plausibly exogenous shift in the *scope* of the USNWR rankings in 1990.

Specifically, we examine whether colleges added into the USNWR rankings increase their expenditure and revenue when they become subject to the rankings incentives, in comparison to colleges already in the rankings and colleges that are never in the rankings. Crucially for our research design, the expansion in scope satisfies two conditions: (1) exactly which colleges become newly included in the USNWR rankings in 1990 was based on pre-defined college characteristics, and (2) the timing of the rankings expansion was due to a USNWR managerial decision and was not related to differences in pre-existing trends in college expenditure and revenue per student.

to the present paper. He examines the effect of higher education accountability in Brazil on measures of faculty quality and finds that accountability has a significant positive effect on these outcomes. He does not study the effect of college rankings on expenditure or revenue as we do here. Anecdotal evidence of an expenditure response to USNWR rankings has been documented. For example, in 2000 the Republican Gov. James S. Gilmore III promised sustained budget increases to higher education so that colleges like Virginia Commonwealth University could realize its goal of moving from Tier 3 to Tier 2 in the USNWR rankings (Argetsinger (2000)).

[5]For excellent overviews of the history of public higher education in the United States see Katz and Goldin (1999). For a excellent overview of recent literature on the public involvement in higher education see Kane (2006).

Using college level data from 1987 to 1995 we have two main findings. First, inclusion in the USNWR ranking causes colleges to increase educational and general expenditures per student by 3.2%. This is funded by a 6.8% increase in state appropriations per student, but tuition revenue does not respond. Second, the appropriation revenue response is not driven by updating prior information on college quality contained in Barron's Guide of Colleges. Instead our results are more consistent with USNWR rankings generating increased attention to the issue of college quality.

We consider two explanations for the positive state appropriation response to USNWR ranking inclusion. First, the disclosure of USNWR rankings may provide a focal point for the public to pay attention to the quality of public colleges, especially for those with little prior information about college quality. We present some evidence in favor of this explanation by showing that the state appropriation response is larger when the change in the scope of the USNWR rankings is likely to generate more attention from the public and state legislators. Second, the disclosure of USNWR ranking may provide information on the quality of colleges which the public use to update their priors. State legislators may either reward better than expected performance by colleges or provide resources to worse than expected colleges so that they can improve, depending on their objective function. We find that responses to only good or bad news do not explain our central findings.[6]

We see the broader contribution of the paper as twofold. First, there has been a significant literature examining how consumers and producers respond to the disclosure of quality information. Such disclosure may come from a private information provider (e.g. HMO quality information from the National Committee of Quality Assurance and hospital rankings from the USNWR), or a government agency (e.g. school report cards for primary and secondary education, restaurant hygiene ratings from county health departments, or hospital mortality rates in cardiovascular surgeries by state governments). Many studies in this literature focus on whether the disclosed information yields a change in consumer priors (Jin and Sorensen (2006), Dranove and Sfekas (2007), and Chernew, Gowrisankaran, and Scanlon (2006)) or whether firms engage

[6] We choose a different empirical approach from prior work on the effects of USNWR rankings on the admission market. Focusing on whether a college is included in the USNWR rankings, our approach allows for a response due to both attention allocation and the updating of college quality priors. In comparison, Monks and Ehrenberg (1999) and Pope (2006) examines how college admission outcomes respond to changes in a college's actual numeric ranking. By definition, a change of numeric ranking represents a piece of news on top of last year's rank leading to the updating of priors. Small changes in a college's numeric ranking are unlikely to generate significant attention to the issue of college quality however. Thus their approach is more suited to the admissions market where the attention allocation effect is less likely to be important.

in behaviors that lead to changes in the disclosed information (Jin and Leslie (2003), and Dranove, Kessler, McLellan, and Satterthwaite (2004)). Our study emphasizes that information disclosure not only alters the prior of those consumers who observe some quality measures before the disclosure, it may also bring quality information to a greater audience who care about quality in general but were not paying attention to quality issues beforehand. We argue that this is especially important in the context of college rankings, because college quality is a public good rather than a private good specific to college entrants.

The second literature relating to our study examines the role of information in the funding and provision of public goods. One branch of the literature has focused on the effect of media information on the quantity of public goods provided in a developing country or in a historical context.[7] Other studies have examined the role of salience and attention in explaining the equilibrium level of tax rates.[8] Our findings suggest that the media can affect public good provision, not only as a device for the public to better monitor government behavior, but also by raising attention to a public policy issue that was previously out of the spotlight.

The rest of the paper is organized as follows. In the next section we discuss the history of U.S. News college rankings. In section three we present the econometric specification and details of the data we use to conduct our analysis. The central results are presented in section four. Section five presents evidence on the importance of two mechanisms in explaining our findings. Section six concludes.

2 History of the U.S. News College Rankings

In this section we provide background on the USNWR rankings as related to the incentives they provide for college expenditure and the variation we use to identify the effects of the rankings on behavior.

[7] See Stromberg (2004) for an analysis of the impact of the diffusion of the radio on public spending and Besley and Burgess (2002) for an analysis of the role of the media in the allocation of relief spending in India.

[8] See Finkelstein (2007) and Chetty, Looney and Kroft (2007) for theoretical development and empirical evidence on the role the salience of taxation in determining tax rates.

2.1 The Components of the U.S. News College Rankings and Incentives

The purpose of the U.S. News college rankings is to provide the information necessary to allow meaningful comparisons of quality across colleges. At first glance this seems a simple enough task, but defining college quality based on easily comparable and observable measures is quite controversial.[9] An ideal measure of the quality of an undergraduate education would be the value added for a freshman completing his/her education at a given college. There are two reasons that the value-added approach is not implementable: (1) output is difficult to measure due to the lack of data on post-education outcomes for each cohort of graduates at every college, and (2) high ability students sort into high quality colleges and therefore unbiased estimates of college and student-specific value added are very difficult to obtain. As a compromise, most existing measures of college quality focus on a long list of college inputs while assigning small weights to crude measures of output such as retention and graduation rates.[10]

The USNWR rankings are no exception. Table 1 describes the variables and weights used to compute the 1990 USNWR rankings. In addition to the survey measure of academic reputation (a 25% weight), four groups of college-level statistics were employed in the 1990 rankings: student selectivity (25%), faculty quality (25%), financial resources (20%), and student satisfaction (5%). Similar criteria were applied throughout the 1990s, although the definition of specific variables or specific weights may have changed from year to year in response to suggestions from colleges and education experts. One change in the measure of financial resources in 1992 was placing more weight on expenditures that are more directly related to instruction and student support.[11]

Table 1 demonstrates the direct and indirect incentives USNWR rankings provide for a

[9] See NORC (1997), Clarke (2000), and Dichev (2001) for an overview of the debate on how well USNWR rankings measure quality

[10] To the best of our knowledge, the only exceptions are Princeton Review and the National Survey of Student Engagement (NSSE), both of which are based on surveys of student experience in college. See Pike (2004) for more details about the comparability between NSSE benchmarks and the USNWR rankings.

[11] According to the Integrated Postsecondary Education Data System (IPEDS), most educational and general expenditures can be decomposed into eight academic functions: (1) instruction, (2) research, (3) public service, (4) academic support (which includes library services), (5) student service, (6) institutional support, (7) operation and maintenance of plant, and (8) scholarships and fellowships. Since 1992, the USNWR has categorized these functions into two groups: the first group is comprised of instruction, academic support, student services and institutional support, the sum of which are calculated on the basis of per full-time-equivalent student. The second group includes research, public service, scholarships, and plant operation and maintenance (public service was added-in 1993). Unlike the first group, this second group is weighted by the proportion of undergraduate Full-Time Equivalents (FTE) in the total student body and thus become less important in the ranking algorithm.

college to increase expenditure per student. The direct incentives are provided by the 20% weight that USNWR allocates to expenditure per student. The indirect incentives are provided by the fact that other variables such as faculty salary and the student-faculty ratio are included in the rankings. To the extent that increases in expenditure per student can affect these variables there are indirect incentives to increase expenditure. The fact that this information is quite costly to obtain before a college is covered by USNWR rankings mutes the incentives to compete on expenditure (and the quality defined by expenditure) in the absence of the rankings. Potential students and legislators may have some information in the absence of rankings about the covered items but constructing the explicit head to head comparisons that USNWR rankings allow would require substantial effort.

2.2 The Scope of the USNWR College Rankings and Identification

When the USNWR published the first ranking issue in 1983, it focused on four categories: national universities, national liberal arts colleges, regional universities and regional liberal arts colleges. Each category included the top 10 colleges. The grouping was based on the 1976 Carnegie Classification of Institutions of Higher Education.[12] 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 colleges that belonged to the same Carnegie Classification as their own institution. The same structure was used in 1985.

In 1987, the USNWR expanded the scope of its rankings to include the top 25 national universities and the top 25 national liberal arts colleges, while the regional rankings continued to include only the top 10 colleges. Starting in 1988, USNWR rankings became an annual event and the ranking coverage expanded to include the top 25 colleges in all four categories. In addition, the ranking criteria began to include self-reported statistics, while the weight on the academic reputation survey was reduced from 100% to 25%. The self-reported data included a number of variables measuring college quality based on inputs, such as student selectivity and faculty resources, financial resources, and outputs, such as the freshmen retention rate and the graduation rate. If a college did not report included statistics, the USNWR used supplemental data from other sources.[13] Variable definitions and the corresponding weights have changed over

[12]The later two categories were further classified by region, and therefore the number of colleges ranked was much higher in the regional categories than in the national ones.

[13]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.

time, but the framework of the ranking criteria has remained stable since 1988.[14]

Our identification strategy is based on the changes after 1988 which are largely in terms of the *scope* of the USNWR rankings rather than their content. 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 in the national categories occurred in 1990. In that year, USNWR rankings covered *all* the national universities and *all* the national liberal-arts colleges. If a college belonged to the two national categories (as classified by the most recent Carnegie Classification in 1987) 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 all national colleges in quartiles marks a major change in the scope of the USNWR rankings; the rankings now included 295 national universities and liberal arts colleges in addition to the top 25 colleges. This structure remained unchanged until 1995.[15]

Based on the expansion in scope of the USNWR rankings in 1990, we categorize all public four year colleges into one of three groups. *Previous-in* colleges are national and regional colleges that had been included in the USNWR rankings before 1990. National previous-ins include prestigious national universities such as University of California - Berkeley. Regional previous-ins include top regional colleges such as the University of Central Florida and St. Mary's College of Maryland. *Added-in* colleges are national colleges added into the rankings for the first time in the 1990 expansion of the USNWR rankings, such as the University of Maryland - College Park. *Never-in* colleges are colleges that were never included in the USNWR rankings during our sample period (1983-1995), such as Central Missouri State University. Because the 1990 expansion of USNWR rankings apply to all national schools, every never-in college is regional by definition. In comparison, previous-in colleges can be national or regional, while the added-ins are all national. Our analysis centers on comparisons of changes in revenue and expenditure outcomes between added-in and never-in or previous-in colleges.

[14]The biggest exception is that USNWR stopped using the freshmen yield rate in 2003, largely in response to college complaints.

[15]In the magazine issue, the rankings of regional colleges 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. In 1995, national colleges 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 scope of the ranking at all. Rather it gave more detailed information about the relative quality within the first quartile of the two national categories.

The key structural change in the USNWR ranking that forms the basis of our identification strategy are illustrated in Figure 2. 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 the timing of this change in scope was driven by a USNWR managerial decision and does not reflect underlying changes in the supply or demand for state funding of higher education. Furthermore, which colleges were included in the rankings expansion in 1990 was determined by the pre-existing Carnegie Classification of colleges which groups institutions into national/regional universities and colleges. These two features lead us to believe that this shock will allow us to estimate the causal effect of ranking inclusion on the allocation of public resources in higher education.

3 Econometric Specification and Data

3.1 Specification

The central question is whether the inclusion of a college in the USNWR rankings affects the expenditure and revenue of that college. We answer these questions in a simple difference-in-difference framework. The specification is:

$$y_{it} = \beta \cdot D_{addedin,i} \cdot D_{t>=1991} + \alpha_i + \lambda_t + \epsilon_{it},$$

where y_{it} denotes the log of revenue or expenditure per Full-Time Equivalent student (FTE) for college i in enrollment year t, $D_{addedin,i}$ is a dummy variable for a college i being an added-in college, $D_{t>=1991}$ is a dummy variable indicating a year after the 1990 expansion, α_i denotes college fixed effects, λ_t denotes a set of year effects, and ϵ_{it} is the error term independent of all the regressors. The coefficient of interest, β, reflects the impact of USNWR inclusion on the outcome y_{it}. The sample for our main analysis included added-in, previous-in and never-in colleges.[16] We estimate the standard errors with an arbitrary covariance matrix to address the fact that inclusion in the USNWR is a permanent shock and the outcomes we study are likely to be autocorrelated within the same college (Bertrand, Duflo and Mullainathan (2004)).

[16] We also considered a regression discontinuity design to estimate the parameter of interest, however because we cannot obtain data on the reputational element of the USNWR rankings for the added-in colleges before 1990 we are unable to estimate the distance to the top 25 discontinuity in their rankings for the added-in colleges.

There is some ambiguity in the precise timing of a governmental response to the change in scope of the rankings in 1990, so our main analysis focuses on the comparison for enrollment years 1987-1989 versus 1991-1995.[17] The financial data for enrollment year t are referred to as the revenues and expenditures incurred in the fiscal year $t+1$, which usually ends at June 30. Since the 1990 USNWR rankings were published in the Oct. 15 issue, the shift in the ranking scope should not affect who enrolled as freshmen in September 1990 but might have influenced the amount of financial resources received and spent up to the end of the fiscal year 1991. More specifically, the initial state budget for a public college is most likely determined before the start of a fiscal year, but the budget is subject to change during the year.[18]

For the difference-in-difference estimate to yield a causal interpretation the control colleges must be a valid counterfactual for the added-in colleges. There are two reasons why this assumption might be violated in this context. First, the added-in and other colleges might be following different time trends and so post-treatment differences may simply reflect differences in time trends across different colleges. This is likely to be important here as the college market is becoming increasingly national over this time period leading to increasing dispersion across colleges in key variables (see Hoxby (2004)). Second, the information provided on the added-in colleges may directly effect the provision of funding to the control colleges. Because state appropriation allocations are simultaneously decided on for all the colleges in the state and total state funding of higher education may not respond to rankings, the rankings may simply redistribute resources between colleges. While it is not possible to test either of these assumptions directly, we present evidence that these two concerns are unlikely to explain our results, and that the previous-in and never-in colleges do represent appropriate counterfactuals for the added-in colleges.

3.2 Data Sources

The heart of the paper analyzes two major data sources: the USNWR magazines, and the Integrated Postsecondary Education Data System (IPEDS).[19] As noted above, a complete collection of the USNWR ranking issues since 1983 helps us define treatment and control groups. However, while the USNWR publications provide some information on the variables of interest for

[17] As shown in section 4.3, adding enrollment year 1990 as after the shock does not change our central conclusions.

[18] Grapevine (http://www.grapevine.ilstu.edu/) provides more detailed information on the extent to which state budgets for higher education may differ at the beginning and end of a fiscal year.

[19] Table A1 summarizes the definitions, sources and unit of analysis of all the key variables used in this study.

the ranked colleges, it is necessary to track both ranked and unranked colleges before and after 1990. The IPEDS is a census of all the colleges operating in the U.S. collected by the Department of Education. It provides basic institutional information, such as degrees offered, private and public status, tuition, enrollment, faculty resources, and detailed financial information on revenue and expenditure.[20] The IPEDS data are merged with the ranking issues of USNWR by year and institution name.[21]

We consider three measures of college revenue and expenditure per FTE from the IPEDS as outcomes.[22] First, we examine college expenditure on items covered by the USNWR rankings algorithm. We term this variable total main expense which includes expenditure on instructional activities and student support per FTE. Second, we examine total tuition and fee revenue per FTE.[23] Third, we examine total state appropriation revenue per FTE.[24].

To better understand what determines the response of a college to USNWR ranking inclusion we supplement this dataset with data on priors for college quality, the political and demographic environment in a state, and USNWR circulation data.

To measure expected college quality for each added-in college before the USNWR expansion in 1990 we use college level data from the 1989 Barron's Guide to Colleges (BGC). Based on measures of how selective admissions to a college are (such as total number of applications, percentage accepted and percentage enrolled), BGC groups colleges into nine categories ranging from highly-competitive (1) to non-competitive (9). To determine whether USNWR inclusion represents a good or bad information shock for the added-in colleges we use the BGC selectivity categories to generate quartiles of the BGC ranking distribution and compare this to the colleges place in the USNWR rankings quartile. Given the relative placement of a college in the two ranking distributions we can measure whether inclusion of a college in USNWR provides good news, bad news, or no news at all about a college's quality.

[20]The analysis starts with 1987 because 1987 is the first year that the Department of Education provides college-level financial data in IPEDS (http://nces.ed.gov/ipeds/).

[21]By ranking issues, we are referring to the annual *America's Best Colleges* issue of the USNWR weekly magazine in years 1983, 1985, 1987, 1988, 1989, 1990, 1991, 1992, 1993, and 1994.

[22]The number of FTEs is calculated by taking the total number of full time students (undergraduates and graduates combined) plus one third of the total number of part-time students.

[23]This measure captures the total revenue that a college receives per FTE and may differ from average list price tuition as many colleges discount tuition for some students they wish to enroll.

[24]We only include appropriation revenue for the state government as the appropriation revenue from the federal government is typically allocated by earmarks and is a very small fraction of college revenue. About 97% of public four year college appropriation revenue is from state governments.

We construct the good and bad news variables for the added-in colleges from BGC 1989 and USNWR 1990 rankings as follows. Conditional on being a national university (including both private and public) and being rated by the BGC (156 colleges), we sort the colleges by BGC rating (1-9). We then classify the sorted colleges into groups with the same number of colleges as in the 1990 USNWR categories. For example, the USNWR rankings has 18 added-in colleges in the first quartile, 44 in the second, 49 in the third, and 45 in the fourth. According to BGC ratings, we denote the best 18 colleges as the first BGC quartile, the next 44 as the second BGC quartile, etc. This way we are able to compare, under the same "quartile" cutoffs, whether the BGC quartiles match up with the USNWR quartiles.

More specifically, the quartile-to-quartile comparison is implemented as follows. Since the BGC ratings are crude, it is possible that a quartile cutoff occurs in the middle of BGC original rating group. In that case, we call a BGC rating "ambiguous" if it corresponds to more than one BGC quartile. For an ambiguous BGC rating, we calculate its highest and lowest BGC quartiles. A college receives good news for certain from the USNWR rankings if its BGC rating is not ambiguous (which means we know its BGC quartile for sure) and its BGC quartile is worse than its USNWR quartile. Similarly, the good news is certain if the college's BGC rating is ambiguous but the best possible BGC quartile for such rating is worse than the college's actual USNWR quartile. Following the same logic, a college receives bad news for certain from the USNWR if its worst possible BGC quartile is better than its actual USNWR quartile. The news from USNWR is "ambiguously good" if a college's best possible BGC quartile is equal to its USNWR quartile, and "ambiguously bad" if its worst possible BGC quartile is equal to its USNWR quartile. In all the other cases, there is no clear news. The same algorithm is applied to national liberal arts colleges. An example illustrating the creation of the good and bad news variables from the BGC and USNWR rankings is in Figure 3.

To measure differences in the demographic and political environment across states we compute two sets of variables. First, we compute at the state-level the percentage of the population who are college age (age 18-22) and the percentage of the population who are pre-college age (age 14-17) from the 1990 Census.[25] Second, from the 1990-91 Edition of the Book of the States (Council of State Governments), we collect at the state-level: (1) the ratio of the number of voters in non-presidential elections to the total of voting age population in election year 1986; (2) the absolute seat advantage of Republican party in the state legislature (House and Senate

[25]The 1990 Census collects information on the 1989 population and therefore precedes the 1990 expansion of the USNWR rankings.

combined) as of 1989, (3) whether the governor was Democrat as of 1990.[26] These variables measure the degree of political competition and the extent to which state citizens were politically active.

To quantify the fraction of a state's population exposed to the 1990 USNWR information shock we include two variables from the Audit Bureau of Circulation (ABC): one is the USNWR subscription per capita, and the other is the per-capita number of copies sold via newsstand. Both variables are based on state-level information for the USNWR issue of Oct. 30, 1989.[27] We treat subscription and newsstand sales separately because trade journals suggest that newsstand sales are much more sensitive to magazine content and that advertising rates are more responsive to newsstand sales than to regular subscriptions.

3.3 Sample Selection

We draw our initial sample from the IPEDS data. According to the IPEDS data, there were 1641 four-year colleges that offer at least one bachelor's degree in 1987. We further restrict our sample by excluding (1) the colleges located outside the continental United States (i.e. those in Puerto Rico, the US Virgin Islands, etc.), the District of Columbia and Maine (due to lack of control colleges), (2) the colleges that failed to report public and private status, (3) the colleges for which we do not have enough information to compute the total number of FTEs every year between 1987 and 1995, (4) the colleges that failed to report total revenues every year, and (5) colleges that fail to report government appropriations every year. These criteria define a sample of 1156 colleges, which account for 89% of all the FTEs enrolled in four-year colleges as of 1987. Lastly, we limit our sample to only public colleges and obtain our analysis sample of 436 colleges. Of the 436 colleges there are: 40 previous-ins (9 of which are national), 115 added-ins, and 281 never-ins.[28] The geographic distribution of the colleges by USNWR ranking inclusion status is

[26] Specifically, we compute the absolute seat advantage of Republican party in the state legislature by first calculating the absolute difference between the number of Republican seats and the number of Democrat seats and then dividing by the total number seats.

[27] The 1989 rankings were published in the Oct. 16 issue. ABC audits the total number of paid circulation for every issue of USNWR, but only breaks it down to state level for one random issue every half year.

[28] In any specific year before 1990, the number of regional ranked colleges is less than 100, but the number of regional previous-ins is much larger than 100 because the identities of ranked colleges have fair amount of turnover. In contrast, the list of national previous-ins is very stable from year to year. We drop 20 colleges from the sample which appear in the rankings less than every year after 1990 because they are not strictly added-in or never-in colleges.

displayed in Figure 3.

3.4 Descriptive Statistics

Table 2 presents summary statistics on the sample of colleges which form the basis of our analysis. In the first panel of Table 2 we see that there are some differences between the added-in and control colleges in terms of the levels of expenditure and revenue. Never-in colleges spend and receive significantly less than either added-in or previous-in colleges. In 1987, the average expenditure per student was clearly ordered (from low to high) by never-ins, regional previous-ins, added-ins, and national previous-ins, with the added-ins closer to the regional previous-ins than to the national previous-ins. This is partly driven by the Carnegie Classification of college types, and partly by the history of college coverage in the USNWR rankings.

In the second panel of Table 2 we examine whether pre-existing trends differ across added-in and control colleges. We look at the trends in outcomes over the three years before USNWR included the added-in colleges. The results reveal that the pre-existing trends in outcomes between the added-in and other colleges are not statistically different at the 5% level. The lack of large differences in pre-existing trends in outcomes between colleges provides some evidence that the timing of the USNWR expansion of coverage was not in response to different trends in the outcome variables across colleges. The fact that our sample period is more recent likely explains the differences between our results and those in Hoxby (2004).[29]

The results in the first two panels of Table 2 demonstrate the value of having two potential control groups for our research design. The previous-in colleges are more similar to the added-in colleges than the never-in colleges in terms of the level of outcomes. However, the never-in colleges are more similar to the added-in colleges than the previous-in colleges in terms of the pre-existing trends in outcomes. Thus, each potential control group may represent a better counterfactual for the added-in colleges for different reasons. For example, as previous-in colleges are so similar in terms of expenditure per student to the added-in colleges that these colleges may represent a better counterfactual for what would have happened to the added-in colleges

[29] As can be seen in Appendix Figure 7 in Hoxby (2004), the expansion in the dispersion of subsidy per student across public colleges is concentrated in 1971 to 1981. It is also important to note that for state appropriations we can only reject the hypothesis that the pre-existing trends differ between the added-in and previous-in colleges at the 5% level. We would certainly prefer that time trends were identical. We address this potential concern by examining how sensitive our results are to the use of a sample containing only the never-in colleges as the control group.

in absence of USNWR inclusion. In contrast, the similarity between previous-in and added-in colleges may trigger redistribution of state resources between them in response to USNWR rankings, and therefore never-in colleges would represent better counterfactuals. Below we show that our results are robust to the exact choice of control group which alleviates research design concerns specific to any one control group.

In the third and forth panels of Table 2 we look at differences in college and state characteristics between added-in and control colleges which may be related to college expenditure and revenue. In panel 3 of Table 2 we can see that the colleges in the three groups differ across all of the characteristics we examine. In general added-in colleges are larger, more likely to be the state's flagship college and more likely to be national than previous-in or never-in colleges. In terms of BGC 1989 guides measure of college selectivity the added-in colleges fall between the previous-in and never-in colleges. In panel 4 of Table 2 we see that there are no statistically significant differences in the state characteristics between the never-in and added-in colleges. There are some differences between the added-in and previous-in colleges in the pre-college age population share, voter turnout, per capita income, unemployment rate and the percentage with a college degree. These differences may translate into differences in the public support of higher education.

The findings in the third and forth panels of Table 2 underscore the value of comparing changes in outcomes between added-in and never-in or previous-in colleges, rather than cross sectional comparisons alone. In this setting cross-sectional differences will only bias the results if levels of these variables determine future changes. For example, large colleges may receive an increase in state appropriations relative to smaller colleges, simply due to size difference. We address this concern by allowing outcome variables to follow different trends for colleges with different characteristics, and by estimating specifications which allow for college specific linear trends in the outcomes.

4 Results

This section is divided into three subsections. We first examine key expenditure and revenue outcomes. The next subsection examines the robustness of the state appropriation response to alternative specifications. The last subsection presents estimates to allow for the examination of the effect of USNWR ranking inclusion on the redistribution of state funding between public

colleges.

4.1 Expenditure and Revenue

In Table 3 we present the results of the effect of USNWR inclusion on college expenditure and revenue. Each column in the table presents the results from one regression with the column header noting the outcome used. In column (1) we report the results for the reponse of the total main expense per FTE to USNWR inclusion. We see that USNWR rankings inclusion increases the per-FTE college expenditure on items included in the rankings by 3.2%. Moreover this effect is statistically different from zero at the 5% level. This finding provides evidence that USNWR rankings do indeed generate incentives for public colleges to increase their expenditure.

In column (2) we report the effect of USNWR ranking inclusion on total state appropriation revenue. The results indicate the USNWR ranking inclusion leads to an increase in the per-FTE state appropriation revenue of 6.8%, which is statistically significant at the one percent level. Inclusion in USNWR rankings leads states to allocate significantly more resources to public colleges. The magnitude of the response is also of interest. Public colleges typically receive 40-50% of their revenue from state appropriations. Thus, the increase in appropriation revenue accounts for nearly all of the additional college expenditure stimulated by USNWR coverage.[30] This result is displayed graphically in Figure 4.

The finding that the increase in college expenditure is financed by an increase in state appropriation revenue is confirmed by the results in column (3) which show that tuition and fee revenue does not respond to USNWR inclusion. This may indicate a well-known fact: public colleges are highly subsidized and the price that students face does not necessarily reflect consumer willingness to pay or the underlying quality of the product. Since state governments play an important role in the determination of both tuition and state appropriations, it is interesting that they choose to increase financial resources for the added-in colleges without disturbing the admission market.[31]

[30]While the response of expenditure and revenue per FTE to USNWR ranking inclusion is the most relevant parameter we have also examined whether total state funding or the total number of FTEs responds to USNWR rankings inclusion. We find that the majority of the response to the rankings is accounted for by reductions in FTE and not by increased in total state subsidies to higher education. This is consistent with state governments keeping the total dollars allocated to higher education subsidies largely fixed, but changing the funding formula to reimburse colleges are a higher rate per enrollee.

[31]The fact that ranking inclusion does not increase tuition and fee revenue is not necessarily inconsistent with

4.2 State Appropriations: Alternative Time Trends

The results in Table 3 demonstrate that a college's state appropriation revenue (per FTE) increases in response to inclusion in USNWR rankings. We examine whether these results are robust to allowing for different time trends across different college characteristics. Recall that the added-in colleges are quite different from the control colleges in terms of college size and flagship status (see Table 2). It is possible that the increasingly national nature of the higher education market has lead to state appropriations being increasingly allocated to large flagship colleges after 1990. This possibility alone could account for the results in Table 3. To address this concern we estimate our main specification allowing for colleges of different sizes and flagship status to follow different non-linear time trends.[32]

In column (2) of Table 4 we report the results including size quartile-year fixed effects in the specification. The coefficient estimate remains positive and statistically significant at the five percent level. The magnitude of the coefficient estimate is somewhat smaller than in Table 3, but still economically significant. In column (3) of Table 4 we report the results including flagship-year fixed effects in the specification. Again, the coefficient estimate is positive and statistically significant at the 5% level. The magnitude is also again quite close to the baseline estimate.

The results in columns (2) and (3) in Table 4 demonstrate that the effect of USNWR inclusion on public colleges found in Table 3 is not simply due to differences in trends based on observable differences in college characteristics between added-in and control colleges. However, it is also possible that added-in and control colleges are different in unobservable ways which may be related to their trends in revenue. For example, added-in colleges are typically lower in the college quality distribution than the previous-in national colleges and there may be different trends in outcomes by college quality. To address this issue we include college specific linear trends in our specification. This allows for each college to follow a different time trend in state appropriation revenue.[33] The results from this regression are reported in column (4) of Table 4.

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the findings in Pope (2006) and Monks and Ehrenberg (1999) that increases in colleges numeric ranking do affect admissions market outcomes. Since USNWR inclusion does not necessarily constitute good or bad news about a colleges quality we are estimating a different parameter.

[32] More precisely we allow the year fixed effects, λ_t in the main specification above, to differ by college size quartile and by flagship status.

[33] We estimate the model

$$\Delta y_{it} = \beta \cdot D_{addedin,i} \cdot D_{t=1991} + \alpha_i + \lambda_t + \Delta\epsilon_{it},$$

where Δy_{it} is the change in state appropriation per FTE to college i in year t, $D_{addedin,i}$ is a dummy variable

We see that the coefficient estimate remains positive and statistically significant at the 5% level. The magnitude of the coefficient estimate is half of the baseline estimate. The results in columns (2), (3) and (4) of Table 4 demonstrate that our finding above that USNWR ranking inclusion increases state appropriation expenditure is robust to allowing the time trends in outcomes to follow a richer specification.

Another important concern to address is the fact that state appropriations to higher education are highly cyclical and sensitive to business cycle (see Kane, Orszag and Apostolov (2005)). Because the expansion of the scope USNWR rankings occurs at the beginning of a recession our coefficient estimate above may be due to the possibility that the control colleges are located in states where the recession was more severe. We examine this issue by including state-year fixed effects in our baseline specification. This allows for state appropriations to a college to follow a flexible time trend differentially by state. The results of the state-year fixed effect specification are reported in column (5) of Table 4. We can see that including state-year fixed effects has very little effect on either the statistical significance or magnitude of the central coefficient estimate. This suggests that USNWR inclusion is largely uncorrelated with state-level trends in outcomes.

4.3 State Appropriations: Alternative Control Groups and Time Horizons

In this subsection we examine whether the state appropriation revenue response to USNWR rankings inclusion results are sensitive to the choice of comparison group or time horizon. As noted above examining the sensitivity of the results to which control group is used is worthwhile because each of the two control groups serves as a better counterfactual for the added-in colleges in different ways.

In column (2) of Table 5 we report the results of estimating our main specification using a sample of only the previous-in colleges as controls. The results indicate that we again obtain a positive coefficient which is statistically significantly different from zero at the 5% level. The magnitude of the coefficient is substantially larger than the baseline estimate in column (1) which is based on using both sets of colleges as controls. This may reflect the fact that the pretreatment trends for the previous-in colleges are not identical to those of the added-in colleges. In column (3) of Table 5 we estimate the main specification on a sample of only never-in colleges are controls. The coefficient estimate is positive, statistically significantly different from zero at

for a college i being an added-in college, $D_{t=1991}$ is a year equal to 1991 indicator variable, α_i denotes the linear trend for college i, λ_t denotes a set of year effects, and $\Delta\epsilon_{it}$ is the error term independent of all the regressors.

the 5% level and very similar to the baseline estimate. Thus, the positive response of state appropriations to USNWR inclusion is not driven by the comparison of added-in colleges to any one control group.

Another potential concern with the research design is that the national previous-in colleges may also be treated by the 1990 ranking expansion. Before 1990, if a national college fell out of the top 25 college this would result in the college failing to appear in the rankings, which may be especially costly. After 1990, a national college out of the top 25 can still appear in one of the four quartiles. The change in the fall-back option implies that previous-in national colleges may be affected by the inclusion of added-in national colleges, which would invalidate the research design. We examine this issue by excluding national previous-ins from the sample and only comparing national added-in colleges against regional previous-in and never-in colleges. The results are reported in column (4) of Table 5. Again the coefficient estimate is positive, statistically significantly different from zero at the 5% level with nearly an identical magnitude to the baseline estimate.

We also examine the sensitivity of the results to the time horizon and the inclusion of 1990 as a post-shock year in Table 5. Whether the impact of USNWR inclusion is transitory or permanent is important in understanding how rankings affect the public spending on higher education. Since the 1990 USNWR inclusion of national schools is a permanent change, if it motivates schools to improve quality via increasing financial resources, the financial increase should be permanent as well.

In column (5) of Table 5 we examine whether the short run and long run effects of the rankings differ by allowing for different effects of the rankings in the first two years (1991-1992) and last three years (1993-1995) of the post-shock period. We find that there are no statistically significant differences in the short and long-run effects of USNWR ranking inclusion on state appropriations. In column (6) in Table 5 we lastly examine whether the results thus far are sensitive to including 1990 as a post-shock year. As noted above there is some ambiguity about the exact timing of the state legislature funding allocation decisions lining up with the USNWR ranking issue in 1990. Comfortingly the results in column (6) suggest that the central results are not sensitive to the exact definition of the post-shock time period.

4.4 State Appropriations: Redistribution of Higher Education Spending

The results above demonstrate that the positive response of state appropriation revenue to USNWR ranking inclusion are robust to alternative specification and control group choices. The robustness in control group definition provides some evidence that USNWR rankings are not simply leading to the redistribution of total state expenditure from colleges with similar levels of spending to added-in colleges. However, because the nature of redistributive response to USNWR rankings depends on the precise objective function of state legislators, USNWR ranking inclusion may stimulate other types of redistributive responses. The potential redistributive responses of legislators range from (1) allocating state appropriations equally across all the colleges so that all colleges appear in USNWR rankings to (2) allocation state appropriations to the best college in a state so that this college can rise in the national USNWR rankings.

To address the concern of redistribution, we conduct two further tests of whether control colleges are affected by the inclusion of other colleges in their state in USNWR rankings. First, we examine whether inclusion in USNWR rankings has a differential effect of flagship colleges. A flagship college is typically the best college in a state. If the response of state appropriations to USNWR is simply due to redistribution of resources away from or towards the best college in the state we expect flagship colleges have a different response to inclusion in the USNWR rankings. We add two interaction terms in our model to test for this. We include an interaction of a flagship indicator with USNWR inclusion in 1990 and an interaction with whether the state's flagship college is a previous-in college or not. The results of this specification are reported in column (2) of Table 6. We find little evidence that flagship colleges or states that have previous-in flagship colleges have a different response to a college's USNWR ranking inclusion.

The second test we examine is whether previous-in colleges experience a decrease in state appropriation revenue after 1990. We report the results of this specification in column (3) of Table 6. The results indicate that while the point estimate is negative the previous-in colleges do not experience a statistically significant drop in state appropriations relative to the never-in colleges after 1990. These findings provide little evidence that in response to USNWR ranking state legislators redistribute resources either away or towards the best colleges in their state.

We also conduct additional analysis at the state level which suggests that redistribution is unlikely to be driving our results. In an unreported analysis, we take state-year as the unit of observation, compute state appropriations per student including all the four-year public colleges within a state, and regress it (in log) on the interaction of the after-1990 dummy and the

percentage of college students enrolled in the public added-ins as of 1987 (while controlling for state and year fixed effects). The coefficient of the interaction term is positive (0.0289) and statistically different from zero at the 15 percent level (p=0.138). The positive sign suggests that, on average, states that have more students in the public added-ins allocate more resources to higher education in response to the inclusion of USNWR rankings. We believe that the lack of statistical significance is due to the lack of power from only using data at the state level.

A more direct test of whether never-in colleges experience funding cut as the result of the 1990 USNWR change is repeating the above state-level regression but focusing on the state appropriation (per student) among all the never-ins in a state. If the 1990 USNWR inclusion motivates states to shift funding from the never-ins to the added-ins, the funding change for the never-ins should be more negative the more students there are in the added-ins. The regression results show the opposite: the coefficient on the interaction of the after-1990 dummy and the percentage of students in the added-ins is positive (0.014) and insignificant from zero (p=0.593). Above all, the two state-level regressions suggest that redistribution does not explain our key results.

5 Mechanisms: Increased Attention or Prior Updating?

There are two potential mechanisms for USNWR rankings to affect the allocation of state funding to higher education: namely increased attention or prior updating. In this subsection we examine whether there is evidence for the two mechanisms by examining heterogeneous responses to USNWR ranking inclusion.

In the first mechanism, the wide distribution of USNWR college rankings may increase the attention that the public and state officials give to the issue of college quality. We test for this mechanism by examining whether the positive inclusion effect on state appropriation is due to particularly large responses when the change in the scope of the USNWR rankings is likely to generate more attention from the public and state legislators. We consider three sets of variables measuring state differences in attention: (1) the fraction of students about to enter college, (2) the readership of USNWR and percentage of students attending added-in colleges, and (3) political environment.

The second potential mechanism considers the case where the public and state officials are

always attentive to the issue of college quality but the 1990 USNWR rankings provide new information relative to the pre-existing college guides. If added-in colleges are revealed to be worse or better than expected they may be allocated more funds by legislators. Whether state legislators increase funding in response to good news or bad news is an empirical question because we do not know the precise objective function of state legislators. We test for this mechanism by examining whether the positive response of state appropriations is due to particularly large responses to either good or bad news about the college's quality revealed by USNWR ranking inclusion.

In both tests, the exact specification we estimate is:

$$y_{it} = \beta \cdot D_{addedin,i} \cdot D_{t>=1991} \cdot Hetero_i + \alpha_i + \lambda_t + \epsilon_{it},$$

where y_{it} is the log of state appropriations per FTE to college i in year t, $D_{addedin,i}$ is a dummy variable for a college i being an added-in college, $D_{t>=1991}$ is a year greater than 1991 indicator variable, $Hetero_i$ denotes the state-level measures of expected attention to the rankings or the college-level measure of the "news" content of the rankings, α_i denotes the linear trend for college i, λ_t denotes a set of year effects, and ϵ_{it} is the error term independent of all the regressors.

5.1 Attention

The USNWR rankings may represent an important source of information to the public, especially to those who care about public education but are not currently attending a college. If individual voters value the quality of education their state government provides and they can obtain some information about what resources are actually allocated to higher education by the government their political influence will motivate the state government to respond to the USNWR rankings. Alternatively, the wide distribution of USNWR college rankings may raise the attention of state officials directly, who in turn give a higher priority to the budget (hence quality) of the added-ins. Given the data constraints, it is impossible to distinguish between these two types of attention changes. Rather, we test them as a whole in Table 7.

As a benchmark, Table 7 column (1) reports the baseline result from Table 3. Columns (2) to (4) examine three sets of interactions separately: one is interacting $D_{addedin,i} \cdot D_{t>=1991}$ with

the fractions of pre-college age and college age population, as we believe these two population groups may pay more or less attention to college rankings than the rest of the population; the second is interacting with the fraction of population that are explicitly exposed to the 1990 USNWR ranking expansion, measured by USNWR suscription per capita, USNWR newsstand sales per capita, and the percentage of students enrolled at the added-ins; and the third is interacting with political variables including voter turnout, the absolute seat advantage between democrats and republicans in state legislature, and whether the governor is a democrat. With the exception of the Democratic governor variable, all these state level variables are standardized by the nationwide mean and standard deviations of the variable so that a value of one indicates that a state is one-standard-deviation higher than the national average for the specific variable. Column (5) includes all of the interactions in one specification.

In column (2) we see that the state appropriation response to the rankings is larger when a state has a larger fraction of their population pre-college age. Students in this age range, and their parents, value college quality in the near future, but may not be paying close attention to the quality of colleges in their state without USNWR rankings. In column (3) we see that the state appropriation response is larger when a greater fraction of students attend added-in colleges. We expect that changes in the scope of the rankings is more salient when more students are affected by the shock. This is what we find. In column (4) we find that that state appropriation response is larger when there is more voter turnout in a state. We would expect politicians to devote more attention to this issue when more citizens are politically active. It is also plausible that politicians may be more responsive in a more competitive environment, but the data provides little support to this contention.

In column (5) of Table 7 we include all interactions simultaneously in the specification. The results are broadly similar to those including each set of interactions separately, with two exceptions: (1) the interaction between rankings inclusion and USNWR circulation becomes statistically significant, with an expected positive sign for newsstand sales but a negative sign for subscriptions; (2) the interactions with voter turnout and the percentage of students in the added-ins become insignificant. These changes are largely due to the high correlation between USNWR circulation and voter turnout.[34] Given the fact that we have only 47 states to explore the differential attention across states, we suspect including all the interactions in one specification over controls the state-by-state variation introducing a collinearity problem. For this

[34]Because USNWR is a political magazine, the correlation between U.S. News Subscription Circulation and voter turnout is high (0.63). In comparison, the correlation between U.S. News Newsstand Circulation and voter turnout is smaller, roughly 0.24.

reason we feel that specifications where each set of interactions enter separately (as in columns (2) to (4)) are more informative.

Overall, Table 7 provides some evidence that the allocation of additional attention to the issue of college quality can partially explain the positive state appropriation response. Though we have difficulty pinning down the exact channel through which the attention is raised, we note that the main effect in all of the specifications in Table 7 is still large and statistically significant. This is consistent with the explanation that all the states in our sample have increased attention to the issue of college quality and such attention results in a significant increase of state appropriations to the added-ins.

5.2 Prior Updating

In this subsection we examine whether the positive state appropriation response is due to prior updating. As described in Section 3.2, we use the 1989 Barron's Guide of Colleges as a proxy for the prior belief that people may have had about college quality before the 1990 USNWR ranking expansion. In Table 8 we present the results allowing for the response of state appropriations to USNWR inclusion to vary according to the "news" content of the rankings for the added-in colleges. More specifically, we classify the new information conveyed in the USNWR rankings in five categories: no news, clear positive news, clear negative news, ambiguous positive news and ambiguous negative news. The exact definition of these five categories are available in the data section above. The distribution of the five categories are relatively even within the added-in colleges: between 9% and 31% of colleges fall into each category, with 'Ambiguous Bad News' containing the most colleges and 'Certain Bad News' containing the least colleges.

In column (1) of Table 8 we present the results allowing for the response of state appropriations to USNWR inclusion to vary by the news content of the rankings. The first finding to note in this specification is that the main effect of USNWR inclusion is still positive and statistically significant. In terms of magnitude it is slightly larger than in the baseline specification. Since we use "no clear news" as the default category, this coefficent represents the effect of USNWR ranking inclusion on the added-in colleges that witness no clear news upon the 1990 USNWR ranking. The insignificant coefficents on "clear positive news", "ambiguous positive news", and "ambiguous negative news" suggest that the news content of the rankings does not explain the central finding. The second finding to note in this specification is that the colleges that clearly experience bad news about their quality receive less appropriations in response to USNWR in-

clusion than other added-in colleges. This is consistent with state legislators penalizing colleges for poorer than expected performance. Interestingly, the results in column (2) reveal that there are no differences by the news content on tuition and fee revenue per FTE. Again, this suggests that state governments decide to affect a college's financial resources without disturbing the admission market.

6 Conclusion

This paper makes two contributions. First, we show that inclusion in the USNWR rankings leads to an increase in college spending per student by 3.2% and the additional expenditure is funded by an increase in state appropriation per student of 6.8%. In contrast, tuition revenue per student does not respond to the inclusion of a college in USNWR rankings. Second, we demonstrate that the college revenue and expenditure responses to USNWR inclusion are not driven by updating college quality priors as defined in the Barron's Guide of Colleges. Instead our results are more consistent with USNWR rankings increasing attention to the issue of college quality.

Two caveats suggest directions for future work. First, as we do not know the rate of return on state appropriations resources to colleges stimulated by USNWR we are unable to draw welfare conclusions from our findings. Estimating of the rate of return to the increase in college expenditure would be a fruitful extension of our study. In recent work, Bound and Turner (2007) have shown that college completion rates are positively related to resources per student. However, because their estimates are of the average return to resources they may be larger than the return to additional resources stimulated by college rankings. In this sense, the context of Bacolod, DiNardo and Jacobson (2006) is more similar to ours. They show that accountability awards to secondary colleges in California have little impact on student achievement.

The second caveat pertains to the fact that financial resources per student represent only one dimension of college quality. Another important avenue for future work would be to test for a college gaming response to the USNWR rankings. If it is less costly to improve on-paper quality (as defined in the ranking algorithm), USNWR rankings may distort college behavior away from improving true quality, and therefore reduce welfare. To understand whether this is a concern, more extensive data is required, where both true-quality and on-paper quality can be separately measured. The response of alumni giving to the USNWR ranking exposure represents

a possible case, since both the fraction of alumni giving and the total dollars donated by alumni are a component of the USNWR definition of quality. However, the total resources provided by alumni are much more likely to be related to true college quality than who provides them.

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TABLE 1: USNWR College Ranking Algorithm (1990)

Category	Weight	Detailed measures
Academic Reputation	25%	[Responses from Survey of College Presidents Conducted By USNWR]
Student Selectivity	25%	Acceptance Rate, Yield Rate, High School Class Standing, Average SAT/ACT Score
Faculty Quality	25%	Student-Faculty Ratio, Percentage of Faculty with Ph.D., Percentage of Part-Time Faculty, Average salary of Tenured Full Professors
Financial Resources	20%	Total Education and General Expenditures
Student Satisfaction	5%	Graduation Rate

Note: Source: USNWR magazine issue Oct. 15, 1990. The USNWR implements some minor differences in the ranking algorithm and the regional algorithm. This table reflects the national algorithm. Graduation rate performance refers to the difference between actual graduation rate and the graduate rate predicted by student SAT scores.

TABLE 2: Public College Characteristics, by USNWR Ranking Inclusion Status

	Added - In	Previous -In	Never -In	(1)-(2) t-stat [p-value]	(1)-(3) t-stat [p-value]
	(1)	(2)	(3)	(4)	(5)
(1) Levels of Outcome Variables (1989):					
Total Main Expense	7273	7165	5141	0.33	9.74
	(236)	(457)	(105)	[0.743]	[0.000]
State Appropriation Revenue	6156	6164	4306	0.10	7.28
	(251)	(368)	(125)	[0.987]	[0.000]
Tuition and Fee Revenue	2408	2080	1656	1.71	8.65
	(99)	(163)	(38)	[0.090]	[0.000]
(2) Trends in Outcome Variables (1987 to 1989):					
Percent Change in Total Main	0.11	0.11	0.09	0.30	1.43
Expense	(0.01)	(0.02)	(0.01)	[0.771]	[0.152]
Percent Change State Appropriation	0.08	0.12	0.07	1.77	0.66
Revenue	(0.01)	(0.02)	(0.01)	[0.078]	[0.507]
Percent Change Tuition and Fee	0.16	0.15	0.16	0.26	0.24
Revenue	(0.01)	(0.02)	(0.01)	[0.697]	[0.814]
(3) College Characteristics (1989):					
Enrollment (FTE)	17059	13842	5253	1.97	19.78
	(758)	(1733)	(226)	[0.051]	[0.000]
Flagship College	0.37	0.18	0	1.44	12.71
	(0.05)	(0.06)	(0)	[0.026]	[0.000]
National College	1	0.23	0	19.51	--
	(0)	(0.07)	(0)	[0.000]	
Barron's Guide 1989 Ranking	6.65	5.35	7.62	4.66	7.91
	(0.13)	(0.29)	(0.07)	[0.000]	[0.000]
(4) State Characteristics (1989):					
Pre-College Age Population Share	0.056	0.053	0.056	3.54	0.32
	(0.001)	(0.01)	(0.000)	[0.001]	[0.753]
College Age Population Share	0.067	0.068	0.067	1.47	0.56
	(0.000)	(0.001)	(0.000)	[0.140]	[0.580]
U.S. News Newsstand Circulation	191	184	179	0.35	0.96
(per million)	(11)	(10)	(7)	[0.734	[0.337
U.S. News Subscription Circulation	9.5	9.2	9.2	0.62	1.34
(per thousand)	(0.3)	(0.2)	(0.1)	[0.534]	[0.182]
Voter Turnout	0.38	0.33	0.36	3.56	1.48
	(0.01)	(0.01)	(0.00)	[0.001]	[0.137]
Seat Advantage	0.27	0.25	0.31	0.39	1.74
	(0.02)	(0.02)	(0.01)	[0.703]	[0.083]

Governor Democrat	0.59	0.48	0.058	1.25	0.17
	(0.05)	(0.08)	(0.03)	[0.214]	[0.868]
Number of Colleges	115	40	281	--	--

Notes: Source: Authors' Calculations using data from the Integrated Post Secondary Education Data System, Barron's Guide to Colleges 1989, 1990 Census, the Book of the States, Audit Bureau of Circulations, and U.S. News *America's Best Colleges* [various issues]. See Table A2 for the data source for each variable.

TABLE 3: The Effect of USNWR Ranking Inclusion on College Expenses and Revenue

Dependent Variable = Log (Financial Variable per FTE)

	Total Main Expense (1)	State Appropriation Revenue (2)	Tuition and Fee Revenue (3)
Added-in * After 1991	0.032**	0.068***	0.007
	(0.011)	(0.015)	(0.024)
Adjusted R^2	0.947	0.936	0.920
Number of Observations	3485	3488	3488
Number of Colleges	436	436	436

Notes: Source: Author's Calculations. Each main entry in the table reports the coefficient for the regression of the relevant outcome on USNWR inclusion in 1990. The standard errors clustered by college are presented in parentheses. All models included college and year fixed effects. See text for details of exact model specification. * indicates significantly different from zero at the 10% level of significance; ** indicates significantly different from zero at the 5% level of significance; *** indicates significantly different from zero at 1% level of significance.

TABLE 4: The Effect of USNWR Ranking Inclusion on College State Appropriations: Alternative Time Trend Specifications

Dependent Variable = Log (State Appropriation Revenue per FTE)

	Baseline	Size Quantile-Year Fixed Effects	Flagship-Year Fixed Effects	College Specific Linear Trends	State-Year Fixed Effects
	(1)	(2)	(3)	(4)	(5)
Added-in * After 1991	0.068***	0.053**	0.058***	0.034***	0.068***
	(0.015)	(0.021)	(0.016)	(0.010)	(0.012)
Size Quartile-year fixed effects	NO	YES	NO	NO	NO
Flagship-year fixed effects	NO	NO	YES	NO	NO
College-specific linear trends	NO	NO	NO	YES	NO
State-year fixed effects	NO	NO	NO	NO	YES
Adjusted R^2	0.936	0.937	0.936	0.139	0.966
Number of Observations	3488	3488	3488	3052	3488
Number of Colleges	436	436	436	436	436

Notes: Source: Author's Calculations. Each main entry in the table reports the coefficient for the regression the log (State Appropriation Revenue per FTE) on USNWR inclusion in 1990. The standard errors clustered by college are presented in parentheses. All models included college and year fixed effects. See text for details of exact model specification. Baseline results in column (1) are from Table 3. * indicates significantly different from zero at the 10% level of significance; ** indicates significantly different from zero at the 5% level of significance; *** indicates significantly different from zero at 1% level of significance.

TABLE 5: The Effect of USNWR Ranking Inclusion on College State Appropriations: Alternative Control Groups and Time Horizons

Dependent Variable = Log (State Appropriation Revenue per FTE)

	Baseline	Control = Previous in Only	Control = Never in Only	Control = Regional Only	Short-run and Long-run	Count 1990 As Post
	(1)	(2)	(3)	(4)	(5)	(6)
Added-in * After 1991	0.068***	0.102***	0.063***	0.069***	0.067***	0.059***
	(0.015)	(0.024)	(0.016)	(0.015)	(0.017)	(0.014)
Added-in * Year = 1991 or 1992	--	--	--	--	0.002	--
					(0.010)	
Adjusted R^2	0.936	0.952	0.935	0.933	0.936	0.938
Number of Observations	3488	1240	3168	3416	3488	3924
Number of Colleges	436	155	396	427	436	436

Notes: Source: Author's Calculations. Each main entry in the table reports the coefficient for the regression the log (State Appropriation Revenue per FTE) on USNWR inclusion in 1990. The standard errors clustered by college are presented in parentheses. All models included college and year fixed effects. See text for details of exact model specification. Baseline results in column (1) are from Table 3. * indicates significantly different from zero at the 10% level of significance; ** indicates significantly different from zero at the 5% level of significance; *** indicates significantly different from zero at 1% level of significance.

TABLE 6: The Effect of USNWR Ranking Inclusion on College State Appropriations: Redistribution Responses

Dependent Variable = Log (State Appropriation Revenue per FTE)

	Baseline	By Flagship College	Effect on Previous-ins
	(1)	(2)	(3)
Added-in * After 1991	0.068***	0.063***	0.063***
	(0.015)	(0.024)	(0.016)
Added-in * After 1991 * Flagship College	--	-0.040	--
		(0.033)	
Added-in * After 1991 * State Flagship College is Previous In	--	-0.044	--
		(0.057)	
Previous-in * After 1991	--	--	-0.039
			(0.024)
Adjusted R^2	0.936	0.936	0.936
Number of Observations	3488	3488	3488
Number of Colleges	436	436	436

Notes: Source: Author's Calculations. Each main entry in the table reports the coefficient for the regression the log (State Appropriation Revenue per FTE) on USNWR inclusion in 1990. The standard errors clustered by college are presented in parentheses. All models included college and year fixed effects. See text for details of exact model specification. Baseline results in column (1) are from Table 3. * indicates significantly different from zero at the 10% level of significance; ** indicates significantly different from zero at the 5% level of significance; *** indicates significantly different from zero at 1% level of significance.

TABLE 7: The Effect of USNWR Ranking Inclusion on College State Appropriations: Attention Interactions

Dependent Variable = Log (State Appropriations per FTE)

	Baseline (1)	Demographic (2)	Population Exposed (3)	Political (4)	All (5)
Added-in * After 1991	0.068***	0.075***	0.057***	0.079***	0.083***
	(0.015)	(0.015)	(0.016)	(0.023)	(0.021)
Added-in * After 1991 * Pre-College Age Population Share	--	0.046***	--	--	0.066***
		(0.016)			(0.016)
Added-in * After 1991 * College Age Population Share	--	-0.053***	--	--	-0.092***
		(0.016)			(0.018)
Added-in * After 1991 * Percentage of State Students at Added-in	--	--	0.039***	--	0.017
			(0.015)		(0.014)
Added-in * After 1991 * U.S. News Newsstand Circulation	--	--	-0.008	--	0.037**
			(0.027)		(0.017)
Added-in * After 1991 * U.S. News Subscription Circulation	--	--	-0.006	--	-0.076**
			(0.018)		(0.017)
Added-in * After 1991 * Voter Turnout	--	--	--	0.027**	-0.016
				(0.012)	(0.012)
Added-in * After 1991 * Seat Advantage	--	--	--	0.008	0.003
				(0.011)	(0.011)
Added-in * After 1991 * Governor Democrat	--	--	--	-0.012	-0.027
				(0.024)	(0.023)
Adjusted R^2	0.936	0.937	0.936	0.936	0.937
Number of Observations	3488	3488	3488	3488	3488
Number of Colleges	436	436	436	436	436

Notes: Source: Author's Calculations. Each main entry in the table reports the coefficient for regressing the log (State Appropriation Revenue per FTE) on USNWR inclusion in 1990. The standard errors clustered by college are presented in parentheses. All models included college and year fixed effects. See text for details of exact model specification. Baseline results in column (1) are from Table 3. Additional State-Level Interactions are: per capita income, percent of population with college degree, unemployment rate, and the percentage of college students at public colleges. * indicates significantly different from zero at the 10% level of significance; ** indicates significantly different from zero at the 5% level of significance; *** indicates significantly different from zero at 1% level of significance.

TABLE 8: The Effect of USNWR Ranking Inclusion on College State Appropriations: Prior Updating Interactions

Dependent Variable = Log (Financial Variable per FTE)

	State Appropriation Revenue (1)	Tuition and Fee Revenue (2)
Added-in * After 1991	0.078***	-0.022
	(0.028)	(0.026)
Added-in * After 1991 * Certain Good News	-0.025	0.009
	(0.034)	(0.037)
Added-in * After 1991 * Ambiguous Good News	0.031	0.007
	(0.035)	(0.030)
Added-in * After 1991 * Ambiguous Bad News	-0.019	0.087
	(0.034)	(0.066)
Added-in * After 1991 * Certain Bad News	-0.104***	-0.018
	(0.036)	(0.039)
Adjusted R^2	0.936	0.920
Number of Observations	3488	3488
Number of Colleges	436	436

Notes: Source: Author's Calculations. Each main entry in the table reports the coefficient for the regression the relevant outcome on USNWR inclusion in 1990. The standard errors clustered on college are presented in parentheses. All models included college and year fixed effects. Baseline results in column (1) are from Table 3. See text for details of exact model specification. * indicates significantly different from zero at the 10% level of significance; ** indicates significantly different from zero at the 5% level of significance; *** indicates significantly different from zero at 1% level of significance

TABLE A1: Variable Definitions, Sources and Units of Observation

Variable Name	Definition
A: Integrated Postsecondary Education Data System (IPEDS), College-level	
Total Main Expense	= Total funds spent on instructional expenditure, academic support, student services and institutional support functions per FTE in the 12-month fiscal year
Tuition and Fee Revenue	= Total funds received from Tuition and Fees per FTE in the 12-month fiscal year
State Appropriation Revenue	= Total funds received from State Appropriations per FTE in the 12-month fiscal year
B. U.S. News and World Report "America's Best Colleges" Issues, College-level	
Added-in	= Included in the USNWR rankings for the first time in 1990
Previous-in	= Included in the USNWR rankings before 1990
Never-in	= Never included in the USNWR rankings (during the sample period)
Percentage of State Enrollment at Added-in	= Percentage of Students in a State attending Added-in Colleges in 1987 (State-level)
C. Barron's Profiles of American Colleges Book 1989, College-level	
Barron's Guide 1989 Ranking	= College selectivity category (1=most selective, 8=least selective)
No News	= Barron's Guide 1989 based ranking indicates the *same* quality as the USNWR 1990 quartile ranking
Certain Good News	= Barron's Guide 1989 based ranking indicates *clearly worse* quality than the USNWR 1990 quartile ranking
Ambiguous Good News	= Barron's Guide 1989 based ranking indicates *likely worse* quality than the USNWR 1990 quartile ranking
Ambiguous Bad News	= Barron's Guide 1989 based ranking indicates *likely better* quality than the

	USNWR 1990 quartile ranking
Certain Bad News	= Barron's Guide 1989 based ranking indicates *clearly better* quality than the USNWR 1990 quartile ranking

D. Author Collected from College Websites, College-level

Flagship Status	= College is the Flagship Campus in the State

E. 1990 Census, State-level

Pre-College Age Population Share	= The share of the state population in 1990 that is aged 14 to 17
College Age Population Share	= The share of the state population in 1990 that is aged 18 to 22

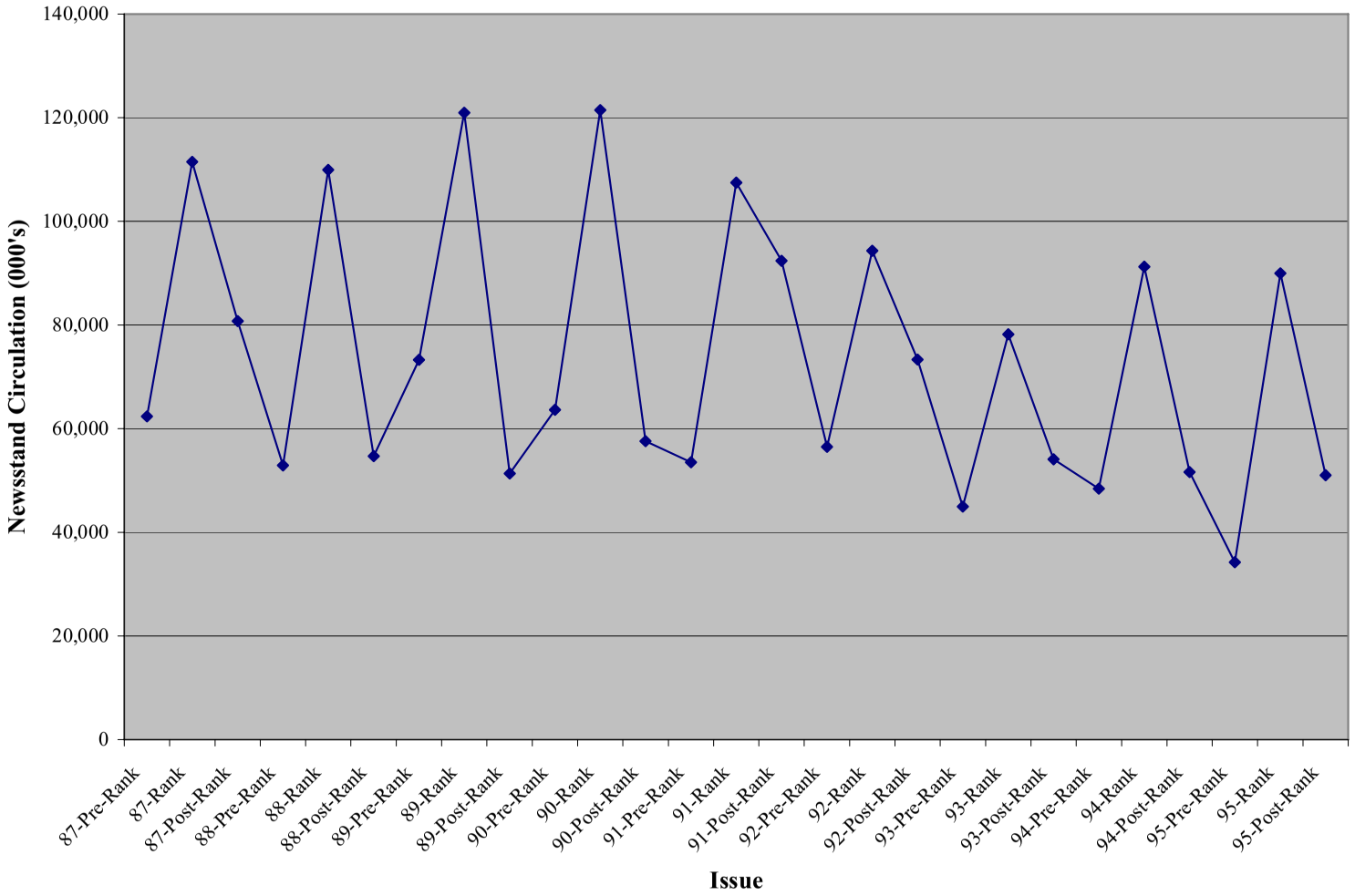
F .Book of the States, State-level

Voter Turnout	= The ratio of number of voters in non-presidential elections to the total voting population in 1986
Seat Advantage	= The absolute difference between the number of Republican seats and the number of Democrat seats divided by the total number seats in the House and Senate in the state
Governor Democrat	= Whether the governor is a Democrat in 1990

G. Audit Bureau of Circulations (ABC), State-level & National-level

U.S. News Subscription Circulation	= U.S. News and World Report Subscriptions (October 30, 1989) Per 1000
U.S. News Newsstand Circulation	=U.S. News and World Report Copies Sold at the Newsstand (October 30, 1989) Per Million

FIGURE 1: U.S. News and World Report Newsstand Sales, 1986-1995



Notes: Source: Author's calculations using Audit Bureau of Circulations (ABC) national-level data for the newsstand sales of USUNWR for the college ranking and contiguous issues.

FIGURE 2: History of U.S. News College Quality Rankings

Year:	Before 1983	1983-86	1987-1989	1990-1994	1995 and After
US News Ranking Method:	No US News	Top 10	Top 25	Top 25 + 4 Tiers for National Colleges	Top 50 + 3 Tiers for National Colleges
Number of Colleges Ranked:	0	76	124	439	482

Source: U.S. News *America's Best Colleges* [various issues]. The number of colleges ranked includes both public and private colleges, and includes the total number of colleges in any category in a given year.

FIGURE 3: Illustration of the Creation of Informational Content Variables

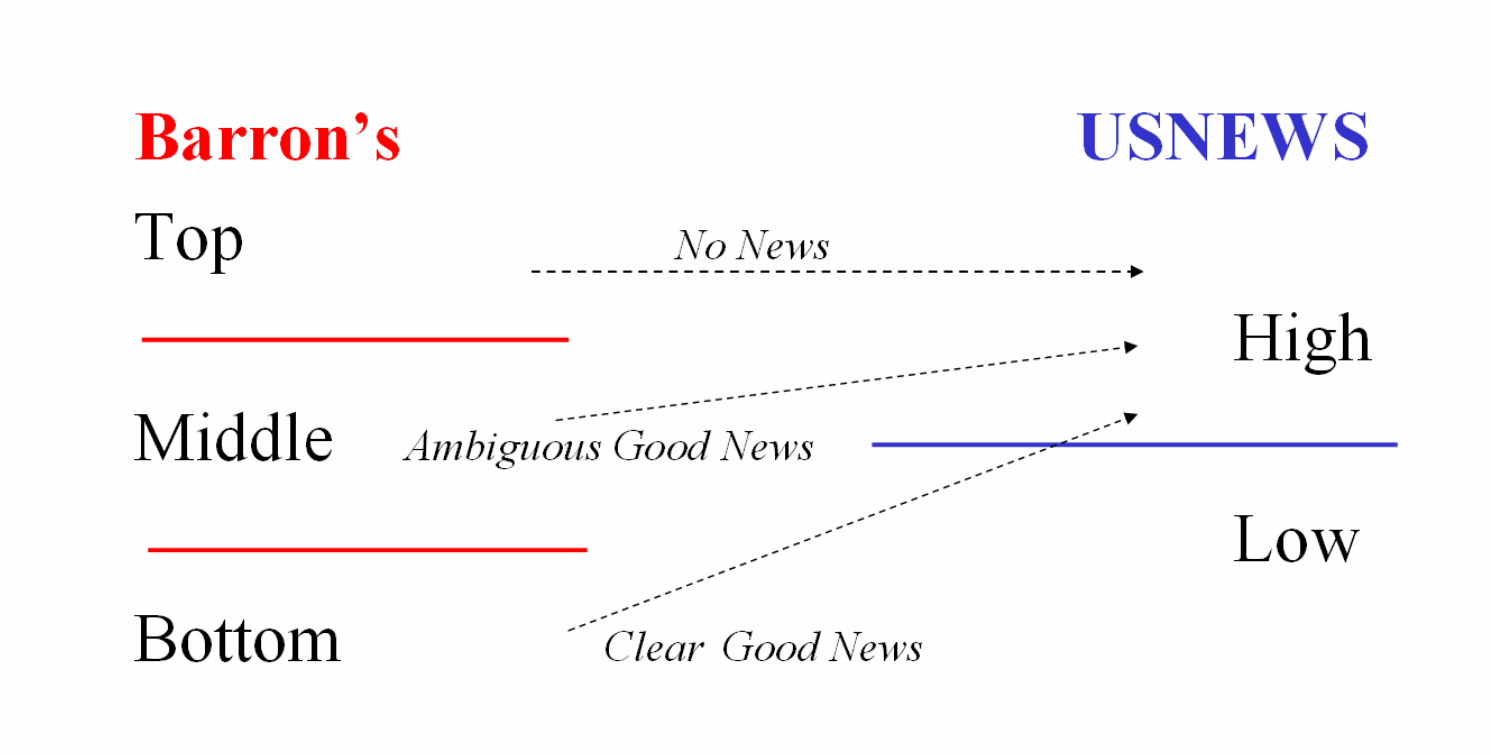
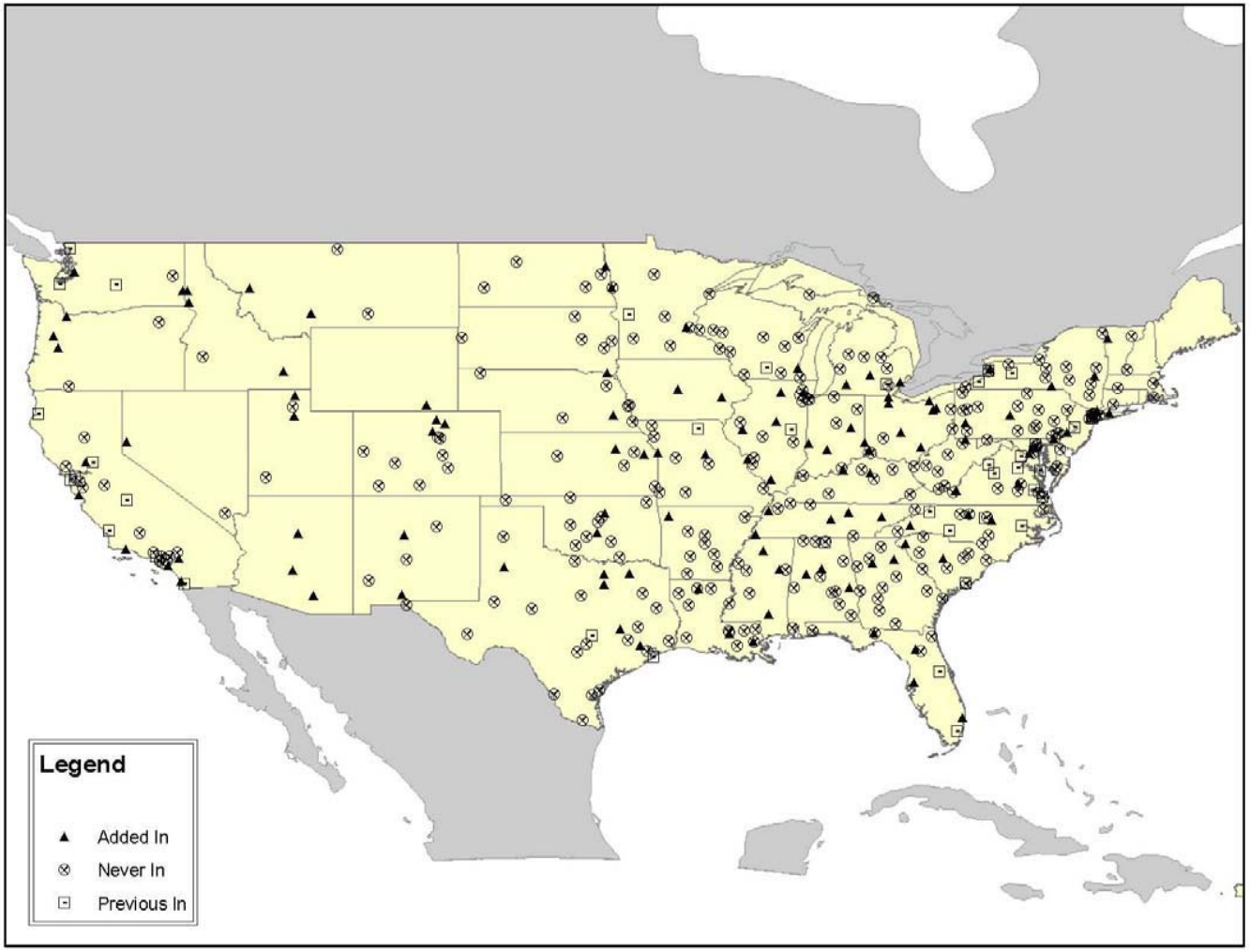
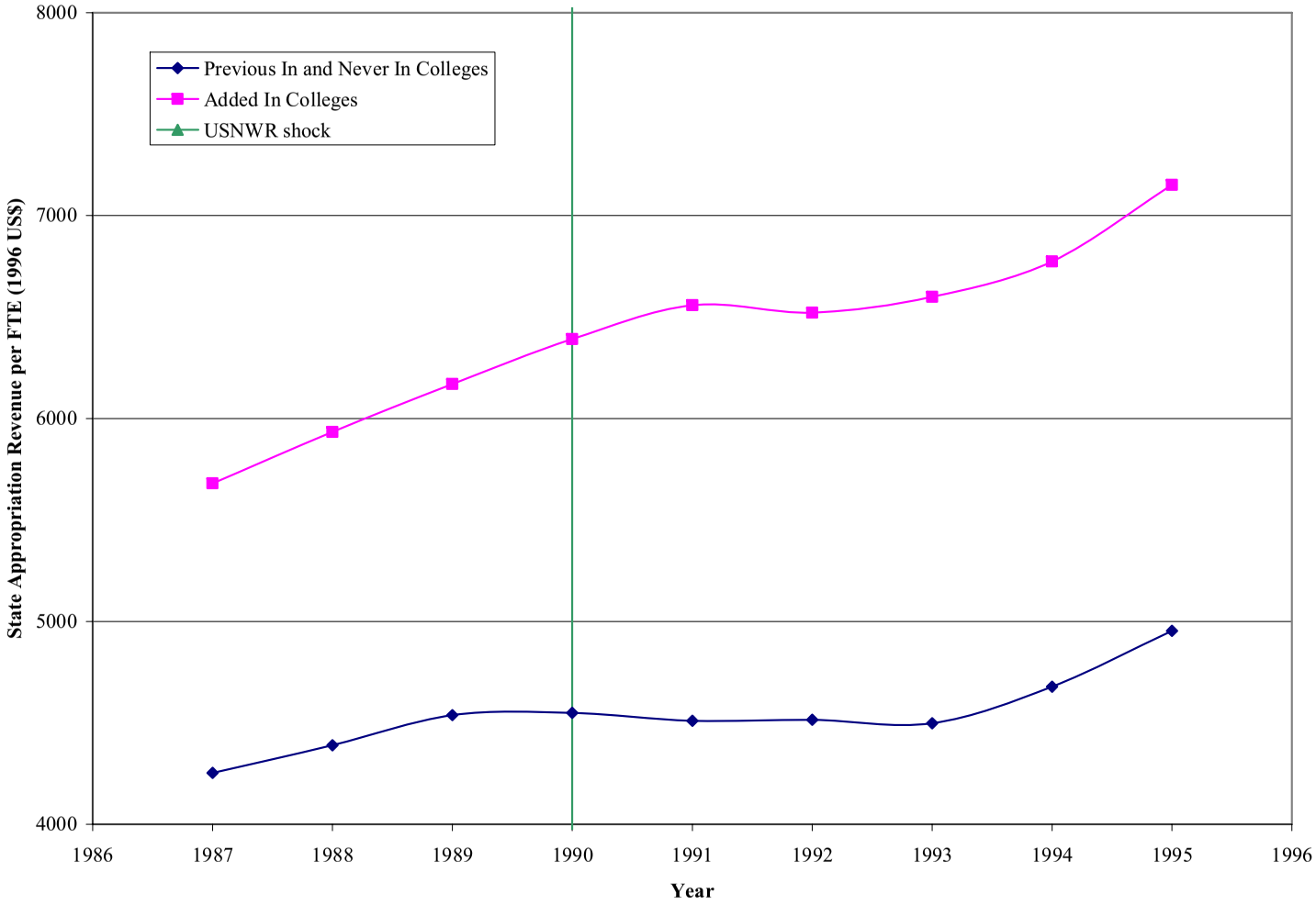


FIGURE 4: Public College Location Map, by USNWR 1990 Inclusion Status



Notes: Source: Author's Calculations using IPEDS and USNWR data from 1987-1995. All location are based on the college zip code in 1987

FIGURE 5: Public College State Appropriation Revenue 1986-1995, by USNWR 1990 Inclusion Status



Notes: Source: Author's Calculations using IPEDS and USNWR data from 1987-1995.