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1. List of current and pending publications based on the project's findings

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Modeling U.S. News & World Report's Predicted Graduation Rate and Explaining Differences between Actual and Predicted Rates

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Abstract: Research shows that a student who is retained at a college for four years generates the same income as four new students who leave after one year and students who graduate are less likely to default on student loans than those who withdraw; hence, colleges need to better understand what factors impact their graduation rates especially during these financially difficult times. This paper investigates U.S. News and World Report's "graduation rate performance" measure for liberal arts institutions as well as alternate models of predicted graduation rate performance. The results highlight the need for confidence intervals when reporting predicted graduation rates since differences may be erroneously attributed to the value-added of the institution when in fact it is random error.

Keywords: graduation rates, liberal arts, confidence intervals, U.S. News and World report, rankings

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INTRODUCTION

College Rankings

Ranking colleges and universities is not a new phenomenon; however, the number of college guides and publications that provide some type of undergraduate ranking system has grown substantially in the past two decades. The following are examples of some of the more well-known: (a) Barron's, (b) College Board, (c) Fiske, (d) Peterson's, (e) Princeton Review, (f) U.S. News & World Report (USNWR), and (g) Washington Monthly.

One of the best-known, and most widely criticized of these publications, is U.S. News & World Report's America's Best Colleges. Published annually in both print and online versions, this edition provides rankings in several categories: (a) National Universities, (b) Master's Universities, (c) Historically Black Colleges, (d) Liberal Arts Colleges, and (e) Baccalaureate Colleges. Rankings are also provided by region - Northern, Southern, Midwestern, and Western. Rancor over this type of ranking data has always existed, but it appeared to reach a fever pitch in 2007 when a number of college presidents, mostly from liberal arts colleges, denounced USNWR's ranking system. Let us examine the good and bad of college rankings.

The Good

Not surprisingly, those that publish such rankings are in favor of their methodology and use. USNWR states "[t]he data we gather on America's colleges—and the rankings of the schools that arise from these data—serve as an objective guide by which students and their

parents can compare the academic quality of schools” (Morse & Flanigan, 2007). In addition, The Princeton Review (2006), which provides rankings in 62 categories, states that their rankings reflect “environmental considerations” and “are meant to provide broad categorizations of the college experience on each campus” (p.25).

Other sources, including critics, provide at least three ways in which colleges rankings are good. (Barnes, n.d.; College Confidential, n.d.) First, colleges are listed by category and region, making it easier for students and parents to see their options and to perhaps identify schools that were not on their original short list. Second, the rankings normally come with detailed data about the institutions and are available in one central location, making comparisons among institutions easier. Finally, college rankings may influence a school to improve services or programs that impact educational outcomes.

Others argue from the point of accountability, as raised by the Spellings Commission report (Carey, 2007). Carey argues that “real” accountability is a myth and that ranking systems, similar to USNWR, are steps in the right direction even if some of the details are problematic. Such ranking systems not only collect and report data but they “push institutions to act” which is a vital component missing from most accountability systems.

The Bad

In May 2007, a group of college presidents sent a letter to colleagues seeking their commitment to a new approach to college rankings. To quote directly from the letter sent by The Education Conservancy (2007) on behalf of 12 college presidents, USNWR rankings:

1. imply a false precision and authority that is not warranted by the data they use;
2. obscure important differences in educational mission in aligning institutions on a single scale;

3. say nothing or very little about whether students are actually learning at particular colleges or universities;
4. encourage wasteful spending and gamesmanship in institutions' pursuing improved rankings;
5. overlook the importance of a student in making education happen and overweight the importance of a university's prestige in that process; and
6. degrade for students the educational value of the college search process.

While it may be no surprise that college administrators are against such ranking systems, representatives of the college guides themselves also question the systems. Graham and Thompson (2001) provide a very clear and detailed argument about the pitfalls of USNWR's rankings. Graham was the former director for data research at USNWR while Thompson is an editor at Washington Monthly, another publication that provides ranking data. The authors contend that the most glaring omissions from USNWR rankings are measures of student learning and good educational practices. More pointedly "U.S. News' rankings primarily register a school's wealth, reputation, and the achievement of the high-school students it admits" (para. 13).

Finally, those who conduct research within the realm of higher education have also questioned the usefulness of such ranking systems. George Kuh (2007), former director of the National Survey of Student Engagement (NSSE), recently discussed the pressure to produce "a consumer-friendly information database" per the recommendations of the Spellings Commission. Kuh contends that "a common reporting template" is meant to serve three purposes: (a) Improvement, (b) Transparency, and (c) Accountability; however, he also highlights "problematic" as well as "unacceptable possibilities." It is within his discussion of these "unacceptable possibilities" that Kuh raises his concerns over the use of ranking data. First, a

single ranking does not explain complicated student-and-institution level patterns in the data. Second, “rankings tend to exaggerate differences between institutions” (p. 33) and, finally, unwarranted resources and time are devoted to attempts to improve one’s ranking as opposed to targeting what matters most – teaching and learning.

Graduation and Retention

As mentioned previously, all measures of retention and graduation account for 25% of USNWR’s ranking system; hence such measures are quite important to a college’s overall rank. Graduation and retention rates are inextricably linked – higher retention rates translate into higher graduation rates and vice versa. Various theories and models have been put forth to help understand, and explain, student attrition (Astin, 1984, Bean, 1980; Pascarella, 1985; Tinto, 1975, 1987). Inevitably, the research examines two sets of characteristics: student and institutional.

Student Characteristics

Pre-entry characteristics include measures of demographics (e.g., gender, race/ethnicity, age), entering ability (e.g., SAT/ACT scores, class rank), and background characteristics (e.g., socioeconomic status, family education, etc.) (Astin, 1975, 1977; DesJardin, McCall, Ahlburg, & Moye, 2002; Goenner & Snaith, 2004; Scott, Bailey, and Kienzl, 2006; Tinto, 1975, 1987). Naturally, colleges cannot influence these variables but can rather limit their selection of students based on these pre-entry characteristics.

Research has found that women graduate at higher rates than men (Astin, 1975; DesJardin, et al., 2002; Goenner & Snaith, 2004; Scott, Bailey, and Kienzl, 2006; Tinto, 1987). Astin (1975) and Pascarella & Terenzini (1991) noted gender differences at the institution level such that same sex women’s colleges had higher graduation rates than their male counterparts. Meanwhile, the findings of the effects of race/ethnicity on graduation rates are slightly mixed.

Astin (1975) found higher drop out rates among minority students, especially Black students, but Tinto (1987) found that the effect of race was removed when social status was controlled. In addition, DesJardin, et al. (2002) found the negative effect of membership in a minority group diminished when financial aid and GPA were controlled. Finally, traditional age students have higher graduation rates than their non-traditional age counterparts (Astin, 1975; Goenner & Snaith, 2004; Ryan, 2004). NCES defines a nontraditional student as one with the following characteristics which are most often correlated with age: (a) delayed enrollment in postsecondary education; (b) part-time attendance; (c) financially independent; (d) single parent; (e) dependent care responsibilities; (f) full-time employment; and (g) lack of a high school diploma.

Entering academic ability has been studied extensively and, overall, the research concludes that students with higher SAT/ACT scores and those ranked higher in their class have higher retention and graduation rates (Astin, 1975, 1997; Goenner & Snaith, 2004; Ryan, 2004; Tinto, 1987). Hence, these groups of students are better prepared for the academic rigors associated with college more than their counterparts.

Finally, background characteristics also affect persistence and graduation. Astin (1975) noted that the relationship between family income and attrition was mediated by other factors such as ability, parental education, and finances. Later (1977), he concluded that students from “relatively wealthy families are more likely to...have better chances of graduating” (p. 219). Thayer (2000) highlighted work by Mortenson (1998) showing that students from low-income backgrounds completed a baccalaureate degree at a 5% rate compared to their higher-income peers whose rate was 75%. In addition, first-generation students, those whose parents had not earned a bachelor’s degree, persisted and graduated at lower rates in both four-year institutions and two-year public institutions (U.S. Department of Education, 1998a).

Once students are at the college, various models have examined similar variables - social and academic integration (Tinto, 1987), student involvement (Astin, 1975), and student engagement (Pascarella & Terenzini, 1991; Kuh, 2001). The distinguishing factor in all of the models is the interaction between the student and institution at both the social and academic levels. In other words, colleges are not just bastions of learning but they must also pay special attention to the social needs and integration of their students if they hope to retain and graduate them.

In Tinto's (1987) model, academic integration is composed of both academic performance and student interactions with faculty and staff. "The more frequent and rewarding interactions are between students and other members of the institution, the more likely are individuals to stay" (p. 150). Social integration is composed of extracurricular activities and peer-group interactions. Tinto theorized that students might integrate well into the academic system of a college but not the social or vice versa and that this lack of integration would have a direct effect on their decision to stay or leave an institution.

Astin's (1975) model of student involvement is quite similar to Tinto's such that "integration" could be substituted for "involvement." Astin discusses three areas: academics, faculty, and peer groups. Students who are academically involved are characterized as those who "spend a great deal of time at and say they work hard on their studies" (p. 222). Student-faculty interaction exhibits the strongest relationship among all involvement variables as well as any other student or institutional characteristic (p.223). When referring to peer group involvement, Astin included athletics, research, and student government activities. In the end, Astin (1975) concluded that "[A]ll three patterns of high involvement – interpersonal, academic, and athletic – lead to increased chances of completing college...(p. 241).

The concept of student engagement was put forward by Pascarella & Terenzini (1991) but was taken to another level by the development of the National Survey of Student Engagement (NSSE) in 2001. Two components are vital to student engagement: (a) What students do – time and energy devoted to educationally purposeful activities; (b) What institutions do – using effective educational practices to induce students to do the right things (Kuh, 2001). NSSE developed Five Benchmarks of Effective Educational Practice to facilitate the discussion surrounding student engagement. They include:

1. Level of Academic Challenge: Refers to levels of the importance placed on academic effort and expectations for student performance.
2. Active & Collaborative Learning: Refers to the involvement level of students in their education and how often they are asked to think about what they are learning in different settings.
3. Student-Faculty Interaction: Refers to how students learn from their teachers who serve as role models, mentors, and guides for continuous, life-long learning.
4. Supportive Campus Environment: Refers to the quality of the working and social relations of the student with different groups on campus.
5. Enriching Educational Experiences: Refers to the fact that complementary learning opportunities enhance academic programs (e.g., internships, community service, study abroad, etc.)

Based on the above literature related to social and academic integration, involvement, and engagement, we can conclude that colleges can positively impact persistence and graduation by:

1. Ensuring student involvement in academic and non-academic activities.
2. Fostering an environment of learning.

3. Setting high expectations.
4. Creating environments that encourage contact between students and faculty
5. Providing clear communication about majors and career path options

Institutional Characteristics

Institutional variables affecting graduation rates include type (public/private), selectivity, and size (Pascarella & Terenzini, 1991). In addition, researchers have also examined the effect of financial aid and other resources on retention and graduation rates (Choy, 2002; Lotkowski, Robbins, & Noeth, 2004; Pascarella, 1985; Tinto, 1982).

Generally, graduation rates are lower among public colleges and universities in comparison to their private counterparts (Tinto, 2003). Institutional selectivity refers to the average or median score of entering or enrolled students on standardized tests, such as the SAT or ACT. Research indicates that institutional SAT/ACT scores correlate significantly with retention and graduation rates (Astin, 1975, 1997; Choy, 2002; Lotkowski, Robbins, & Noeth, 2004; Tinto, 1987). Student selectivity accounts for 15% of USNWR's overall ranking and is comprised of acceptance rate, either the proportion of students in the Top 10% or Top 25% depending on type of institution, and SAT/ACT scores. Critics have commented that private colleges naturally outperform public ones since the mission of public institutions is to take less qualified students (Van Der Werf, 2007). Finally, institution size has also been found to predict graduation rates with small to medium sized enrollment colleges having higher rates (Pascarella & Terenzini, 1991).

It is hard to imagine a theory of retention/graduation that did not address the issue of institutional financial support. For many students, the greatest obstacle to higher education is the cost. The Spellings Commission and others have highlighted the unacceptable nature of skyrocketing tuition fees. In fact, just recently, the U.S. House introduced H.R. 4137, the

College Opportunity and Affordability Act of 2007, to reauthorize and amend the Higher Education Act. The Higher Education Act (HEA) authorizes the major federal student aid programs that are responsible for the majority of financial assistance to postsecondary students. The issue of college prices and the need for colleges to rein them in was raised on and off throughout the hours of debate on the House floor (Inside Higher Ed, 2007).

Tinto (1982) noted that finances have a major impact on student attrition at the point of entry and can subsequently affect persistence due to fluctuations in financial need. Since the 1990's there has been a shift in financial aid with increased loans being offered in place of grants, a move which disproportionately affects low-income students who have more need. There is ample research that financial aid does impact persistence and graduation (Gansemer-Topf & Schuh, 2006; Morris, Wu, & Finnegan, 2005; Texas State Higher Education Coordinating Board, 2004; Tinto, 1982) but quite clearly there is an interaction with socioeconomic status, and likely, family education.

Recently, Gansemer-Topf & Schuh (2006) and Ryan (2004) examined the effects of institutional expenditures on graduation rates. Ryan's study focused on the relationship between expenditures for instruction, academic support, and student services and 6-year graduations rates while Gansemer-Topf & Schuh's study expanded their expenditure data to include institutional support and institutional grants. Ryan found significant positive correlations between instructional and academic support expenditures and 6-year graduation rates. There was no effect on graduations rates for expenditures on student services. Gansemer-Topf & Schuh confirmed Ryan's earlier results regarding the positive contributions of expenditures on instruction and academic support on graduation rates but also found a positive effect for institutional grants. Interestingly, "expenditures for student services either did not contribute to

retention or graduation rates or there was a negative relationship...” (p.633). The authors offered two explanations: (a) the sample studied may have influenced the results since all colleges were small; and (b) these types of monies are typically allocated to the Admissions office whose focus is on “recruiting” students and not necessarily “retaining,” as well as the Registrar’s office which is not directly related to student success. Gansemer-Topf & Schuh (2006) also found that institutional support expenditures negatively contributed to graduation rates. Expenditures in this area are focused in the administrative areas of legal and fiscal operations as well as public relations and thus may end up diverting funds from the other expenditure categories that actually impact the graduation rate.

RESEARCH QUESTIONS

The focus of the project is on “graduation rate performance.” Overall, the current research is designed to: (a) test the validity of the USNWR model of predicted graduation rates, (b) redesign USNWR’s model to include relevant excluded variables related to degree completion, and (c) build an explanatory model of factors that may help explain differences between actual and predicted graduation rates. The following research questions will be addressed:

1. Is it possible to replicate the predicted graduation rates as published by U.S. News & World Report for the Top 100 Liberal Arts Colleges?
2. Are there more powerful, and explanatory, models of predicted graduation rates that incorporate additional variables from the literature - those not included in USNWR’s model?
3. What are the differences between actual and predicted graduation rates among various liberal arts colleges using different models?

4. What variables help explain why one college's actual graduation rate is much higher, or lower, than predicted?

METHODOLOGY

Sampling

There are a total of 262 Liberal Arts institutions, as identified by USNWR's 2008 *America's Best Colleges* publication; however, using the 2000 Carnegie Classification system, there are 188 Liberal Arts institutions. In order to compare the USNWR and alternate models, the researcher utilized only the 188 Liberal Arts institutions when conducting analyses¹.

Variables

Table 1 details the independent variables of interest, the data source(s) from which the variables are collected, and a brief description.

[INSERT TABLE 1]

Where feasible, data was collected from multiple sources. For example, USNWR provides SAT/ACT scores but the data are also available through the Integrated Postsecondary Education Data System (IPEDS). Nearly all variables used in the analyses are from publicly available data sources. The dependent variable is 6-year graduation rate for the Fall 2000 cohort.

The need for multiple data sources became quite pronounced during the project, especially with respect to the dependent variable, 6-year graduation rate. Upon request, USNWR provided the researcher with Excel tables containing data from that year's ranking. The

¹ At the 2009 AIR Forum, Bob Morse, from U.S. News & World Report, noted that they had used the newer Carnegie Classification system when grouping these institutions under the title of "Liberal Arts." Under the 2005 Carnegie Classification virtually all were categorized as "Arts & Sciences."

researcher also downloaded the 6-year graduation rates from IPEDS in order to compare the rates reported by the two sources. Table 2 highlights the differences.

[INSERT TABLE 2]

Even though the categories presented in Table 2 are arbitrary, the researcher contends that nearly all IR professionals would agree that a difference of +/- 5% is a large one, especially when dealing with graduation rates. Hence, nearly 7% of the institutions in the sample reported 6-year graduation rates either higher or lower to USNWR and IPEDS. Needless to say, such discrepancies impact predicted graduation rates and ultimately, “graduation rate performance.”

RESULTS AND DISCUSSION

Research Question #1: Is it possible to replicate the predicted graduation rates as published by U.S. News & World Report for the Top 100 Liberal Arts Colleges?

The Predicted Graduation Rate Methodology, used for the *2008 America’s Best Colleges* edition, was received from a USNWR contact. The one-page document detailed the variables included in the regression equation as well as the beta weights associated with each of the explanatory variables. The regression equation for Liberal Arts Colleges was:

$$\begin{aligned} & -2.208 - (18.372/\text{square root of expenditures per student}) + (.057 * \text{standardized test} \\ & \text{score}) + (-3.30*10^{-9})*(\text{standardized test scores}^3) + (.285 * \text{proportion of students in} \\ & \text{top 25\% of high school class}) + (-9.617 \text{ if the school is public}) + (-33.498 * \text{proportion of} \\ & \text{student body receiving Pell grants}) \end{aligned}$$

Table 3 highlights the Ordinary Least-Squared (OLS) regression results, using the variables highlighted above, and shows that the model was significant in predicting 6-year

graduation rates for the 188 Liberal Arts Colleges. SAT z-score and Top 25% had direct, positive effects while Percent Pell and Public had negative effects on 6-year graduation rates.

[INSERT TABLE 3]

The parameter estimates from the USNWR equation and those listed in Table 3 are not the same. One explanation for the inability to replicate the model is that the sample of colleges was 188 versus 262. It should be noted that the researcher did run the model with the 262 colleges and the results were very similar to those for the 188. In the end, although the exact parameter estimates were not reproduced, they were all in the same direction as the original USNWR model. In other words, if the USNWR parameter estimate was negative or positive, so too was the replicated model estimate.

Another explanation for the replicated difference revolves around data integrity issues. Clearly, 6-year graduation rates reported to USNWR and IPEDS did not always correspond and there are valid explanations for such a fact but it did, and will, affect predictive modeling based on such rates. In addition, the data provided in Excel tables by USNWR did not contain all data necessary to run the model. Percent Pell and expenditures per student had to be retrieved from the Postsecondary Opportunity web site and IPEDS, respectively. It is quite possible that the years pulled for analysis or the data itself were not the same as what USNWR used to run their original model even though the researcher went to great lengths to establish the correct years with the USNWR contact. Ultimately, the researcher was not surprised that the equation and subsequent predicted rates could not be replicated since the rankings are a proprietary enterprise rather than an academic endeavor designed to ensure reliable and valid results.

Research Question #2: Are there more powerful, and explanatory, models of predicted graduation rates that incorporate additional variables from the literature - those not included in USNWR's model?

Research Question #4: What variables help explain why one college's actual graduation rate is much higher, or lower, than predicted?

These two research questions are inextricably linked and therefore, the results are presented together. The same type of regression analysis, OLS, was used to test an alternate model to predict 6-year graduation rates. Variables from the literature that were added to those found in the USNWR model² included: 1) Percent Minority, 2) Percent Female, 3) Undergraduate Enrollment, 4) Acceptance Rate, 5) Discount Rate, and 6) Religious Affiliation. For all new continuous variables, a three-year average was entered into the model (2000-2002). In addition, expenditures per student was not entered into the model as one variable but rather as the major categories of instruction, academic support, institutional support, and student services per other research studies on 6-year graduation rates (Gansemer-Topf, 2006; Ryan, 2004).

Results indicated that in addition to SAT z-score and Percent Pell, Discount Rate, Acceptance Rate, and Undergraduate Enrollment significantly predicted 6-year graduation rates (see Table 4). Specifically, SAT z-score, Discount Rate, and Undergraduate Enrollment contributed significantly, and positively whereas, Percent Pell and Acceptance Rate effects were negative.

[INSERT TABLE 4]

² Whether the institution was public or private was NOT included in the alternate model because Pell data retrieved from the Postsecondary Opportunity web site did not have figures available for the Fall 2000 cohort for public institutions.

The results for acceptance rates and undergraduate enrollment are similar to those found elsewhere in the literature (Gansemer-Topf, 2005; Porter, 1999; Ryan, 2004). Specifically, past research has pointed to a positive relationship between size and graduation rates such that larger institutions may offer a better variety and higher level of certain academic and support services that enhance degree attainment (Ryan, 2004). Also, lower acceptance rates translate into lower selectivity which is well established in the literature as resulting in lower graduation rates.

However, closer inspection of the parameter estimates and zero-order correlations as well as the collinearity diagnostics indicate a problem. Suppression is signaled when the signs of r and β differ (see Table 4). Specific variables where the regression and correlation coefficients were in different directions included: 1) SAT cubed, 2) Percent Female, 3) Percent Minority, 4) Discount Rate, and 5) Religious Affiliation. As a rule of thumb, if the tolerance statistic is less than .20 and the VIF value is above 4 then multicollinearity is a problem which is true for both SAT z-score and SAT cubed.

Review of the zero-order correlations among all of the independent variables showed a high correlation between SAT z-score and the other independent variables. Therefore, partial correlations were run holding SAT z-score constant and the results are presented in Table 5. The correlation between 6-year graduation rate and SAT cubed changed from a strong positive to a significant, negative, correlation when SAT z-score was held constant. Meanwhile, negative correlations between graduation rate and Percent Minority, Discount Rate, and Religious Affiliation switched to positive when SAT z-score was held constant normally signaling multicollinearity issues.

[INSERT TABLE 5]

Even though the discount rate results are mixed there is an explanation for the positive parameter estimate in the regression model. Specifically, institutions with higher discount rates also have higher selectivity and are better endowed. The higher selectivity brings in smarter students who are, as a group, more likely to graduate. The competition for them can certainly drive up the discount rate as better funded institutions can afford the higher dollar amounts. The more charges are covered by free money then money becomes less of an issue for a student to stay or leave.

Although many in higher education decry a reliance on standardized test scores, both the USNWR and Alternate models clearly indicate the importance of such scores for predicting graduation rates. However, the results also point to the suppression effect of these standardized test scores in the model. When examining the zero-order correlations, virtually all of the independent variables have significant relationships with graduation rates but when entered into a regression model, only a handful are significant predictors.

Finally, in the original design of the study, first-year NSSE benchmark scores were to be included in the alternate model of 6-year graduation rates; however, there were a large number of missing cases (115 out of 188). Therefore, these regression results are presented separately since there were only 73 valid observations. Table 6 highlights the significant predictors in the Alternate model with the inclusion of NSSE benchmark scores. In the end, only Student-Faculty Interaction entered the model as a significant predictor and its effect was negative.

[INSERT TABLE 6]

Unfortunately, the limited sample size restricts generalizability of these findings. Bob Gonyea, Associate Director, Research & Data Analysis at NSSE, (personal communication, August 3, 2009) discussed the fact that certain items comprising this benchmark may indicate a student is struggling in a class which leads to the increased interaction with the faculty member as opposed to the normally positive connotation used to explain the benchmark. In addition, Pike's 2004 research compared 14 institutions' NSSE benchmarks with the six rankings of academic excellence used by USNWR and he stated, "...the results revealed that *U.S. News* rankings and NSSE benchmarks were not related to one another..." (p. 201-202). Regardless, future research is necessary to determine if the negative effect holds with larger samples and if other benchmarks exert a separate influence on 6-year graduation rates.

Research Question #3: What are the differences between actual and predicted graduation rates among various liberal arts colleges using different models?

As the above results illustrate, the Alternate model reduced the error in the model by one-sixth over USNWR but what does that translate into with respect to predicted graduation rates? Table 7 highlights differences, among a selected group of 10 institutions, between predicted graduation rates for the USNWR and Alternate models.

[INSERT TABLE 7]

Interestingly, when reviewing the actual 6-year graduation rates reported to both USNWR and IPEDS, the institutions highlighted in Table 7 are the same, or within +/- 4% , but the predicted rates vary by larger percentages (+/- 9 and higher). To recap, the USNWR model

contained expenditures per student, standardized test scores, proportion of students in top 25% of high school class, proportion of the student body receiving Pell grants, and a constant if the institution was public. Meanwhile, the Alternate model included the USNWR variables, with the two exceptions noted above, as well as proportion of the student body that was female and minority, the discount and acceptance rates, undergraduate enrollment, and the institution's religious affiliation (0 or 1). The USNWR model accounted for 81% of the variance in 6-year graduation rates while the Alternate model accounted for 84%.

As noted by Porter (1999) predicted values taken from regression equations have error associated with their computation. Porter's results showed how confidence intervals often "bracket" actual graduation rates for many institutions indicating that the difference between actual versus predicted is no longer significant. "Yet, USN (USNWR) and other researchers report these institutions as over- or under-performers, while the models themselves indicate they are performing as expected" (p. 3). Dichev (2001) found that as little as 10% of the variation in an institution's *U.S. News* scores over time was due to changes in the quality of the institution. The remainder of the variation was primarily due to changes in how the ratings were calculated.

Over- or under-performers, per USNWR, are institutions with a +/- 1% difference between actual and predicted 6-year graduation rates. Therefore, the researcher utilized these performance categorizations (Under, Over, or At Expected) to create a classification table between USNWR and the Alternate model with 95% confidence intervals (Alternate 95%). The results are displayed in Table 8.

[INSERT TABLE 8]

The gray-highlighted cells in Table 8 are those instances where the USNWR performance classification matched the Alternate 95%. As the table shows, the two models matched on 54% of the institutions with respect to “graduation rate performance”; however, more interesting are those cells where USNWR classified an institution as Under- or Over-performing yet the Alternate 95% classified it as performing “At Expected” levels. In total, there were 46 institutions, or 28% of the sample, where the Alternate 95% model classified an institution as performing “At Expected” while the USNWR model classified it as Under- or Over-performing.

CONCLUSIONS

The current research confirms Porter’s (1999) assertion that such graduation rate models are volatile. The sample and/or variables have marked effects on the results and in the end error is used to establish “value-added” performance, especially in the absence of confidence intervals.

Table 8 highlights the issue most clearly. Whereas, USNWR attributed “value-added” to 28% of the sample, there were in fact measurable variables accounting for the difference. For example, the researcher’s own institution was classified as underperforming by 9% (actual graduation rate was 73% and USNWR’s predicted rate was 82%). Utilizing the Alternate model, where acceptance and discount rates as well as undergraduate enrollment served as significant predictors, the predicted rate decreased to 76%. Hence, the institution went from underperforming by 9% to 3% with the inclusion of the above-mentioned variables. Taking it one step further, if 95% confidence intervals - 73% (lower) and 78% (upper) - are included then the institution’s performance is actually “At Expected” levels as opposed to underperforming. Unfortunately, this pattern repeats frequently in the findings which leads to the next logical question...How much additional error could be accounted for by identification of influential variables in the model and/or reporting confidence intervals? This researcher was able to reduce

model error by one-sixth with publicly available data and it would stand to reason that USNWR should be able to do the same or better especially since the implication is that those with higher rates are doing a better job at educating students than their counterparts.

It has certainly been argued that colleges and universities have been slow, perhaps even reticent, to provide public data on their institutions, and therefore publications such as USNWR and the guidebooks just did the work that the college administrators should have done themselves (Webster, 1992). Over the last couple of years, a number of additional projects, whose aim was providing the accountability data students and parents need to make informed decisions without rankings were introduced. The National Association of Independent Colleges and Universities (NAICU) developed U-CAN (the University and College Accountability Network), a free college information Web site. Meanwhile, NSSE, in conjunction with USA Today, built a searchable web site located in the Education section of the USA Today site. The site provides results on the five benchmarks scores for first-years and seniors based on results from the college or university's most recent NSSE administration. Nearly 350 schools have agreed to have their NSSE benchmark scores posted on the USA Today web site. Finally, the Education Department, through the National Center for Education Statistics (NCES), announced their revamped IPEDS College Opportunity Online Locator (COOL) site. The 7-year old site is no longer referred to as "COOL" but rather College Navigator (collegenavigator.ed.gov). "College Navigator enables users to search for colleges based on location and program of study. But the new site requires fewer steps to produce the same results and allows users to factor more criteria into their initial searches, including tuition and SAT or ACT scores" (Marklein, 2007).

Quite clearly, the emergence of these non-ranking alternatives is a concerted effort to address accountability concerns and to stave off ranking, but policy makers and administrators

must still address the underlying results of the data that are reported. This research has once again pointed out the weaknesses associated with USNWR “graduation rate performance” and will hopefully serve as a resource for those charged with explaining such gaps in institutional performance.

In closing, future research should address the following issues:

- ❖ *Data integrity.* The results indicate that at a minimum, actual graduation rates may be suspect in approximately 10% of the liberal arts colleges. Such errors affect the model parameters and the resulting coefficients used to create the predicted rates.
- ❖ *Retention rates.* They were excluded from the current modeling because the data were not publicly available for the Fall 2000 cohort; however, given the strong, positive, correlation future research should include these rates in the model.
- ❖ *Multicollinearity.* This phenomenon does not violate OLS assumptions but the greater the multicollinearity, the larger the standard errors. In such situations, the confidence intervals are larger and coefficients must be larger to be statistically significant. The SAT z-score and SAT cubed were highly correlated which affects calculations involving individual predictions. Therefore, future models should pay careful attention to the issue, especially when including linear transformations of variables already included in the model.

Table 1. Variables, Data Sources, and Descriptions

Variables	Data Source	Description
1) Expenditures per student	USNWR	Financial resources are measured by the average spending per full-time-equivalent student on instruction, research, public service, academic support, student services, institutional support, and operations and maintenance (for public institutions only).
2) Standardized test scores	USNWR, IPEDS, CDS	Average test scores on the Critical Reading and Math portions of the SAT or Composite ACT of all enrolled first-time, first-year students.
3) Class rank	USNWR, CDS	Proportion of students in Top 10% of high school class.
4) Pell grants	USNWR, IPEDS	Proportion of students receiving Pell grants.
5) Institution Type	USNWR, IPEDS	Public or private
6) Expenditures for instruction	IPEDS	A functional expense category that includes expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted.
7) Expenditures for academic support	IPEDS	A functional expense category that includes expenses of activities and services that support the institution's primary missions of instruction, research, and public service.
8) Expenditures for student services	IPEDS	A functional expense category that includes expenses for admissions, registrar activities, and activities whose primary purpose is to contribute to students emotional and physical well - being and to their intellectual, cultural, and social development outside the context of the formal instructional program.
9) Expenditures for institutional support	IPEDS	A functional expense category that includes expenses for the day-to-day operational support of the institution.
10) Expenditures for institutional grants	IPEDS	Scholarships and fellowships granted and funded by the institution and/or individual departments within the institution, (i.e., instruction, research, public service) that may contribute indirectly to the enhancement of these programs.
11) Percent female	IPEDS	Proportion of the student body that is female.

Table 1. Variables, Data Sources, and Descriptions (cont.)

Variables	Data Source	Description
12) Percent minority	IPEDS	Proportion of the student body that is Non-White, non-Hispanic; Black, non-Hispanic; Hispanic; Asian or Pacific Islander; American Indian or Alaska Native; Unknown
13) Undergraduate enrollment	IPEDS	Institution's fall enrollment for all levels offered at the institution for full- and part-time students.
14) NSSE Benchmarks	USA Today, College web sites	Level of Academic Challenge, Active & Collaborative Learning, Student-Faculty Interaction, Supportive Campus Environment, Enriching Educational Experiences.
15) Acceptance rate	USNWR, IPEDS, CDS	The ratio of the number of students admitted to the number of applicants for fall admission. The acceptance rate is equal to the total number of students admitted divided by the total number of applicants. Both the applications and acceptances counted only first-time, first-year students.
16) Discount rate	IPEDS	The total institutional grant dollars divided by gross tuition and mandatory fees
17) Religious affiliation	IPEDS	A classification that indicates whether a private not-for-profit institution is associated with a religious group or denomination. Private not-for-profit institutions may be either independent or religiously affiliated.

**Table 2: Differences between USNWR and IPEDS 6-year Graduation Rates:
Fall 2000 Cohort**

	Count	%
+/- 5% points	12	6.5%
+/- 1 to 4% points	48	25.8%
Zero Difference	126	67.7%
TOTAL	186	100.0%

* **Note:** Two institutions had missing values

**Table 3. USNWR Graduation Rate Results:
Means, Standard Deviations, Coefficients, Correlations, Collinearity Statistics, and Model Summary**

	N	Mean	Std Dev	β	Zero-order Correlations	Collinearity Statistics	
						Tolerance	VIF
Expenditures per student	184	0.100	0.004	-3.522	-0.660 ***	0.296	3.373
SAT cubed	176	0.898	1.428	-0.009	0.642 ***	0.247	4.041
SAT z-score	176	0.654	0.582	0.154 ***	0.841 ***	0.117	8.545
Percent Pell	149	0.241	0.160	-0.226 **	-0.735 ***	0.468	2.138
Public	186	0.081	0.273	-0.119 **	-0.389 ***	0.648	1.543
Top 25%	171	65.895	21.423	0.001 *	0.706 ***	0.435	2.300

*p < .05, ** p < .01, *** p < .001

Model	R2	Adj. R2	Root MSE	F	Sig.
6-year Graduation Rate	0.783	0.773	0.076	79.9	<.0001

**Table 4. Alternate Model Graduation Rate Results:
Means, Standard Deviations, Coefficients, Correlations, Collinearity Statistics, and Model Summary**

	N	Mean	Std Dev	β	Zero-order Correlations	Collinearity Statistics	
						Tolerance	VIF
Expenditures for Instruction	164	9.225	0.394	-0.002	0.720 ***	0.201	4.970
Expenditures for Academic Support	163	7.836	0.558	0.023	0.666 ***	0.394	2.535
Expenditures for Institutional Support	164	8.581	0.418	-0.010	0.378 ***	0.365	2.737
Expenditures for Student Services	164	8.262	0.452	-0.011	0.524 ***	0.508	1.968
SAT cubed	154	0.695	1.129	-0.019	0.634 ***	0.183	5.456
SAT z-score	154	0.643	0.516	0.176 ***	0.855 ***	0.102	9.804
Percent Pell	134	0.237	0.163	-0.287 ***	-0.734 ***	0.336	2.975
Top 25%	155	67.510	20.933	0.000	0.695 ***	0.432	2.316
Percent Female	164	0.469	0.058	-0.034	0.143 *	0.811	1.233
Percent Minority	164	0.162	0.201	0.083	-0.310 ***	0.447	2.239
Discount Rate	164	0.366	0.125	0.126 *	-0.015	0.636	1.571
Acceptance Rate	164	0.634	0.198	-0.119 **	-0.382 ***	0.347	2.880
Religious Affiliation	164	0.506	0.501	0.003	-0.162 *	0.552	1.813
Undergraduate Enrollment	164	1497.970	685.209	0.000 ***	0.143 *	0.537	1.862

*p < .05, ** p < .01, *** p < .001

Model	R ²	Adj. R ²	Root MSE	F	Sig.
6-year Graduation Rate	0.839	0.818	0.057	39.72	<.0001

Table 5. Zero-order and Partial Correlations holding SAT z-score constant

	Actual Grad Rate	
	Zero-order Correlations	Partial Correlations
Expenditures for Instruction	0.720 ***	0.150 *
Expenditures for Academic Support	0.666 ***	0.200 **
Expenditures for Institutional Support	0.378 ***	0.126
Expenditures for Student Services	0.524 ***	0.152 *
SAT cubed	0.634 ***	-0.216 **
Percent Pell	-0.734 ***	-0.257 **
Top 25%	0.695 ***	0.158 *
Percent Female	0.143 *	0.100
Percent Minority	-0.310 ***	0.002
Discount Rate	-0.015	0.117
Acceptance Rate	-0.382 ***	-0.139
Religious Affiliation	-0.162 *	0.184 *
Undergraduate Enrollment	0.143 *	0.034

*p < .05, ** p < .01, *** p < .001

**Table 6. Alternate Model with First-Year NSSE Benchmarks Graduation Rate Results:
Means, Standard Deviations, Coefficients, Correlations, Collinearity Statistics, and Model Summary**

	N	Mean	Std Dev	β	Zero-order Correlations	Collinearity Statistics	
						Tolerance	VIF
Expenditures for Instruction	138	9.290	0.359	-0.045	0.610 ***	0.264	3.793
Expenditures for Academic Support	137	7.919	0.510	0.014	0.592 ***	0.403	2.479
Expenditures for Institutional Support	138	8.588	0.422	0.004	0.310 **	0.362	2.759
Expenditures for Student Services	138	8.332	0.418	-0.035	0.262 **	0.568	1.761
SAT cubed	129	0.853	1.152	-0.024	0.647 ***	0.149	6.709
SAT z-score	129	0.769	0.413	0.136 **	0.780 ***	0.106	9.474
Percent Pell	112	0.204	0.122	-0.267 ***	-0.684 ***	0.474	2.109
Top 25%	135	70.970	19.499	0.001	0.610 ***	0.390	2.563
Percent Female	138	0.469	0.059	0.299	0.187 *	0.629	1.591
Percent Minority	138	0.134	0.127	0.156 *	0.061	0.442	2.261
Discount Rate	135	0.360	0.131	0.103	-0.272 **	0.702	1.425
Acceptance Rate	138	0.621	0.195	-0.122	-0.598 ***	0.300	3.338
Religious Affiliation	138	0.435	0.498	-0.013	-0.294 ***	0.607	1.648
Undergraduate Enrollment	138	1588.330	654.733	0.000	0.515 ***	0.400	2.499
Academic Challenge	94	58.437	2.875	0.006	0.439 ***	0.285	3.514
Active and Collaborative Learning	94	46.070	2.982	0.000	-0.245 *	0.387	2.587
Student-Faculty Interaction	94	38.021	3.794	-0.009 **	-0.393 ***	0.458	2.181
Enriching Educational Experiences	94	31.928	3.085	-0.001	0.189	0.495	2.021
Supportive Campus Environment	94	66.493	3.852	0.000	0.072	0.533	1.875

*p < .05, ** p < .01, *** p < .001

Model	R2	Adj. R2	Root MSE	F	Sig.
6-year Graduation Rate	0.827	0.765	0.055	13.36	<.0001

Table 7. Differences in Predicted Graduation Rates between the USNWR and Alternate Models

	IPEDS Actual Graduation Rate	USNWR Actual Graduation Rate	Alternate Model Predicted GraduationRate	USNWR Predicted Graduation Rate	Difference in Predicted Graduation Rates
Institution A	70%	70%	60%	71%	-11%
Institution B	54%	56%	55%	66%	-11%
Institution C	80%	80%	85%	74%	11%
Institution D	77%	77%	77%	64%	13%
Institution E	85%	85%	94%	85%	9%
Institution F	85%	85%	87%	96%	-9%
Institution G	52%	48%	52%	42%	10%
Institution H	61%	61%	69%	50%	19%
Institution I	59%	59%	68%	78%	-10%
Institution J	63%	59%	63%	78%	-15%

Table 8. Performance Categorizations: USNWR Model and the Alternate Model with 95% Confidence Intervals

		USNWR Classification			
		Under	At expected	Over	TOTAL
Alternate 95% Classification	Under	35 21.1%	3 1.8%	10 6.0%	48 28.9%
	At expected	18 10.8%	7 4.2%	28 16.9%	53 31.9%
	Over	11 6.6%	6 3.6%	48 28.9%	65 39.2%
	TOTAL	64 38.6%	16 9.6%	86 51.8%	166 100.0%

NOTE: There were 22 institutions not classified due to missing predicted graduation rates under the Alternate model.

REFERENCES

- Astin, A.W. (1975). Preventing students from dropping out. San Francisco: Jossey-Bass.
- Astin, A.W. (1977). Four Critical Years: Effects of college on beliefs, attitudes, and knowledge. San Francisco: Jossey-Bass.
- Astin, A.W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel*, 25, 297-307.
- Astin, A.W. (1993, September 22). College retention rates are often misleading. *The Chronicle of Higher Education*, 40(5), A48.
- Astin, A.W. (1997). How “good” is your institution’s retention rate? *Research in Higher Education*, 38(6), 647-658.
- Barnes, W.S. (n.d.). Are college rankings a scam? Retrieved December 26, 2007, from http://www.clarion.edu/art-sci/biology/otherfeatures/ranking_scam/ranking-scam.htm
- Bean, J.P. (1980). Dropouts and turnover: The synthesis and test of a causal model of student retention. *Research in Higher Education*, 12, 155-187.
- Carey, K. (2007). Truth with the myth of higher-education accountability. *Change*, 39(5), 24-29.
- College Confidential. (n.d.). College Rankings - Good, Bad, or Ugly? Retrieved December 28, 2007, from http://www.collegeconfidential.com/college_rankings/
- Choy, S.P. (2002). Access & Persistence: Findings from 10 years of longitudinal research on students. Washington, D.C. American Council on Education.
- DesJardins, S.L., McCall, B.P., Ahlburg, A., Moye, M.J. (2002). Adding a timing light to the “tool box”. *Research in Higher Education*, 43(1), 83-114.

Dichev, I. (2001). News or noise? Estimating the noise in the U. S. News university rankings.

Research in Higher Education, 42, 237-266.

Gansemer-Topf, A.M, & Schuh, J.H. (2006). Institutional selectivity and institutional

expenditures: Examining organizational factors that contribute to retention and

graduation. Research in Higher Education, 47(6), 613-642.

Goenner, C.F., & Snaith, S.M. (2004). Accounting for model uncertainty in the prediction of

university graduation rates. Research in Higher Education, 45(1), 25-41.

Graham, A., & Thompson, N. (2001). Broken Ranks. Retrieved December 26, 2007, from

<http://www.washingtonmonthly.com/features/2001/0109.graham.thompson.html>

Inside Higher Education. (2007, November 15). Warning on Tuition, Shift on Accreditation.

Retrieved December 26, 2007, from <http://insidehighered.com/news/2007/11/15/hea>

Kuh, G.D. (2001). The National Survey of Student Engagement: Conceptual Framework and

Overview of Psychometric Properties, Indiana University Center for Postsecondary

Research and Planning, Bloomington..

Kuh, G.D. (2007). Risky business: Promises and pitfalls of institutional transparency. Change,

39(5), 30-35.

Lotkowski Veronica A., Robbins Steven B. & Noeth Richard J. (2004). The role of academic and

non-academic factors in improving college retention. Iowa , ACT.

Marklein, M.B. (2007). Need to pick a college? New websites can help. Retrieved January 3,

2008, from <http://www.usatoday.com/news/education/2007-09-24-college->

[navigator_N.htm](http://www.usatoday.com/news/education/2007-09-24-college-navigator_N.htm)

Morris, L. V., Wu, S., Finnegan, C. L. (2005). Predicting retention in online general education

courses. American Journal of Distance Education, 19(1), 23-36.

- Morse, R. J., & Flanigan, S. (2007). How we do the rankings. Retrieved December 27, 2007, from http://colleges.usnews.rankingsandreviews.com/usnews/edu/college/rankings/about/rank_brief.php
- Mortenson, T.G. (1998). Institutional graduation rates by control, academic selectivity and degree level 1993 to 1998. *Postsecondary Education Opportunity*, 73, 1-10.
- Pascarella, E.T. (1985). Students' affective development within the college environment. *The Journal of Higher Education*, 56(6), 640-633.
- Pascarella, E.T., & Terenzini, P.T. (1991). *How College Affects Students: Findings and Insights from Twenty Years of Research*. Jossey-Bass, San Francisco.
- Pike, G.R. (2004). Measuring Quality: A comparison of U.S. News rankings and NSSE benchmarks. *Research in Higher Education*, 45(2), 193-208.
- Porter, S.R. (1999). The robustness of the "graduation rate performance" indicator used in the U.S. News & World Report college rankings. Paper presented at the Second Annual AIR-CASE Conference, Washington, D.C.
- Ryan, J.F. (2004). The relationship between institutional expenditures and degree attainment at baccalaureate college. *Research in Higher Education*, 45(2), 97-114.
- Scott, M., Bailey, T., & Kienzl, G. (2006). Relative success? Determinants of college graduation rates in public and private colleges in the U.S. *Research in Higher Education*, 47(3), 249-279.
- Texas State Higher Education Coordinating Board. (2004). *The art of student retention: A handbook for practioners and administrators*. Austin, TX: Texas State Higher Education Coordinating Board. (ERIC Document Reproduction Services No. ED 485 498)

The Education Conservancy. (2007, May 10). President's letter. Retrieved December 28, 2007, from http://www.educationconservancy.org/presidents_letter.html

The Princeton Review. (2006). *The best 361 colleges: The smart student's guide to colleges*. New York. The Princeton Review.

Thayer, P.B. (2000, May). Retention of students from first generation and low income backgrounds. *Opportunity Outlook: The Journal of the Council for Opportunity in Education*, 2-8.

Tinto, V. (1975). Dropouts from higher education: A theoretical synthesis of the recent literature. *A Review of Educational Research*, 45, 89-125.

Tinto, V. (1982). Limits of theory and practice in student attrition. *Journal of Higher Education*, 53(December), 687-700.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

Tinto, V. (2003). Establishing conditions for student success. In L. Thomas, M. Cooper, & J. Quinn (Eds.), *Improving completion rates among disadvantaged students* (p. 1-10). Stoke on Trent: Trentham Books.

U.S. Department of Education (1998a). National Center for Education Statistics. *First-Generation Students: Undergraduates Whose Parents Never Enrolled in Postsecondary Education* (NCES 98-082). Washington, D.C. Nunez, A. & Cuccaro-Alamin, S.

Van Der Werf, M. (2007, May 25). *Rankings Methodology Hurts Public Institutions*. Retrieved December 28, 2007, from <http://chronicle.com/free/v53/i38/38a01301.htm>

Webster, D.S. (1992). Are they any good? *Change*, 24(2), 18-30.